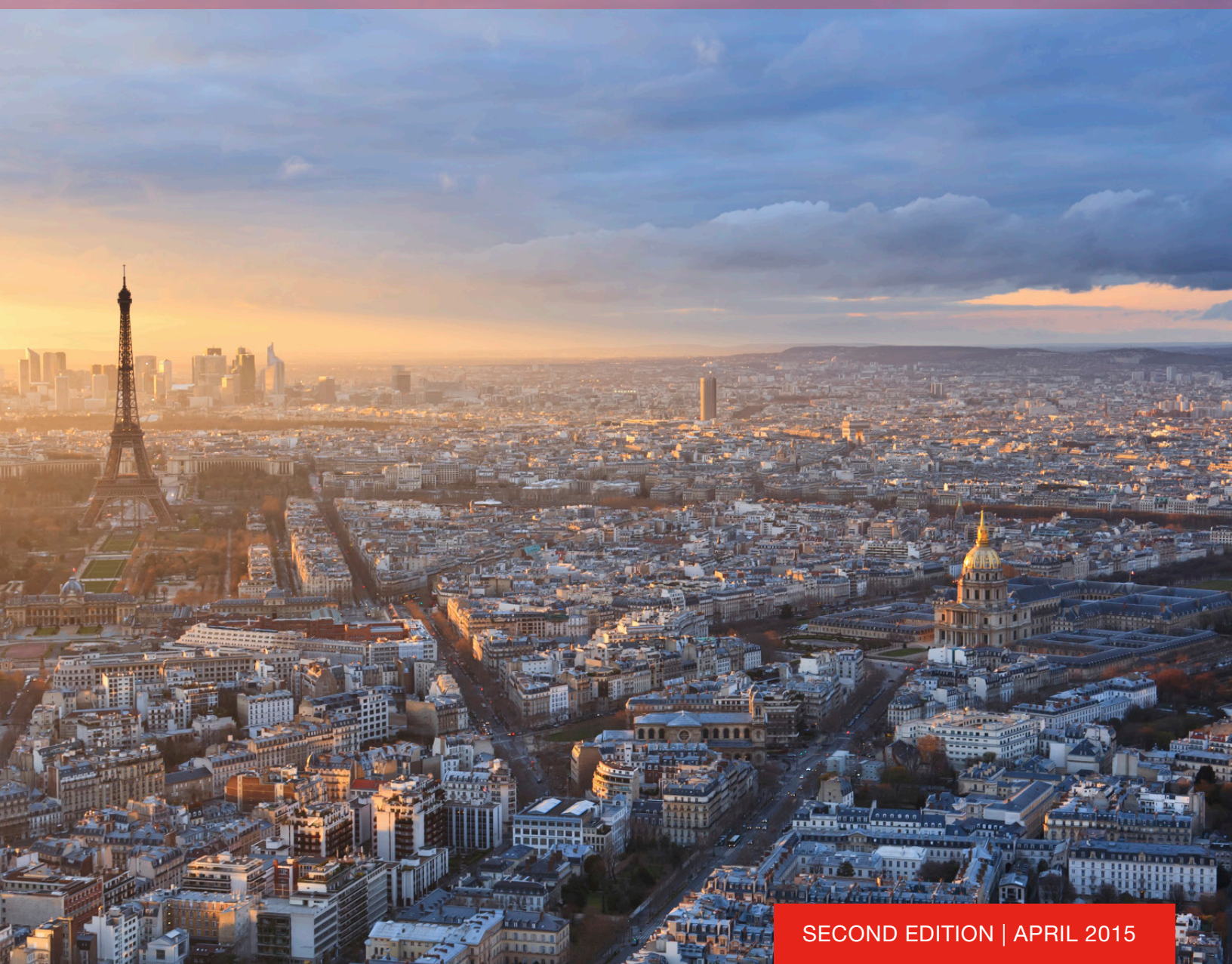


Business in a Climate-Constrained World

---

# Creating an **Action Agenda** for Private-Sector Leadership on Climate Change



SECOND EDITION | APRIL 2015

# About This Report

This report presents BSR's strategy to mobilize our formidable business network, global reach, industry insights, and issue expertise in support of sustained business action on climate change. Business and society face unprecedented risks as a consequence of climate-related impacts, including increases in temperature and sea level, increases in the intensity and frequency of extreme weather events, threats to biodiversity and ecosystem services, and changes in water distribution. We must pursue strategies to enhance resilience with urgency and ambition. We must both reduce our emissions to keep them consistent with a 2°C pathway and enhance adaptive capacity in the face of inevitable climate impacts.

Our strategy aims to catalyze business ambition through translation, stabilization, and collaboration.

- » **Translation** involves deepening private-sector understanding of climate risk and opportunities for resilience. Climate risk varies across geographies, industries, and individual companies. Some geographies are exposed to risks associated with extreme weather events, whereas others are threatened by drought and temperature variation. Some industries experience climate risk due to dependence on fragile natural resources, whereas others will be affected by direct impacts on operations, transport, and logistics. Materiality will be the principal driver of action in some companies, whereas others will be responding to regulatory, investor, and stakeholder demands. We will translate climate risk with actionable and tailored insights for business that will provide them with a platform for action. We will also respond to increasing demands from member companies to equip them to engage with the international negotiations conducted under the United Nations Framework Convention on Climate Change (UNFCCC) and expected to conclude with a new climate agreement in Paris in December 2015.
- » **Stabilization** means creating a menu of actionable “resilience wedges” tailored to specific industries and companies that allow for cumulative actions to reduce the full suite of greenhouse gases (GHGs), including carbon dioxide, methane, and black carbon. It further means developing a menu of interventions to build adaptive capacity in the face of inevitable climate impacts. The wedges approach allows for business leadership on climate that is both ambitious and pragmatic. Instead of waiting on a technological or policy silver bullet we will demonstrate that real ambition can be achieved through cumulative and manageable steps across the full value chain. We do not set out to present a comprehensive, exhaustive, or definitive inventory of measures for business to follow. Instead, we propose a framework for action that helps companies identify a menu of small steps that cumulatively add up to significant ambition to address climate change.
- » **Collaboration** involves facilitating cross-sector and multistakeholder partnerships through BSR Collaborative Initiatives and with our partners in the We Mean Business coalition. Collective action is key to the success of this strategy as climate change cannot be solved by any one stakeholder acting alone. Cross-sector collaboration is essential to address systemic challenges holistically. multistakeholder partnerships are vital to creating the appropriate policy-enabling environment to catalyze and incentivize business leadership on climate change.

This report begins with a section on translating climate risks for business and society. We then move into a description of what companies can do to build resilience in a climate-constrained world—a combination of reducing emissions consistent with a 2°C pathway and building adaptive capacity in the face of inevitable climate impacts. We outline how BSR will partner with companies and other stakeholders to apply the climate stabilization wedges across our industry clusters. We then detail BSR's value proposition and conclude with a description of how we will leverage our network and experience in implementing this strategy by 2020.

This strategy was initially prepared over a six-month period from November 2013 to April 2014. This second edition of our report updates our framework, captures learning from the first year of implementing our strategy, and situates our climate work firmly within the context of the so-called 2015 moment – the wave of political and business activity designed to drive negotiations leading to a new international climate agreement in Paris in December. The report is the result of an extensive literature review, elite interviews conducted with leading practitioners across a variety of important sectors and issue areas, and discussions held within focus groups convened throughout BSR's formidable network. Moreover, it is the product of harvesting lessons from more than two decades of BSR insights and experience working with business on interrelated, complex global challenges.

## ACKNOWLEDGMENTS

The authors wish to thank the following people for their peer review and insightful feedback: Adam Lane, Alice Valvodova, Angie Farrag-Thibault, Aron Cramer, Chengbo Wang, Cristina Rumbaitis del Rio, David Wei, Drazen Kucan, Dunstan Allison-Hope, Eric Olson, Eva Dienel, Inka Schomer, Jeremy Prepscius, Jessica Davis Pluess, Laura Gitman, Melanie Janin, Michael Oxman, Peder Michael Pruzan-Jorgensen, Racheal Meiers, Sissel Waage, Smruti Govan, and Stacy Kotorac.

We would also like to thank Dean Matsueda for designing the original graphics in this report, and Sunhee Choi for refreshing the overall design of the second edition. We further acknowledge the following organizations for allowing us to reproduce their graphics: UN Environment Programme (UNEP) and World Resources Institute (WRI).

## DISCLAIMER

BSR publishes occasional papers as a contribution to the understanding of the role of business in society and the trends related to corporate social responsibility and responsible business practices. BSR maintains a policy of not acting as a representative of its membership, nor does it endorse specific policies or standards. The views expressed in this publication are those of its authors and do not reflect those of BSR members.

Working papers contain preliminary research, analysis, findings, and recommendations. They are circulated to stimulate timely discussion and critical feedback and to influence ongoing debate on emerging issues. Most working papers are eventually published in another form, and their content may be revised.

## SUGGESTED CITATION

Cameron, E.; Erickson, C.; Praticco, E; and Schuchard, R., 2015. "Business in a Climate-Constrained World (Second Edition): Creating an Action Agenda for Private-Sector Leadership on Climate Change." BSR Working Paper. BSR, San Francisco.

[www.bsr.org/bccw](http://www.bsr.org/bccw)

BSR works with its global network of more than 250 member companies to build a just and sustainable world.

From its offices in Asia, Europe, and North and South America, BSR develops sustainable business strategies and solutions through consulting, research, and cross-sector collaboration. Visit **[www.bsr.org](http://www.bsr.org)** for more information about BSR's more than 20 years of leadership in sustainability.



# Contents

<b>Foreword:</b> The Future of Our Climate Depends on Business by Aron Cramer	v
<b>Executive Summary</b>	1
<b>Translating Climate for Business</b> Why climate matters for business and sustainability during this decisive decade	6
<b>Catalyzing Business Resilience in a Climate-Constrained World</b> How BSR's climate stabilization wedges can catalyze business to go further, faster to build climate resilience	26
<b>Driving New Ideas and Collaboration on Climate Resilience</b> How BSR will capitalize on more than 20 years of experience working on sustainability to drive forward actionable ideas and collaboration on climate	56
<b>The Road to Paris and Beyond</b> The road ahead for business and BSR as partners driving climate ambition	68
<b>References</b>	74

## List of Tables and Figures

<b>FIGURE 1:</b> Climate Collision Course	8
<b>FIGURE 2:</b> Translating Climate Risk: The IPCC Fifth Assessment Report	13
<b>TABLE 1:</b> Climate Risks	15
<b>FIGURE 3:</b> Countries are Acting	21
<b>FIGURE 4:</b> The Emissions Gap	25
<b>FIGURE 5:</b> The Stabilization Triangle	32
<b>FIGURE 6:</b> BSR Resilience Wedges: Driving Emissions Reductions Across Industry Clusters	36
<b>FIGURE 7:</b> BSR Resilience Wedges: Enhancing Adaptive Capacity Across Industry Clusters	42
<b>FIGURE 8:</b> Emissions Reductions Wedges Within the Agriculture Industry	46
<b>FIGURE 9:</b> Adaptive Capacity Wedges Within the Agriculture Industry	48
<b>FIGURE 10:</b> Emissions-Reduction Wedges in All Industries	52

## Foreword:

# The Future of Our Climate Depends on Business



### The window of opportunity for business leadership on climate has arrived.

In 2014, BSR launched our Business in a Climate-Constrained World initiative, which seeks to mobilize our business network, global reach, industry insights, and issue expertise in support of sustained private-sector leadership on climate change. We presented a vision for catalyzing a climate-resilient future powered by the innovation, investments, products, and voice of business.

One year on, we have much to celebrate. By translating both the risks of climate change and the opportunities of an early transition to a low-carbon future, we are helping build a broad business case for climate action. By developing a framework for climate stabilization based on a menu of ambitious and pragmatic steps accessible to any company, we are equipping businesses to develop their own plans for greenhouse reductions and enhanced adaptive capacity. And by working to boost opportunities for collaboration, both among companies and between business and other stakeholders, we are creating a platform for bold collective action, the sharing of solutions, and a dialogue on how to bring policymaking and markets together to incentivize an action agenda on climate change.

Central to this effort is our collaboration with our partners in the We Mean Business coalition. In 2014, seven business-facing networks, working with thousands of the world's most influential businesses and investors, joined forces to amplify the business voice, work with companies to kick-start a low-carbon economy, and promote smart policy frameworks.

In December of this year, governments from across the globe will come together in Paris to finalize a new international climate agreement. It is critical that this new agreement be a catalyst for action and not just a collection of commitments. During this pivotal year, BSR looks forward to deepening our own commitment to a just and sustainable world by building an action agenda for private-sector leadership on climate.

A handwritten signature in black ink, appearing to read 'Aron Cramer'.

**Aron Cramer**  
President and CEO, BSR  
April 2015

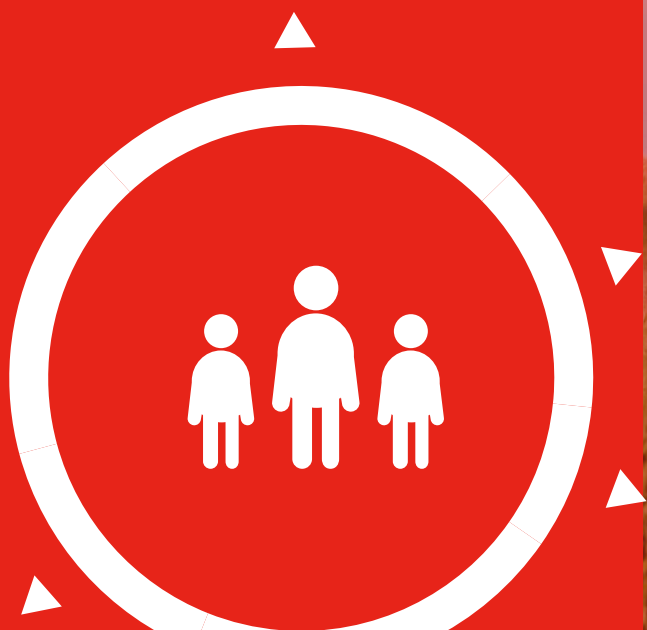
“

One year on, we have much to celebrate. By translating both the risks of climate change and the opportunities of an early transition to a low-carbon future, we are helping build a broad business case for climate action.

”

# 01

## Executive Summary





# Executive Summary

2015 is a pivotal year for climate change. Representatives of 196 governments are expected to conclude a new global agreement in Paris in December that will substantially reduce greenhouse gas emissions, mobilize finance in support of low-emissions development, and create a pathway for long-term decarbonization. Businesses, investors, and consumers are already preparing for a new landscape that incentivizes sustainability, innovation, and climate-compatible growth. BSR is working to shape this emerging landscape and equip businesses to seize this window of opportunity through our Business in a Climate-Constrained World strategy.

The science is clear. We must hold the global mean temperature rise to less than 2°C above preindustrial levels to avoid unprecedented climate risks to society and business.

The latest Intergovernmental Panel on Climate Change (IPCC) report on impacts, adaptation, and vulnerability also stresses that observed impacts of climate change are widespread and consequential.<sup>1</sup> Describing climate change impacts as severe, pervasive, and irreversible, the report presents implications on social systems, including damage to livelihoods and homes, threats to food security and development, increased incidence of poverty and conflicts, the undermining of human rights, and heightened public health risks stemming from climate-related diseases and fatalities. Impacts on ecological systems include loss of critical habitat, heightened risk of species extinctions, and damage to ecosystem services.<sup>2</sup>

In the face of this reality, climate action is increasingly seen

not as a burden but as a historic economic opportunity. What we have found is that companies are eager to act with greater ambition and are increasingly rooting their emissions reductions targets in the latest climate science. Forward-thinking companies have seen an internal rate of return of 27 percent on their low-carbon investments.<sup>3</sup> One hundred of the world's leading companies are committing to 100 percent renewable power by 2020 through the Climate Group's RE100 initiative.<sup>4</sup>

A year ago, BSR launched our signature Business in a Climate-Constrained World strategy with a view to mobilize our business network, global reach, industry insights, and issue expertise to address global climate change. Our strategy consists of **translation** of climate risk; **collaboration** across business sectors and stakeholder groups in pursuit of urgent, ambitious, and sustained climate-related action; and **stabilization** of the climate system through the implementation of resilience wedges.

<sup>1</sup> IPCC, 2014.

<sup>2</sup> Ibid.

<sup>3</sup> We Mean Business, 2014.

<sup>4</sup> The Climate Group, 2015.

We profiled our approach to climate in the first version of this report, which was published on Earth Day 2014. Now, a year later, we have refreshed this report to capture the momentum created by the so-called “2015 moment” and to illustrate the range of ambitious and pragmatic options available to companies wishing to embark on the road to climate resilience.

We are very proud of what we have accomplished over the past year. In just 12 months, we have:

- » **Translated risk and resilience for industry:** In June and July 2014, we launched three reports outlining climate risk and strategies for resilience for agriculture, extractives/primary industries, and transport. These reports are part of a wider 13-part series that translates the IPCC assessments for business leaders published jointly with the University of Cambridge and the European Climate Foundation. In 2015, we are building on that work by translating the “fast mitigation” potential of short-lived climate pollutants across a range of sectors through our work with the Climate and Clean Air Coalition.
- » **Deepened our existing climate-facing Collaborative Initiatives and launched two new climate-facing initiatives:** BSR’s Climate Science Initiative helps companies understand critical new areas of climate research; places climate science in the business context; identifies opportunities for individual and collective action to respond to emerging threats and opportunities; and enhances the ability of companies to invest in resilience-building activities. Our Regional Adaptation Initiative explores opportunities for climate adaptation in key regions and provides a platform for companies to collaborate in building resilience.
- » **Facilitated the development of climate strategies through our framework:** In 2014, we worked with a range of member companies, as well as partners in government, civil society, philanthropy, and the UN family, to design and execute climate strategies with a focus on mobilizing finance in support of climate-compatible development; enabling ambitious greenhouse gas reductions; and deepening collaboration between government and the private sector in support of sector-based approaches to climate change.

- » **Served as founding member of the We Mean Business Coalition,** which brings together seven business-facing networks to amplify the business voice, catalyze bold climate action by all, and promote smart policy frameworks.
- » **Became a non-state partner of the Climate and Clean Air Coalition:** In January of this year, we joined the Climate and Clean Air Coalition (CCAC), which brings together governments, business, and civil society actors to tackle so-called short-lived climate pollutants such as methane and black carbon.

As the New Climate Economy report outlines, low-carbon, climate-resilient growth is possible.<sup>5</sup> The transition to a low-carbon future is already generating returns and savings and helping to produce high-quality jobs. But despite this progress, there is much more work to be done.

This year provides an opportunity to capitalize on the existing momentum and create a catalyst for further ambition and action on climate change. In December 2015 in Paris, representatives of 196 governments are expected to sign a new international climate agreement that will substantially reduce greenhouse gas emissions and set a course for long-term decarbonization. The expected agreement will be a global first because it will engage all countries—not just a select few from the industrialized world—to change their development path. This, in turn, will send strong signals to the market that the time to act on climate has arrived. In preparation for this pivotal climate summit, the French government is calling on business and other stakeholders to help create an “action agenda” to drive bold collective action with the widest possible participation. The aim of this strategy is to prepare business to be part of the action agenda and to seize the opportunities of a transition to a low-carbon future.

## Why This Matters for Business

As the threat of climate change increases, so do the risks for business. These risks include disrupted supply chains, reduced availability of scarce natural resources, damage to vital infrastructure and utilities, disrupted transport and logistics routes, heightened price and market volatility, and

<sup>5</sup> New Climate Economy, 2014.

unpredictable impacts on the workforce and consumers. Some estimates put the cumulative global cost of climate change impacts as high as US\$4 trillion by 2030 if we continue on our current path of greenhouse gas (GHG) emissions.<sup>6</sup> These threats demand a reappraisal of climate risk and a comprehensive strategy for resilience.

The IPCC report defines resilience as “the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.”<sup>7</sup> Resilience has always been understood as the ability to manage and rebound from risks, but what if some risks are so severe that they breach irreversible thresholds? Under these circumstances, resilience must include a balance between avoiding the unmanageable by aggressively reducing emissions while managing the unavoidable risks of climate change by enhancing adaptive capacity.

- » **Avoiding the unmanageable** requires ambitious reductions in GHG emissions to hold the global mean temperature rise to less than 2°C above preindustrial levels. Breaching this threshold by emitting excessive GHGs into the atmosphere would critically undermine socioecological systems beyond their points of resilience.
- » **Managing the unavoidable** recognizes that inevitable climate impacts are already locked into the system as a consequence of the rapid accumulation of GHGs in the atmosphere over many centuries and from numerous sources.

Resilience in the face of climate change, therefore, requires action on two fronts simultaneously: aggressive emissions reductions and sustained enhancement of adaptive capacity.

## Our Approach to Climate Resilience

We have structured this report into three sections, which together constitute our approach to building climate resilience. These sections cover: translation, collaboration, and stabilization.

### TRANSLATION

The nature of climate risk differs across geographies and across sectors, with most industries exposed to multiple, intersecting climate risks. As a consequence, a sophisticated, comprehensive reappraisal of risk is needed to ensure business success in a climate-constrained world. Moreover, the transition to a low-carbon future also holds risks. Some industries may find themselves with stranded assets as a result of climate regulation. Incentives to promote low-carbon energy could put pressure on other industries, as was the case some years ago when a rush to biofuels caused a temporary global food crisis.

Managing this transition is a critical element of managing risk. As you’ll see in the featured case studies, companies like Nike and Walmart are doing just that. Translating these complex risks is a critical part of our strategy. We intend to work with partners to better understand the full spectrum of risks and translate this knowledge into actionable strategies for resilience.

### STABILIZATION

The core of our strategy builds upon the climate “stabilization wedges” pioneered by Princeton professors Robert Socolow and Stephen Pacala in a seminal paper published in 2004. The great value in adopting a wedge-based approach is that it constitutes what author Clay Shirky describes as a “plausible promise”: a strategy that has sufficient ambition to be truly meaningful, while at the same time being achievable using current technologies and operating within current political economy realities.”<sup>8</sup>

We intend to identify appropriate *resilience wedges* to both reduce emissions and enhance adaptive capacity across a range of industry clusters. To address emissions, we will seek to implement actual emissions reductions in partnership with BSR member companies and other stakeholders, including government, philanthropies, civil society actors, academics, and multilateral organizations. To enhance adaptive capacity, we will look for opportunities to strengthen corporate supply chains and increase the ability of communities directly affected by climate to respond to and rebound from impacts with business support.

<sup>6</sup> Mercer, 2011.  
<sup>7</sup> IPCC, 2014, p. 5.

<sup>8</sup> Shirky, 2009, p. 25.

Some wedges will be unique to specific industries. For example, we already know that in order to reduce emissions the agricultural sector will need to address land-use and livestock management, increase the capacity of terrestrial carbon stocks through sequestration in soils and biomass, tackle food waste, and encourage people to change their diets. We also know that enhanced adaptive capacity in the agricultural sector will require altering cultivation and sowing times, improving crops' tolerance to high temperatures, breeding additional drought-tolerant crop varieties, improving adaptive water management techniques, and using more suitable livestock breeds or species in regions with changing temperatures and water patterns.

Some wedges—particularly those related to energy use and mix—will be common across all industry sectors. Moreover, their application, particularly those related to efficiencies in the supply chain, will be replicable across industries.

We know that more research is needed to investigate and implement the ambitious wedges that are appropriate for each sector, but companies like Somo, Verizon, Walmart, Nike, and Coca-Cola are already taking action. Because each industry is unique, we will work with our partners to identify and act upon the spectrum of options available for emissions reductions and enhanced adaptive capacity in each sector.

## COLLABORATION

Tackling the challenge of global climate change is an enormous task—too large for any single company or organization. All stakeholders, including business, will need to commit to bold collective action to build resilience in a climate-constrained world. This need, in turn, requires a new emphasis on collaboration. We believe that collaboration across industries and with multiple stakeholder partners creates an ecosystem for climate action, allowing industries to enable each other and the communities in which they operate.

Business can avail itself of the transformational power of collaboration by working across industries to share knowledge, pioneer new approaches and technologies, and test business-to-business solutions. Companies can share costs and resources through partnerships with peers as well as with the public sector and civil society.

These partnerships will drive effective action in the areas where business has the most to contribute—and the most to lose—through improvements to shared infrastructure, local capacity building, and disaster preparedness and response. The case studies that follow illustrate several examples of transformative collaborations, including the We Mean Business Coalition, Climate and Clean Air Coalition, and BSR's own Collaborative Initiatives. Nonetheless, we believe more collaboration is needed to truly advance the climate agenda.

## A Call to Action and an Invitation to Partnership

At BSR, we believe in the transformational power of the private sector. We further believe that businesses can lead to address climate change by:

- » Developing new technologies and business models;
- » Aggressively reducing their emissions and enhancing their adaptive capacity through their investments, procurement, and use of energy, land, and transportation;
- » Enabling climate resilience in other sectors and in the communities in which they operate through their innovations, products, services, and commitment to the social license to operate; and
- » Working with governments and other stakeholders to create the right policy and financial environment for a low-carbon future.

The good news is that many businesses are already beginning to act. According to CDP in 2013, 84 percent of Global 500 companies—defined by CDP as the largest companies by market capitalization included in the FTSE Global Equity Index Series—reported that they have emissions reductions targets, and 75 percent reported that they have already reduced their emissions in some areas of their business.<sup>9</sup> It is clear that many companies are already innovating and investing with the goal of building climate resilience. Moreover, more than 96 governments from developed and developing countries have initiated climate policies, ranging from domestic laws and standards to emissions trading systems and carbon

<sup>9</sup> CDP, 2013, p. 8.



pricing. The enabling environment for climate resilience is being constructed all around us.

The bad news is that, despite some initial progress, this activity does not yet equal ambition. Too many businesses believe that climate-related action is impractical in an age of fiscal austerity and is incompatible with their bottom line. Others are waiting for a silver bullet—either a new technology or a policy incentive from government—to spur them to act.

**This strategy therefore constitutes a call to action—to match the volume of activity on climate with a greater commitment to ambition.**

We believe that our strategy of translation, stabilization, and collaboration provides a menu of tangible, actionable steps that all companies and sectors can take to cut emissions, consistent with a 2°C pathway, while also enhancing their adaptive capacity in the face of the inevitable impacts. We invite BSR members and noncorporate stakeholder partners to join us in this effort—to work with us to identify the resilience wedges across all industry sectors and to seed the innovation necessary to build a climate-resilient world.

## **BSR is Driving New Ideas and Collaboration on Climate Resilience**

We believe our legacy of work on sustainability over two decades has prepared us well to lead this effort. BSR is practical and ambitious at translating good ideas into actionable strategies that deliver value for business and society. Working with more than 250 major corporations across eight industry clusters, we promote individual company leadership and innovation, collaborative change across business networks, and cross-sector solutions for systemic change.

With eight offices on four continents, we work in the key geographies that will determine success or failure on climate. We understand the social and environmental issues and how they play out across different regions. We are also collaborative. Extending from our work with individual companies, we bring business and its stakeholders together to tackle intransigent common problems. This work involves improving industry standards, sharing best practices

across industries, pooling resources to develop value-chain partnerships, and hosting unlikely discussions with adversaries. Our partnership development work allows us to cooperate with governments, philanthropies, multilateral organizations, and civil society actors.

## **What We Know and What We Hope to Learn**

We know that this is a decisive decade for the global climate. We must have a greater sense of urgency and ambition if we are to avoid dangerous climate thresholds with potentially catastrophic implications for socioecological systems and global prosperity. We also know that catalyzing climate resilience will not be easy. Our global economy, and with it the legitimate development aspirations of billions of people, is heavily dependent on fossil fuels and other high-carbon practices. The transition to a low-carbon future must be managed in a manner that recognizes this context, minimizes negative dislocations, and facilitates equitable access to sustainable development.

We already know enough to get started, and our initial success building the Business in a Climate-Constrained World strategy proves that. As Ecofys, a leading energy consultancy, points out, “. . . [E]xisting scenarios show that it is technically and economically feasible to reduce emissions to zero for roughly 90 percent of current sources of GHG emissions with technological options that are available today and in the near future.”<sup>10</sup> The wedges approach does not require us to wait for breakthrough energy technologies or other technological or policy silver bullets. We can act with urgency and ambition straightaway.

We don’t know everything, however. We will therefore call upon our members and other partners to work together to complete a comprehensive, definitive inventory of appropriate wedges and to develop collaborative approaches to building resilience in a climate-constrained world.

<sup>10</sup> Hohne et al., 2013.

# 02

Translating  
Climate for Business



# Translating Climate for Business

The science of climate change is clear. We must hold the global mean temperature rise to less than 2°C above preindustrial levels in order to avoid exposure to significant, potentially irreversible risks to the planet, people, and business.<sup>11</sup> It is equally clear that the road to resilience is visible before us. We must travel that road with purpose, and we must start that journey in 2015.

## Understanding Climate Risks

In June 1962, *The New Yorker* began serializing Rachel Carson's *Silent Spring*. The book derived its power from its fictional "fable for tomorrow," which described a storybook town's descent from natural harmony to a "spring without voices" as ecosystems and biodiversity collapsed due to environmental pollution.<sup>12</sup> Fifty years later, another powerful piece in a different New York magazine described Lower Manhattan as "dark, silent, and underwater." *Bloomberg Businessweek*'s 2012 cover story, "It's Global Warming, Stupid," offered a modern "fable for tomorrow." The culprit was dangerous climate change prompted by the rapid accumulation of GHGs in the atmosphere.<sup>13</sup>

As the United States marked the one-year anniversary of Hurricane Sandy, another extreme weather event devastated communities half a world away. Typhoon Yolanda (Haiyan), which struck the Philippines on November 9, 2013, killed almost 6,000 people and left more than a half million people displaced and more than 2 million people in need of food aid.<sup>14</sup> To many observers,

these events hint at a climate-constrained future.

The IPCC's Fifth Assessment Report clearly lays out a strong rationale for stabilizing the climate. "Since the 1950s, many of the observed changes are unprecedented over decades to millennia," the report stated.<sup>15</sup> These changes are driven by increasing concentrations of GHGs to levels unprecedented in at least the last 800,000 years.<sup>16</sup> The global mean temperature has already increased 0.8°C above preindustrial levels. The IPCC projects that we are on a path to a global mean temperature rise in the range of 1.5°C to 4.5°C<sup>17</sup> by the end of the century. To avoid dangerous climate change, we must limit this temperature rise to 2°C above preindustrial levels.<sup>18</sup> These findings are reinforced by research conducted by the World Bank, which estimates that, based on current trends, the world is likely to warm by 4°C by the end of the century.<sup>19</sup>

As statistician Nate Silver has pointed out, "The science behind the greenhouse effect was simple enough to have been widely understood by the mid- to late 19th century, when the lightbulb, the telephone, and the automobile were being invented—and not the atomic bomb, the iPhone, and the space shuttle. The greenhouse effect

11 IPCC, 2007a. At the Fifteenth Conference of Parties to the UN Framework Convention on Climate Change (UNFCCC) meeting in Copenhagen, Denmark, in December 2009, countries agreed to hold the increase in the global mean temperature to less than 2°C above preindustrial levels in accordance with the findings of the IPCC Fourth Assessment Report.

12 Carson, 1962, p. 27.

13 Barrett, 2012.

14 National Disaster Risk Reduction and Management Council of the Republic of the Philippines, 2013.

15 IPCC, 2013, p. 3.

16 Ibid., p. 7.

17 Ibid., p. 11.

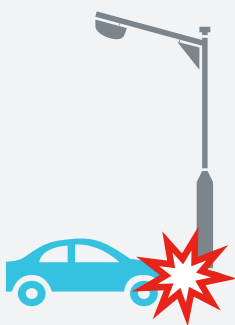
18 IPCC, 2007a.

19 World Bank, 2012.

FIGURE 1

# Climate Collision Course

According to the IPCC, climate change impacts are likely to be “severe, pervasive, and irreversible” as a result of GHG concentrations in the atmosphere at levels not seen in the last 800,000 years. This risk for business results from the interaction between climate-related hazards, the vulnerability and exposure of human and natural systems, and the private sector’s own sensitivity to a range of specific risks. We describe these as climate collision courses.



## HAZARDS

The first collision course is between greenhouse gases (GHGs) and the atmosphere. Concentrations of GHGs in the atmosphere are leading to multiple climate hazards, including a rise in global mean temperature in the range of 1.5°C to 4°C; an increase in the intensity and frequency of extreme weather events; as well as ocean acidification, sea-level rises, and changes in precipitation patterns affecting the availability of fresh water.



## IMPACTS AND VULNERABILITY

The second collision course is between climate hazards and socioecological systems. Climate hazards lead to destruction and fragmentation of habitats, loss of biodiversity and ecosystems services, and severe impacts on homes, jobs, human rights, and lives.



## BUSINESS RISKS

The third collision course is with business sustainability. Business is likely to be an early casualty of climate impacts, with adverse effects including reduced access to essential raw materials and exposure to operational, financial, and reputational risks.

is not rocket science.”<sup>20</sup> Despite this fact, skeptics have attacked and disputed the science underpinning climate change for many decades.<sup>21</sup> The IPCC’s Fifth Assessment Report is the most detailed examination of climate change ever. It is based on more data, contains more detailed regional projections, and is more confident about its conclusions than any other global assessment to date. As a result, the report provides us an opportunity to

transform the conversation from whether climate change is happening to what can be done to build resilience in a climate-constrained world.

## Risks to Socioecological Systems

According to the IPCC, a new world is being forged all around us characterized by rising temperatures, increasing frequency and intensity of extreme weather events, the inundation of coastal cities with many wet regions

<sup>20</sup> Silver, 2012, p. 450.

<sup>21</sup> See Hoggan and Littlemore, 2009, and Boykoff and Boykoff, 2007.



becoming wetter and dry regions becoming drier, an irreversible loss of biodiversity, rainforest dieback, and a rising sea level.<sup>22</sup>

These climate-driven impacts, in turn, lead to loss of livelihoods and homes; increased incidences of poverty and hunger; additional stresses on fragile states, particularly those prone to conflict; the undermining of human rights; and threats to health and lives caused by declining nutrition, increases in vector and waterborne diseases, and fatalities resulting from extreme weather events. These social impacts of climate change reach into every community around the globe but have a disproportionate effect on the world's poor.<sup>23</sup>

The landmark Stern Review on the Economics of Climate Change, prepared by Sir Nicholas Stern, predicted that temperature rises in excess of 2°C will result in as many as 4 billion people experiencing growing water shortages. The most heavily impacted populations would be in Africa, the Middle East, southern Europe, and Latin America. This temperature increase would have consequences not only for drinking water but also for the availability of water for business purposes, including those related to irrigation and urban water supplies.<sup>24</sup> In addition, the UN predicts that temperature rises beyond 2°C could lead to 600 million additional people facing acute malnutrition by the 2080s.<sup>25</sup>

In addition, the changing climate will affect the structure and function of ecological systems. Approximately 20 to 30 percent of plant and animal species are likely to face an increased risk of extinction if we exceed the 2°C threshold. Entire ecosystems, which are not only important in their own right but also provide essential services to communities and business, could be destroyed.<sup>26</sup> Everything from medicines and clothing to irrigation and crop pollination relies on our complex ecosystems.<sup>27</sup>

For example, because of climate change, a tropical

rainforest may have more variable rainfall patterns over time. With shifting conditions, tree stress would likely increase, which would lead to forests becoming more prone to insects, diseases, and fire. Changes in wildlife movement could affect natural forest regeneration because fruit-eating wildlife play a key role in dispersing seeds and continually regenerating (or replanting) forests. Therefore, as trees died off and water became scarcer, wildlife had to spend more time searching for water sources, thereby blocking the pathways to natural forest regeneration. The net effect could be less forest cover over time due to both mortality and lack of natural regeneration, which, in turn, would reduce carbon sequestration and oxygen production as well as contribute to many other issues.

In short order, surrounding communities could begin to see human health impacts associated with climate change related to the unraveling of ecosystem structure and function. Regional air quality could deteriorate because there would be fewer trees in a region to sequester carbon, and insect-borne disease could surge as natural mosquito predators (such as frogs) die off, mosquitoes propagate, and illnesses (such as malaria and dengue fever) skyrocket. Clearly, loss of green infrastructure, in the form of robust ecological structure and function, is in no one's best interest—least of all that of a company relying on stability in a particular part of the world to ensure that its business runs smoothly.

## Climate Risks for Business

Not merely an environmental and social challenge, climate change also poses a significant, growing set of risks for business, spanning the spectrum from financial to operational. These risks include market and price volatility; rising costs of inputs, including energy, water, land, and chemicals; access to scarce natural resources that are vital for production; and damage to the infrastructure and logistics essential for a functioning supply chain. Moreover, increasing demand for action from a variety of stakeholders is imposing a variety of reputational and regulatory risks. BSR has categorized risk vectors and determined seven types of climate risks for business:

22 IPCC, 2013.  
 23 Cameron, 2011.  
 24 Stern, 2006.  
 25 UN Development Programme, 2007.  
 26 UNDP, 2005.  
 27 Cameron, 2013.



1. **Physical Risk:** The impact of abnormal weather on assets and operations. This includes direct impacts such as damage to facilities and investments and disruption of manufacturing and distribution. Such impacts may indirectly affect companies by harming their suppliers and leading to long term changes to weather patterns that harm community and worker health and critical land and habitat.
2. **Input Risk:** Climate change could reduce the availability of raw materials vital to production of goods and services. This would have implications for agricultural and forestry commodities, water, and the loss of provisioning and regulating functions of ecosystems services. Climate change may also undermine access to these materials by damaging the infrastructure and utilities essential to resource extraction and production. Input risks may correspond to the sudden interruption of supplies due to unusual storms, as well as threats to the long-term viability of crops. For simplicity, input risk can be thought of as referring to supplies (e.g., “upstream” from the company), while market risk may more commonly refer to demand and customer markets (e.g., “downstream” from the company).
3. **Regulatory Risk:** The impact of changing regulations on the business that result from a rising price on high carbon sources and energy-intensive activities that depend on them. A price on carbon has many forms, including cap and trade, taxes, standards, and other policy incentives that go beyond regulation specifically. Sectors particularly susceptible to regulatory risk include electric and thermal power, transportation, oil and gas, chemicals, agriculture, heavy industry, and other major energy users.
4. **Market Risk:** The impact of changes to market demand created by climate change, including a reduced demand for products and categories that are not responsive to mitigation and adaptation priorities and an increased willingness to punish brands seen as laggards on climate change.
5. **Sustainability Risk:** The risk of social, environmental, and economic sustainability efforts that companies care about being undermined by a destabilized climate, such as gender and economic inclusion programs that are made more difficult due to hostile weather conditions, health initiatives that are threatened by a greater prevalence of disease vectors, or low-GHG energy infrastructure such as hydro facilities that are being put at risk from reduced river flow.

**6. Stakeholder Risk:** The consequences of failing to deliver on the expectations of key stakeholders. Manifestations include reduced access to finance from investors who are not confident in management or unhappy with project risk profiles, increased negative publicity from activist campaigns, and employee dissatisfaction with the company's approach and culture around climate change." Multinational corporations are increasingly subject to reputational risks for failing to act on climate change or for seeming to be indifferent to the plight of affected communities. This category could alternatively be considered Reputational Risk.

**7. Other Risks:** The aforementioned risks are some of the most common, but actual risks vary by sector, geography, and company. Therefore additional risks are possible. Risks that have been cited in more targeted situations include legal risk (e.g., actions targeting heavy emitters; challenges related to emergent state and federal carbon controls, and increasing scrutiny of greenhouse-gas disclosure); the risk of becoming less competitive as more agile peers develop successful new product lines and lower cost structures; and the risk of state fragility and social unrest if extreme weather undermines basic needs.

The categories above are interrelated. For example, "stranded assets" could result from a combination of regulatory and market factors. Spikes in food prices affect both markets and inputs. A major flood may affect all categories.

Climate change undermines the full range of social, environmental, and economic sustainability efforts that companies care about, such as gender and economic inclusion programs being made more difficult due to hostile weather conditions, health initiatives being threatened by greater prevalence of disease vectors, or low-GHG energy infrastructure such as hydro facilities being put at risk from reduced river flow.

Together these risks have significant operational and financial impact. Supply chains are likely to be adversely affected as a result of reduced access to raw materials;

climate-induced disruption to production lines; unstable energy supply; impacts on transport, physical, and other infrastructure; and increased vulnerability of the workforce, particularly in developing countries. Financial impact resulting from increased insurance and regulatory costs, expenses related to retrofitting and climate-proofing infrastructure, loss and damage costs incurred from extreme weather events, and availability of capital due to shifting investor preferences are likely to be substantial for companies who fail to turn risk into resilience.

Most of these risks can be quantified, and the numbers are significant. According to a report by Mercer, a human resources and financial services consulting firm, the cumulative, global cost of climate change-related impacts on the environment, health, and food security will reach between US\$2 trillion and US\$4 trillion by 2030.<sup>28</sup> The World Economic Forum (WEF) reports that Hurricane Sandy cost more than US\$70 billion in damages in New York and New Jersey alone.<sup>29</sup> The record U.S. drought in 2011 led to US\$7.62 billion in losses in Texas, and in 2012, more than 1,000 counties in 29 U.S. states were designated primary natural disaster areas by the U.S. Department of Agriculture from another record drought that suppressed farming profits and drove up the price of soybeans and corn.<sup>30</sup>

Beyond the financial risks from climate change impacts, companies pursuing business as usual also face economic risks, specifically associated with failing to anticipate a climate-constrained world and the types of policy and financial incentives that will make a high-carbon economy increasingly unattractive. The current debate concerning stranded assets is a case in point. Norway's Storebrand, which holds more than US\$30 billion in assets, announced in July 2013 that it would exclude 13 coal and 6 oil sands companies from all investments "to reduce Storebrand's exposure to fossil fuels and to secure long-term, stable returns for our clients."<sup>31</sup> Storebrand is basing its decision on the idea that holding the global mean temperature rise to less than 2°C may mean that "many fossil fuel resources will become unburnable, and their financial value will be dramatically reduced."<sup>32</sup>

<sup>28</sup> Mercer, 2011.

<sup>29</sup> WEF, 2013.

<sup>30</sup> *The Economist*, 2012.

<sup>31</sup> Quoted in Waage and Cameron, 2013.

<sup>32</sup> Quoted in Waage and Cameron, 2013.

The concept of unburnable fossil fuels is gaining traction. A 2011 Carbon Tracker report asserted that 80 percent of fossil fuel reserves must be left in the ground to avoid some of the worst effects of climate change.<sup>33</sup> Other leaders in the financial services sector have also been weighing in on the matter. In January 2013, HSBC issued a report outlining the unburnable reserves on a company-by-company basis to, among other things, provide investor guidance on how to mitigate risk. According to the report's authors, "A material proportion of the world's undeveloped reserves of fossil fuels could become 'unburnable.'"<sup>34</sup>

From an operational standpoint, climate impacts cover a broad spectrum of activities that get to the core of business practices and products. The following three examples dealing with the agriculture, extractives and primary industries, and transport sectors illustrate the growing spectrum of risks across the private sector.

## AGRICULTURE

Climate-related impacts are expected to lead to increased scarcity and reduced security of freshwater resources, diminished crop production by as much as 2 percent per decade for the rest of the century, enhanced price and market volatility for agricultural commodities, amplified damage to production caused by pests, and substantial losses to the terrestrial ecosystems that facilitate agricultural production, food security, and rural livelihoods.

Agriculture requires large quantities of water for irrigation and other production processes. In many regions, changing levels and patterns of precipitation, melting snow and ice, and retreating glaciers are altering hydrological systems and affecting water resources and quality. Climate change is projected to reduce water resources significantly in most dry subtropical regions, exacerbating competition for water among sectors, with each degree of warming expected to decrease renewable water resources by at least 20 percent for an additional 7 percent of the

global population. Without adaptation, local temperature increases of 1°C or more above preindustrial levels are projected to negatively impact yields for the major crops, such as wheat, rice, and maize, in tropical and temperate regions. In addition, areas suitable for the cultivation of coffee, tea, and cocoa, which support millions of smallholders in more than 60 countries, will be significantly reduced.

In recent years, fluctuations and trends in food production are widely believed to have played a role in price changes, with price spikes often following climate extremes that major producers have weathered. For example, studies suggest price increases of 37 percent for rice, 55 percent for maize, and 11 percent for wheat by 2050 from climate impacts. This volatility has negative implications for business as it heightens uncertainty, increases the costs of production, and impedes access to vital commodities.<sup>35</sup>

## ENERGY AND EXTRACTIVES

The physical impacts of climate change on the extractives and primary industries are expected to be wide ranging. They will likely include damage to networked infrastructure and industrial capital assets, impacts on the availability of natural resources, and reduced access to water resources. Pipelines for the transport of oil and gas may be affected by secondary impacts of climate change, from a rising sea level to bushfires caused by heat waves in hot regions. The supply, transport, and transmission of energy are all likely to be affected by changes in the frequency and intensity of extreme weather events.

An increase in climate-related hazards (such as forest fires, flooding, and windstorms) may affect the viability of mining operations and increase operating, transportation, and decommissioning costs. Surface mining may be particularly affected by precipitation extremes and related floods and erosion, and temperature extremes, especially extreme cold, that may hamper extraction for quite some time.<sup>36</sup>

<sup>33</sup> Campanale and Leggett, 2012.

<sup>34</sup> Spedding, Mehta, and Robins, 2013.

<sup>35</sup> Cameron, 2014.

<sup>36</sup> Bourgoin, 2014.



FIGURE 2

## Translating Climate Risk: The IPCC Fifth Assessment Report



The Intergovernmental Panel on Climate Change, established by the UN under the aegis of its Environmental Programme (UNEP) in 1988, is a body of scientific experts that periodically gathers, evaluates, and disseminates technical, scientific, and economic information on the planet's climate and its changes, impacts, and options for adaptation and mitigation. In almost three decades, it has produced five assessment reports of the kind. Most recently, the Fifth Assessment Report (AR5), consisting of several thousand pages penned by 800 authors over the course of five years, was published as a series of three thematic reports and a synthetic one in 2013-2014.

These reports pool a high level of technical expertise, which is, on one hand, required for understanding the scientific complexity of climate change and its impacts, and, on the other hand, a potential hurdle to non-expert readers keen to act on climate.

Hence the University of Cambridge Institute for Sustainability Leadership (CISL), the [Cambridge Judge Business School](#) (JBS), and the [European Climate Foundation](#) (ECF) backed a series of briefings aimed

at translating the findings of AR5 for business, interpreting the information published by the IPCC through sector-specific lenses. As a result, 11 sector-specific briefings have been created, including: Agriculture, Buildings, Cities, Employment, Energy, Extractive and Primary Industries, Fisheries and Aquaculture, Investors and Finance, Military, Tourism, and Transport, as well as a general overview and a scientific report.

The information presented is accurate and faithful to the science of the AR5 while remaining accessible and orientated to action. Accompanied by infographics, the briefings elaborate the implications of the scientific evidence on climate change for companies willing to act on it and offer pragmatic, ambitious, and fact-based action paths for mitigation and adaptation.

In line with its own translation and collaboration strategy, BSR partnered with the three leading institutions on three of the 13 reports, drawing from its expertise in the Agriculture, Extractives and Primary Industries, and Transport sectors.



*BSR Conference 2013: Mary Robinson, President, Mary Robinson Foundation – Climate Justice*

## TRANSPORT

Climate impacts in the transport sector will vary across transport modes. Extreme heat will soften paved roads, requiring resurfacing with more durable materials. More frequent flooding will require more frequent maintenance and investments in a higher, more expensive drainage standard. Bridges will be exposed to flooding, requiring upgraded design specifications in new construction and retrofitting. Estimates range from US\$140 to \$250 billion to adapt existing bridge infrastructure in the United States over the next 50 years. Extreme heat will reduce the fuel and energy efficiency of vehicles by increasing demand for cooling in private vehicles and on public transport and increasing energy consumption in the refrigeration of perishable freight. More frequent droughts and floods will increase the possibility of storms on certain maritime transport routes, which will translate into higher shipping costs because of the additional safety measures or longer, less storm-prone routes that carriers will need to take.

Storms may increase the number of weather-related delays and cancellations in the aviation sector. Clear-air turbulence will increase in the Atlantic corridor leading to longer, bumpier flights. More intense heat and rainfall will have impacts on runways similar to the ones they have on roads.<sup>37</sup>

Coastal infrastructure, including ports, roads, rail, and airports, are vulnerable to flooding and erosion as a result of a rising sea level and extreme weather, including more intense rainfall, high winds, and storm surges. Recent events illustrating the threat include Hurricane Katrina in 2005, which caused US\$100 million in damages to Mississippi ports, and Hurricane Sandy in 2012, which led to a weeklong shutdown of the Port of New York, causing US\$50 billion in damages. According to the IPCC, port infrastructure assets worth more than US\$3 trillion in 136 cities are vulnerable to weather events.<sup>38</sup>

<sup>37</sup> Farrag-Thibault, 2014.

<sup>38</sup> IPCC, 2014.



TABLE 1

# Climate Risks

According to the IPCC, climate change impacts are likely to be “severe, pervasive, and irreversible.” They are driven by increasing concentrations of GHGs to levels not seen in the last 800,000 years. Risk of climate-related impacts for business results from the interaction between climate-related hazards (including hazardous events and trends), the vulnerability and exposure of human and natural systems, and the private sector’s own sensitivity to a range of specific risks, including those relating to raw materials, operations, and finances.



## HAZARDS

**Temperature:** The global atmosphere has already increased 0.8°C above preindustrial levels. The IPCC projects that we are on a path to a global mean temperature rise in the range of 1.5°C to 4.5°C by the end of the century. Many socioecological thresholds will be breached at 2°C above preindustrial levels.<sup>i</sup>

**Water:** Changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality.

**Extreme events:** Climate change is reinforcing the intensity and frequency of extreme weather events, including floods, droughts, tornadoes, tropical storms, and heat waves.<sup>ii</sup> Risks are already moderate to high with 1°C additional warming, and they increase at higher temperatures.<sup>iii</sup>

**Ocean acidification** poses substantial risks to marine ecosystems, especially polar ecosystems and coral reefs.<sup>iv</sup>

**Sea-level rises, flooding, and storm surges:** The World Bank 4°C report warns that warming of this magnitude will likely lead to a sea-level rise of 0.5 to 1 meter (possibly more) by 2100, while limiting warming to 2°C would likely reduce sea-level rise by about 20 cm by 2100 compared to a 4°C world.<sup>v</sup>

**Large-scale “singularities”:** With increasing warming, climate impacts could lead to the melting of the Greenland and Antarctic ice shelves, the release of methane in Siberia, and the halting of the Atlantic conveyor belt.<sup>vi</sup>



## IMPACTS AND VULNERABILITY

**Unique and threatened systems:** Some ecosystems and cultures are already at risk from climate change. The number of systems at risk of severe consequences increases as the global mean temperature rises more than 1°C.<sup>vii</sup> Approximately 20 to 30 percent of plant and animal species will likely be at increased risk of extinction if the global average temperature exceeds 1.5°C to 2.5°C. Major changes in ecosystem structure and function, species ecological interactions, and species geographical ranges, with predominantly negative consequences for biodiversity and ecosystems, are projected.<sup>viii</sup>

**Socioeconomic impacts:** Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, prolong existing and create new poverty traps, increase the risk of conflict and involuntary displacement, impact human health, and undermine the realization of human rights.<sup>ix</sup>

**Distribution of impacts:** Risks are unevenly distributed and are generally greater for disadvantaged people. Based on projected decreases in regional crop yields and water availability, risks of unevenly distributed impacts are high for warming beyond 2°C.<sup>x</sup>



## BUSINESS RISKS

**Physical risk:** The impact of abnormal weather on assets and operations.

**Regulatory risk:** The impact of changing regulations on business that result from a growing price on high-carbon sources and energy-intensive activities that depend on them.

**Market risk:** The impact of changes to market demand created by climate change, which includes reduced demand for products and categories that are not responsive to mitigation and adaptation priorities, and an increased willingness to punish brands seen as laggards on climate change.

**Input risk:** Reduced availability or increased cost of key business inputs such as raw materials, water, and energy.

**Sustainability risk:** The risk of social, environmental, and economic efforts being undermined by a destabilized climate.

**Stakeholder (reputational) risk:** The consequences of failing to deliver on the expectations of key stakeholders.

**Other risks:** Climate change presents additional legal and other business-related risks.

- i Intergovernmental Panel on Climate Change (IPCC). Climate Change 2014: Impacts, adaptation and vulnerability technical summary. (Cambridge and New York: Cambridge University Press, 2014).
- ii IPCC. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. (Cambridge and New York: Cambridge University Press, 2012).
- iii Intergovernmental Panel on Climate Change (IPCC) (2014) Climate Change 2014: Impacts, adaptation and vulnerability technical summary. (Cambridge and New York: Cambridge University Press, 2014).
- iv Ibid.
- v World Bank (2012). Turn Down the Heat: Why a 4°C Warmer World Must Be Avoided. Washington, D.C.: International Bank for Reconstruction and Development.
- vi Intergovernmental Panel on Climate Change (IPCC). (2007). Climate Change 2007: Synthesis Report. Geneva.
- vii Intergovernmental Panel on Climate Change (IPCC). Climate Change 2014: Impacts, adaptation and vulnerability technical summary. (Cambridge and New York: Cambridge University Press, 2014).
- viii International Union for the Conservation of Nature (2008) Wildlife in a Changing World: An Analysis of the 2008 IUCN Red List of Threatened Species. (Gland, Switzerland: IUCN).
- ix Intergovernmental Panel on Climate Change (IPCC). Climate Change 2014: Impacts, adaptation and vulnerability technical summary. (Cambridge and New York: Cambridge University Press, 2014).
- x Ibid.

## Defining Resilience in a Climate-Constrained World

The risks outlined in this section are neither exhaustive nor definitive, nor are they unique to a small subset of industries. They impact the complex socioecological system upon which all businesses depend for long-term success. It is vital that business understands climate risk, develops strategies for resilience, and implements them with urgency, ambition, and effectiveness during this decisive decade.

The IPCC defines resilience as “the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.”<sup>39</sup> Resilience has always been understood as the ability to manage and rebound from risks, but what if some risks are so severe that they breach irreversible thresholds?

In 2007, the United Nations Foundation issued a report urging action to “avoid the unmanageable warming beyond 2°C while managing the unavoidable.”<sup>40</sup> In recent years, this compact phrase has captured the dual approach needed to ensure resilience in a climate-constrained world.

- » **Avoiding the unmanageable** requires ambitious reductions in GHG emissions to hold the global mean temperature rise to less than 2°C above preindustrial levels. According to the best available climate science, many key socioecological thresholds will be irreversibly breached if the global mean temperature exceeds 2°C above preindustrial levels by the end of this century. Because there is a limit to the level of climate change that we can safely manage, we must pursue urgent, ambitious GHG emissions reductions as part of any sensible strategy for resilience. Breaching this 2°C threshold by releasing excessive GHGs into the atmosphere would critically undermine socioecological systems, stretching them beyond their points of resilience.

- » **Managing the unavoidable** recognizes that inevitable climate impacts are already locked into the system as a consequence of the rapid accumulation of GHGs in the atmosphere over many centuries and from numerous sources.

The IPCC further states that “adaptation and mitigation choices in the near term will affect the risks of climate change throughout the 21st century.”<sup>41</sup> As a result, true resilience in the face of climate change requires action on two fronts simultaneously: aggressive emissions reductions and sustained enhancement of adaptive capacity.

## Avoiding the Unmanageable: Urgent, Ambitious Emissions Reductions

“Avoiding the unmanageable” means taking bold action to reduce GHG emissions to avoid planetary warming of more than 2°C. According to the UN Environment Programme (UNEP), emissions reductions consistent with a 2°C pathway require global GHGs to peak on or before 2020 at around 44 gigatons of CO<sub>2</sub> (carbon dioxide) equivalent (the high end of an acceptable range of 39 to 44 gigatons of CO<sub>2</sub>e). For them to be 50 to 60 percent below their 1990 levels by 2050, CO<sub>2</sub> emissions would need to be reduced by around 3 percent per year between 2020 and 2050 for energy and industry.<sup>42</sup>

The private sector meanwhile must understand the total climate impact of the business along its entire value chain and/or the lifecycle of its products. That’s because many of the most material climate impacts on a company are indirect or outside its direct operational control. Businesses must identify and capture opportunities for radical efficiency gains along the entire value chain.

Efficiencies in energy, water, and material use offer some of the most dramatic near-term wins with respect to business and climate performance, but this tactic remains underexploited by most companies and within most industries. Accelerating the adoption of low-carbon energy sources and technologies in facilities and transport

39 IPCC, 2014, p. 5.

40 UN Foundation, 2007.

41 IPCC, 2014, p. 10.

42 UNEP, 2010.



by partnering with peers and suppliers could increase investment in critical research and development and contribute to efficiency. Harnessing design and innovation to reduce the lifecycle impacts of products and services could provide climate benefits while also achieving better long-term security of supply and greater protection from energy and regulatory costs. Finally, mobilizing in support of public policies that will incentivize a range of climate-related actions (from the need for intelligent carbon pricing and regulation to the importance of sound incentives to accelerate efficiency efforts in individual companies) is a vital ingredient for action.

Although this task sounds daunting, there are at least three pieces of good news:

**1. Many of the investments and actions required will make business stronger and more profitable over time. The opportunities for businesses at the vanguard of climate action are growing rapidly.**<sup>43</sup> A calculation from Third Generation Environmentalism (E3G) suggests that climate policies and incentives around the globe collectively add up to around €3 trillion in additional low-carbon investment by 2030.<sup>44</sup> Beyond the policy measures, investors are already placing their own

bets on the future. According to Bloomberg New Energy Finance, investments in global clean energy rose from US\$39 billion in 2004 to US\$257 billion in 2011, representing more than a sixfold increase in seven years.<sup>45</sup> Most importantly, as Ceres, a nonprofit that advocates for sustainability leadership, points out, this figure represents cumulative clean energy investments of more than US\$1 trillion globally.<sup>46</sup> Analysts at McKinsey further estimate that “if [energy efficiency measures are] executed at scale, a holistic approach would yield gross energy savings worth more than US\$1.2 trillion” annually.<sup>47</sup> UNEP estimates that renewable energy already generates more jobs than employment in fossil fuels and that employment in alternative energy may rise to 2.1 million in wind power and 6.3 million in solar power by 2030.<sup>48</sup> These typically well-paying jobs, in turn, contribute to stimulating the economy. And according to a report produced by We Mean Business, companies at the vanguard of climate action are already reaping the rewards, with forward-thinking companies generating an internal rate of return of 27 percent on their low-carbon investments.<sup>49</sup>

43 Ceres, 2012.

44 E3G, 2010.

45 McCrone and Aspinall, 2012, p. 13.

46 Ceres, 2012, p. 1.

47 Choi Grande et al., 2010, p. 4.

48 UNEP, 2008, p. 8.

49 We Mean Business, 2014.



BSR Hong Kong convening on climate issues in the ICT, financial services, and transport industries (July 2014)

## 2. We are building on existing momentum.

As the case studies in this report reveal, the volume of business action and innovation on climate change is significant and increasing. Cemex, a Mexico-based global supplier of cement, has set ambitious targets to reduce its carbon emissions from cement production by 25 percent by 2015 and reduce the emissions caused by its products over the full life-cycle of buildings and structures. IKEA is taking a different approach by encouraging and enabling its consumers to adopt more sustainable practices by implementing electric-vehicle-charging stations at its retail locations; selling photovoltaic (PV) systems; and installing geothermal and wind turbines in its communities. Moreover, business action is not confined to any one industry or region. Consumer products companies like Nike and Walmart are building adaptive capacity to climate impacts along their operations and supply chains, while manufacturing companies like Tata Steel are making ambitious strides to reduce CO<sub>2</sub> emissions. This activity is not confined to one geography either. Yingli Solar, a China-based global supplier of solar power and manufacturer of photovoltaic cells, is bringing solar power to low-income families in the United States. Sompo Japan launched a new weather-insurance product to support farmers affected by extreme weather events in Thailand. The list goes on and the momentum continues to build.

## 3. The potential for emissions reductions across key sectors is large and real.

The agricultural sector has enormous potential to help avoid dangerous climate change. Emissions from agriculture comprised about 10 to 12 percent of global GHG emissions in 2010. In addition, the sector is the largest contributor of non-CO<sub>2</sub> GHGs, including methane, accounting for 56 percent of emissions in 2005. According to the IPCC, recent studies have found that all land-related mitigation strategies from combined action on agriculture, forestry, and bioenergy could contribute 20 to 60 percent of cumulative emissions reductions by 2030, and 15 to 45 percent additionally by 2100. Industry accounts for around 30 percent of total GHG emissions. Its emissions totals include those from industrial sector

energy consumption, the total global production of materials, the stock of products created from these materials, and services rendered through the use of those products. Broad deployment of the best available technologies could reduce the emissions intensity of industry by approximately 25 percent, with innovation reducing it by up to an additional 20 percent, before technological limits are approached in some energy-intensive sectors.<sup>50</sup> Moreover, we are learning that focusing mitigation efforts on short-lived climate pollutants (SLCPs) can slow the rate of climate change and improve the chances of staying below the 2°C target in the near term.

## Managing the Unavoidable: Enhancing Adaptive Capacity in Business and Communities

Several climate impacts from extreme weather events to changes in water distribution are already evident and locked into the climate system. Their intensity and frequency are now likely to increase, irrespective of emissions reductions over the short term, threatening socioecological systems around the globe. Therefore, immediate action is required to manage the unavoidable impacts.<sup>51</sup>

Although we cannot avoid entirely the impacts of this inevitable climate change, there is a great deal we can do to minimize our vulnerability. This is because vulnerability is not just about exposure to risk but about sensitivity to risk and adaptive capacity in the face of risk. The more we can work to reduce sensitivity and enhance adaptive capacity the greater our chances of being resilient.

Enhancing adaptive capacity is defined as implementing changes in processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate. There are two main approaches to enhancing adaptive capacity: First-generation adaptation is often referred to as “climate-proofing” and typically refers to interventions in infrastructure that attempt to minimize the consequences of exposure to climate change risks (e.g.,

<sup>50</sup> IPCC, 2014.

<sup>51</sup> Adger, 2001; IPCC, 2007b.

flood defenses or seawalls). This approach may address the symptoms rather than the root causes of vulnerability.

Second-generation adaptation is a more development-oriented approach that tackles the underlying drivers of vulnerability, including factors that make populations sensitive to climate change impacts. In addition, this type of adaptation helps build resilience not only to climate change but also to other stressors. These adaptation measures include investments in local early-warning systems, health care and education, governance and legal reform, institutional capacity building, investment in gender initiatives, biodiversity and ecosystem services, and social safety nets.

Business can enhance its own adaptive capacity in multiple meaningful ways:

- » Understand the total climate exposure and risk to the business from the direct and operational to the furthest reaches of the supply chain and customer communities.
- » Map material risks and opportunities by engaging internal and external stakeholders. Senior management will need to review and be part of a team assessing which risks and opportunities are most material and most addressable, both now and in the future.
- » Provide leadership (and share costs and resources) through partnerships with peers, as well as with the public sector and civil society. These partnerships will drive effective action in the areas where the business has the most to contribute (and the most to lose) via improvements to shared infrastructure, local capacity building, and disaster preparedness and response.

A report titled Value Chain Climate Resilience prepared by BSR with Oxfam and Acclimatise highlights the many examples of businesses embracing resilience, including financial leaders who are developing innovative climate-insurance products for communities at increased risk of weather-related natural disasters, engineers working on more resilient construction materials and design standards, ICT companies starting to offer equipment and smart networks to monitor and manage climate-related impacts,



#### CASE STUDIES

## Enhancing Resilience Through Business Leadership

We have included a series of company case studies throughout this report to showcase the ambitious work that many companies are doing to build resilience along their operations and supply chains. These examples demonstrate efforts to translate climate risk, stabilize the climate system through emissions reductions and through work to enhance adaptive capacity, and forge collaboration across business sectors and stakeholder groups.

The featured case studies represent a range of industries and geographies, from Verizon's work to fortify its landline and wireless systems in the wake of Superstorm Sandy to Walmart's efforts to build the resilience of 1 million farmers along its supply chain in China. As these snapshots reveal, the volume and ambition of business leadership on climate is significant and increasing. We hope to build on that momentum even further through BSR's Business in a Climate-Constrained World initiative, and we invite you to join us.



and new technologies being developed and deployed to address increased water stress.<sup>52</sup>

## The Transition to a Low-Carbon Future is Underway: We Must Act with Greater Ambition

This is a decisive decade for the global climate, in part because we are running out of time to reduce emissions at the scale and rate needed to avoid passing the 2°C goal, and also because a moment for collective action is emerging and converging around 2015.<sup>53</sup> The so-called 2015 moment brings together the latest science from the IPCC,<sup>54</sup> the development of a new international climate agreement under the auspices of the UN,<sup>55</sup> and the preparation of sustainable development goals to replace the Millennium Development Goals, which expire in 2015.<sup>56</sup>

Also, without strong intervention now, the International Energy Agency shows that high-emissions fossil fuels are likely to remain a critical part of our energy mix over the coming decades until and unless we can find suitable ways to reduce their carbon intensity and substitute low-emissions alternatives.<sup>57</sup>

Despite these constraints, the risks of inaction greatly outweigh the barriers to action. The risks outlined above undermine business prospects and societal stability around the globe and across industries. A single company or government acting in isolation will be unable to change our current trajectory. However, bold collective action by all, working at the upper limits of ambition, could build climate resilience in a manner consistent with prosperity and profitability.

### GOVERNMENTS ARE ACTING

There is a misconception that climate action is stalled and that too few governments are interested in implementing policies to catalyze climate resilience. Looking deeper at the national and international political landscape reveals

a different picture entirely—one of growing climate policy development, innovation, and increasing incentives.

At the international level, the negotiations under the UN Framework Convention on Climate Change (UNFCCC) are moving toward a decisive summit in Paris in December 2015. Meeting in Warsaw in December 2013, 198 countries confirmed their longstanding commitment to hold the increase in global average temperature below 2°C above preindustrial levels<sup>58</sup> and have expressed their determination to capture this commitment in a comprehensive global climate agreement at the Paris summit.<sup>59</sup>

Although much maligned, the UNFCCC has already led to significant actions by governments. More than 90 countries have submitted formal pledges to reduce their GHG emissions by 2020. Many have initiated domestic actions to make good on these pledges and, as a result, different policy innovations and financial incentives are being tested around the world.<sup>60</sup> A report produced by the Global Legislators Organisation (GLOBE) International reveals significant climate action in 33 countries, including many developing countries. It includes 17 of the top 20 emitters of GHGs and 24 of the top 50, representing more than 85 percent of global emissions. Overall, they report substantial legislative progress in 18 of the 33 study countries and limited developments in 14 others.<sup>61</sup> From emissions-trading systems in the European Union, China, and California to energy transformations in Germany and the United States, we are seeing important steps toward a low-carbon future.<sup>62</sup>

Finance is flowing as a result of these processes. In 2009, developed countries committed to mobilizing US\$30 billion in “fast-start financing” between 2010 and 2012 as a stepping stone toward providing US\$100 billion per year in support of emissions reductions and resilience building. As of November 2013, these same countries have reported that they mobilized US\$35 billion. However, with governments now joining insurers and institutional investors in developing financial products in support of

52 Ardo et al., 2012, p. 3.

53 Cameron et al., 2013.

54 University of Cambridge Judge Business School and Institute for Sustainability Leadership, 2013.

55 Bodansky, 2012.

56 Bapna, 2012.

57 International Energy Agency, 2013.

58 UNFCCC, 2012, p. 2.

59 UNFCCC, 2013.

60 UNEP, 2012.

61 Townshend et al., 2013.

62 Cameron, 2013.



FIGURE 3

## Countries are Acting

More than 96 governments from developed and developing countries have begun to implement climate policies, ranging from domestic laws and standards to emissions trading systems and carbon pricing. Some are working on absolute emissions reductions, others are attempting to deviate from business as usual projects, and a third group is tackling emissions intensity. The enabling environment for climate resilience is being constructed all around us and is likely to gather pace over the coming years.

# 96

### COUNTRIES

96 countries have initiated climate policies at the national and subnational levels.

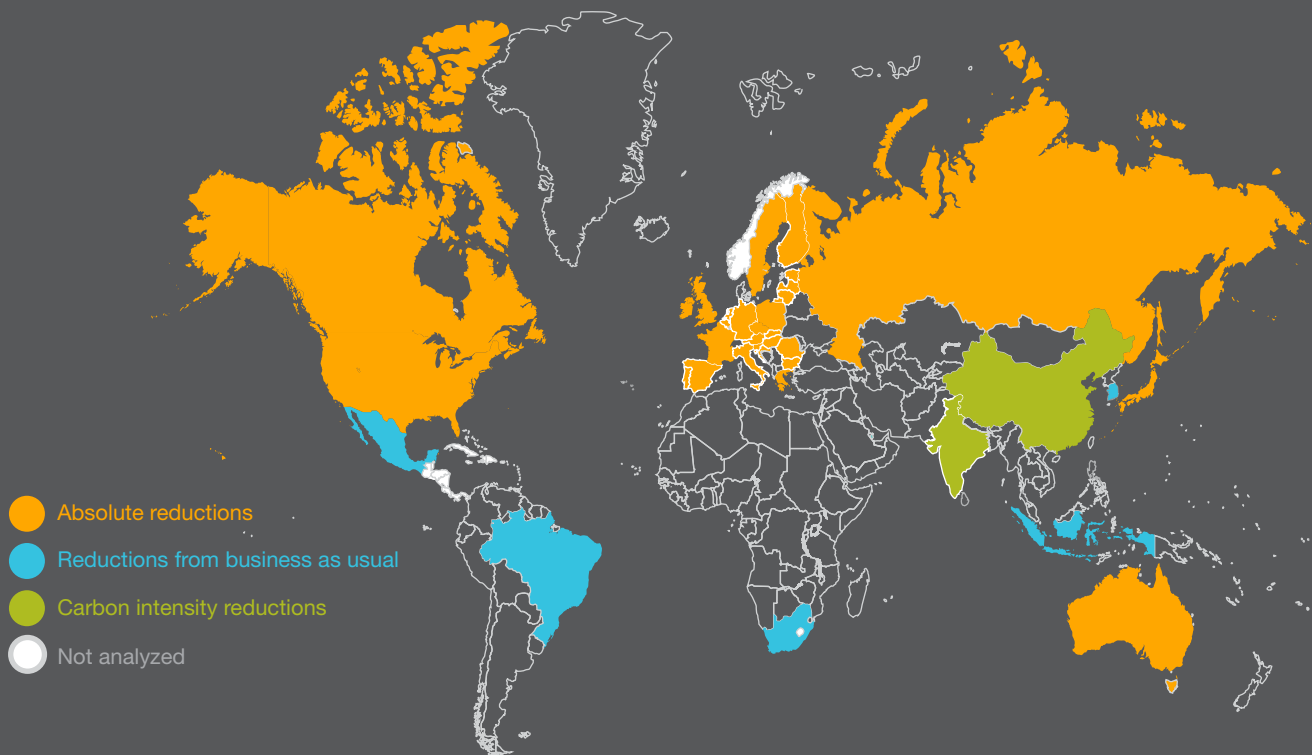
# 40<sup>+</sup>

### COUNTRIES

More than 40 countries are implementing diverse approaches to carbon pricing.

# 2015 PARIS

The global community is working toward a new international agreement to be agreed upon in Paris in December 2015.



Source: WRI, 2013: This analysis is from unpublished assessments from the World Resources Institute.

low-carbon development, an important trend is being set.<sup>63</sup>

In the European Union, financing the decarbonization of the economy may be enabled by the European Council's decision in October 2014 to set binding targets. Indeed, by 2030, the Council has pledged to reach at least 40 percent GHG reduction compared to 1990, at least 27 percent in renewable energy, and at least 27 percent energy-efficiency improvement, compared to baseline. In order to allow member states to reach these targets, the EU commission has adopted a new governance framework that aims to be more transparent as well as new project funding mechanisms to encourage investment in renewable energy. It will also revise its Energy Trading System (ETS) to stabilize market shifts and help countries to reach these goals with the support of the private sector and of investors.<sup>64</sup>

In the context of this agreement, the European Commission, in concert with the European Investment Bank, has launched two financial tools. The first, the Natural Capital Financing Facility, projects a total budget of €100-€125 million for 2014-2017 to increase private financing for energy efficiency projects. The second one represents an €80 million commitment for the same period, with a projected eight-fold leverage effect, which aims to increase private financing for energy efficiency projects.<sup>65</sup>

The global trend in supporting investment by creating appropriate policy frameworks and financial products is well underway to support in their own climate efforts from changing their energy procurement to investing in their adaptive capacity. By all indications this tendency is becoming stronger and the dialogue between policy-makers and the private sector is being bolstered in the process of designing pragmatic tools for climate resilience.<sup>66</sup>

## THE PRIVATE SECTOR IS ACTING

The private sector is also rising to meet the challenge of climate change. Key companies in a variety of sectors are

engaging in activities to reduce and mitigate climate risk and bolster resilience. These include senior management or board-level oversight of climate-related issues, monetary incentives tied to emission reduction targets, and the integration of climate change within the overall business strategy.

According to the 2013 CDP Global 500 Climate Change Report, which examines the largest companies by market capitalization included in the FTSE Global Equity Index Series as of January 2013, 332 companies have incorporated some form of climate action into their overall business strategies. Of those 332 companies, 232 either met or exceeded their emissions reduction targets, and 269 experienced overall emission reductions as a result of successfully implementing various emission reduction activities. Overall, the number of Global 500 companies undertaking initiatives to mitigate climate risk has increased over the past few years, indicating an increasing trend within the global business community to pursue greater climate resilience and recognize climate change as a formidable risk.<sup>67</sup>

## ACTIONS NEED TO BE SUPPORTED BY MORE AMBITION

While climate activity is increasing, climate ambition still lags far behind. As successive UNEP reports have illustrated, current climate initiatives by governments and corporate leaders, while important, remain insufficient to close the gap between current emissions trajectories and a 2°C pathway. The key message from the 2012 Emissions Gap Report is that, even if countries deliver on their current actions, they will still fall short of where we need to be in 2020 by 6 gigametric tons of CO<sub>2</sub> equivalent.<sup>68</sup>

There are numerous legitimate reasons fueling this lack of ambition. Based on discussions with hundreds of companies across sectors and geographies, BSR has identified the following interrelated—and addressable—challenges that stand in the way of individual companies and organizations:

<sup>63</sup> Fransen et al., 2013.

<sup>64</sup> European Council, 2014.

<sup>65</sup> Willis, 2015.

<sup>66</sup> Alberola 2014.

<sup>67</sup> CDP, 2013.

<sup>68</sup> UNEP, 2012.

Business is also acting,  
but greater ambition is needed.

**75%**

**OF BSR MEMBERS  
ARE PROACTIVE**

**THE GOOD NEWS** is that an ever-increasing number of businesses are taking steps to understand their specific climate risks and are engaging partners such as BSR to translate risk into greater resilience. About three-quarters of BSR member companies are proactively managing and reporting on greenhouse gas emissions.



**MORE AMBITION  
NEEDED**

**THE CHALLENGE** is that we all need to increase our ambition. Too few companies have ambitious emissions reductions targets, are sufficiently working to address emissions in their value chains, or are taking steps to build adaptive capacity to address climate change. We have an important opportunity to work collectively to balance ambition and pragmatism.

**Making sense of the science:** While companies' sustainability teams may “get” climate change, executives and decision-makers in key business units of the same company may not see climate change as relevant or a priority. For these personnel, the barrier to becoming more engaged on climate change is less about making the business case on an initiative-by-initiative basis, and more about framing the business case for action generally. This is often stalled by a lack of strategy and commitment to sustainability broadly, insufficient understanding of the interconnections between climate change and other sustainability and business issues, outdated assumptions and stereotypes about climate change, and mistrust of the messenger.

**Taking bold, confident action:** Although decision-makers in many companies understand that there is major value at stake, the options can be still be overwhelmingly complex, and the business case for particular projects can be unclear. This may be because projected returns may not meet traditional payback criteria, and investments needed can be diffused across many players and international borders. Also, while science makes the general climate change problem resoundingly clear, impacts at the level of individual decisions and actions are still hard to pin down. For example, in energy and agriculture, two of the major GHG-emitting sectors, there is a lack of “chain of custody” allowing users to understand and effectively manage the lifecycle impacts of different production practices of fuels and crops. Also, the system impacts of individual decisions in commodity markets, such as energy and crops, are not well understood.

**Creating enabling systems and rules:** More robust climate policies that provide long-term, stable signals that incentivize low-GHG investments will help to enable additional private-sector action and investment, and therefore companies have a key role to play in policy advocacy. However, the international climate policy system can be impenetrable. Similarly, companies must contend with competing calls to action from issue-focused stakeholders (e.g. “create agreements to offtake biofuel,” “wait on biofuel and focus on high-efficiency diesel,” “boycott oil sands,” etc.), make informed choices about



*Meeting of BSR Partnership Development and Research team members: Smruti Govan, Associate; Ryan Schuchard, Associate Director, Climate Change; Racheal Meiers, Director, Inclusive Economy; and Cammie Erickson, Manager*

tradeoffs between different kinds of sustainability impacts, and drive investments that create the most impact among a virtually infinite number of options. This can lead to a sense of “analysis paralysis,” which prevents action that is needed.

As a result, many businesses believe that climate action is impractical in an age of fiscal austerity and is incompatible with their bottom line. Others are waiting for a silver bullet—either a new technology or a policy incentive from government before they act.

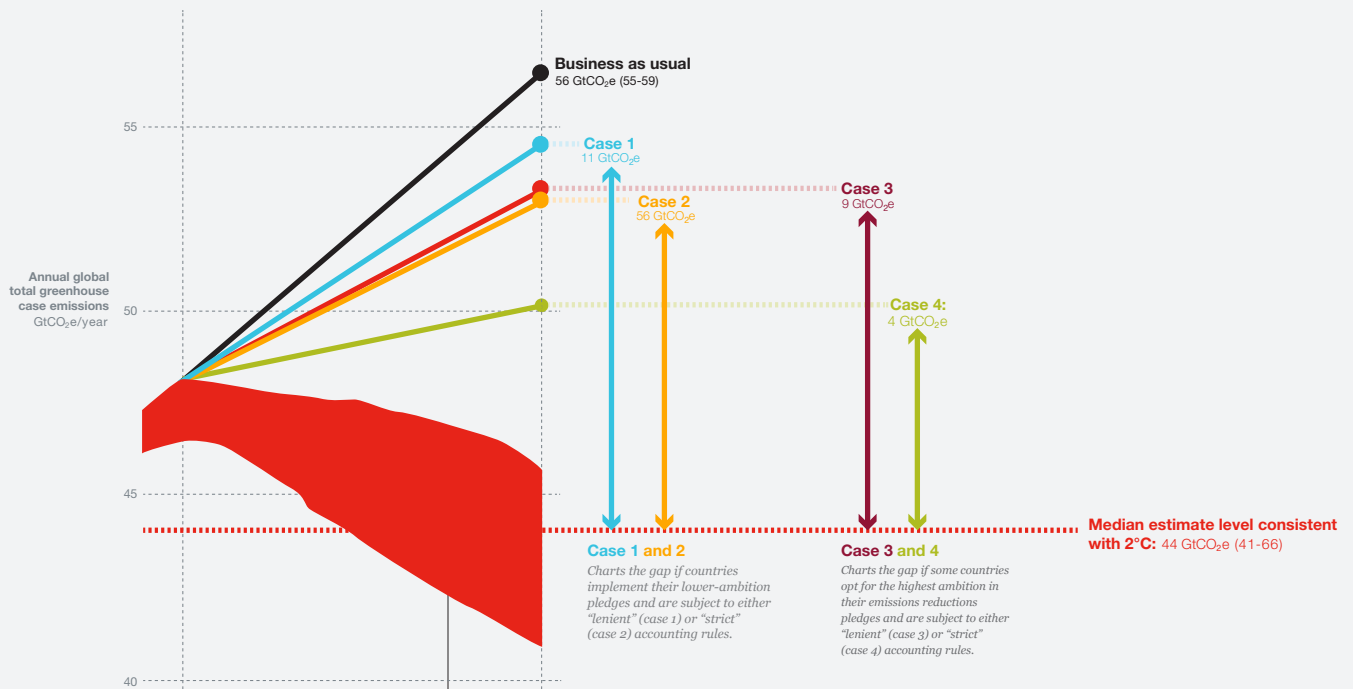
These challenges are resolvable, however, and companies that are committed will find bold and inspiring cases for action through new business models, more creative cross-sector approaches, and a focus on culture change and transformation. BSR’s strategy for climate resilience will help companies realize meaningful climate action with a series of practical and manageable steps.



FIGURE 4

# The Emissions Gap

The UNEP emissions gap report shows that country pledges, if fully implemented, will help reduce emissions to below the “business-as-usual” level by 2020, but not to a level consistent with a 2°C pathway. UNEP considers four cases when trying to assess the size of the emissions gap. The reference point, the emissions gap in 2020 between “business-as-usual” emissions and emissions with a “likely” chance of meeting the 2°C target, is 14 gigatons of CO<sub>2</sub> (GtCO<sub>2</sub>e).



## 2°C Range

Red area shows likely range (greater than 66 percent) to limit global temperature increase to below 2°C during the 21st century.

# 03

Catalyzing Business  
Resilience in  
a Climate-Constrained  
World



Climate Week NYC 2014: Gabi Zedlmayer, Chief Progress Officer, HP

Photo Credit: The Climate Group

# Catalyzing Business Resilience in a Climate-Constrained World

Business can build climate resilience by reducing greenhouse gas emissions and enhancing adaptive capacity. An effective vision for resilience begins with a sound understanding of both the risks of climate change and the benefits of climate action. Stabilization wedges provide an effective means of meaningful and practical action. And collaboration is key to tackling what is essentially a global collective action problem.

BSR's Business in a Climate-Constrained World strategy is an initiative designed to mobilize BSR's business network, global reach, industry insights, and issue expertise to address global climate change. Our strategy consists of **translation** of climate risk, **stabilization** of the climate system through resilience wedges; and **collaboration** across business sectors and stakeholder groups in pursuit of urgent, ambitious, and sustained climate action.

## Translation

The nature of climate risk differs across geographies and sectors with most industries exposed to multiple, intersecting climate risks. As a result, a sophisticated, comprehensive reappraisal of risk is needed to ensure business success in a climate-constrained world.

Part of the problem with the current debate on climate and business is that the "translation" focuses on aggregate, cumulative risks and consequences that few businesses can relate to. Our translation addresses this problem by downscaling climate risks for specific industries and individual companies in a manner that highlights concrete impacts on business operations and strategy. The case

studies in this report indicate how some companies are beginning the process of understanding their specific risks.

The transition to a low-carbon future also holds risks. Some industries may find themselves with stranded assets as a result of climate regulation. To prevent the global mean temperature from rising more than 2°C, some estimates suggest that 60 to 80 percent of the current reserves of the world's publicly listed oil, gas, and coal companies must not be consumed, which raises the possibility of establishing carbon pricing and taxes to ensure that these reserves remain underground, thus making them "stranded." This approach could lead to a "carbon bubble," an overvaluation of oil, gas, and coal reserves that could cause massive losses within the financial system.<sup>69</sup> Incentives to promote low-carbon energy could put pressure on other industries, as was the case some years ago when a rush to biofuels caused a temporary global food crisis.

Managing this transition is a critical element of managing risk. Translating these complex risks is therefore a critical part of our strategy. We intend to work with partners to

<sup>69</sup> Carbon Tracker, 2013; Carrington, 2013.

better understand the full spectrum of risks and translate this knowledge into actionable strategies for resilience.

In addition, more and more companies are exploring ways to engage with the so-called 2015 moment, with the international summit in Paris in December of this year as the crucial point of political convergence. After years of tireless negotiations, the 196 Parties to the United Nations Framework Convention on Climate Change (UNFCCC), consisting of 195 states and the European Union, are expected to reach a comprehensive deal in Paris outlining strategies for climate action covering the next two decades. Agreement is likely to address issues including greenhouse gas emissions reductions for all countries, including for the first time major emerging economies; the provision of climate finance to catalyze investments in low-emissions technologies; funding to build adaptive capacity in vulnerable communities; and a vision of a long-term decarbonization pathway to govern future negotiations. Companies play a critical role in helping to shape this agreement and will certainly be impacted by the settlement that emerges for many years to come. As a result, our approach to translation seeks to equip business to effectively engage with this political process with a view to constructing an agreement that is both ambitious and catalytic of private-sector action.

## Stabilization

The core of our strategy builds upon the climate “stabilization wedges” pioneered by Princeton Professors Robert Socolow and Stephen Pacala. We intend to identify appropriate resilience wedges that combine emissions reductions and enhanced adaptive capacity across a range of industries. They will be implemented in partnership with BSR member companies and other stakeholders, including government, philanthropies, civil society actors, academics, and multilateral organizations. The climate-smart businesses that emerge will not only be resilient in a climate-constrained world, but also positive agents of resilience within the communities from which they derive their social license to operate, their production inputs, and their markets.



### CASE STUDY

## Enhancing Resilience Through Business Leadership: Expedia

Expedia understood that climate change would impact its business—and the travel and tourism industry as a whole—in a variety of ways. Direct impacts could include increasingly extreme weather patterns that affect travel; increased storm, flood, and fire damage to buildings and infrastructure; reduced precipitation, and advancing deserts; and landslides, flash floods, and sinkholes. Indirect impacts could involve strain on water and food supply; loss of natural habitat affecting tourist destinations; increased incidence of disease, drought, and heat waves; forced migration away from coastal areas; and government policy and interventions.

In addition to these impacts, Expedia identified two categories of risk caused by climate change: physical risks and regulatory risks. Physical risks involve disruptions from weather and natural disasters and increased costs from changing temperature and precipitation patterns. Regulatory risks included higher energy prices from potential carbon tax; increased competition on energy management due to carbon markets and global standards; and reduced power supply reliability.

With support from BSR, Expedia translated these impacts and risks into an environmental footprint analysis and ultimately a climate strategy, positioning itself as an environmental leader in the travel and tourism industry.



## Collaboration

Tackling the challenge of global climate change is an enormous task—too much for any single company or organization to address alone. All stakeholders, including business, must take bold collective action to build resilience in a climate-constrained world. This requires a new emphasis on collaboration. We believe that collaboration across industries and with multiple stakeholder partners creates an ecosystem for climate action, allowing industries to enable each other and the communities in which they operate.

Business can avail itself of the transformational power of collaboration by working across industries to share their knowledge, pioneer new approaches and technologies, and test business-to-business solutions. They can share costs and resources through partnerships with peers, as well as with the public sector and civil society. These partnerships will drive effective action in the areas where business has the most to contribute—and the most to lose—through improvements to shared infrastructure, local capacity building, and disaster preparedness and response.

We plan to foster enhanced climate collaboration through this strategy by creating an architecture of participation. In practice, this strategy means exploring every opportunity to build cross-industry and cross-stakeholder partnerships in pursuit of our goals. It also means finding ways to contribute to existing initiatives within the wider climate community. Around the globe, new multistakeholder initiatives designed to build climate resilience are emerging rapidly. We will work to assess these initiatives, encourage stakeholders to collaborate, and seek out suitable opportunities for a private-sector component.

Our ability to catalyze external collaboration has been greatly enhanced during the past year through our involvement in the We Mean Business coalition and our decision to join the Climate and Clean Air Coalition (CCAC) as non-state partners.

We Mean Business is a coalition of organizations working with thousands of the world's most influential businesses and investors. These businesses recognize that the transition to a low-carbon economy is the only way to secure sustainable

economic growth and prosperity for all. To accelerate this transition, BSR has joined with six other business-facing networks to form a common platform to amplify the business voice, catalyze bold climate action by all, and promote smart policy frameworks.<sup>70</sup>

In January BSR became a non-state partner to the Climate and Clean Air Coalition (CCAC). The coalition acts as a forum for state and non-state partners to raise awareness about the challenges and opportunities of fast mitigation of short-lived climate pollutants (SLCPs), to develop science-based measures to ensure success, and to facilitate sector-specific, multistakeholder initiatives focusing on issues such as methane leakage in the oil and gas industry or reducing black carbon emissions from heavy-duty diesel vehicles and engines. Collaboration defines both the purpose and the purposes of the CCAC. As such, it is aligned with BSR's own vision of success for a climate strategy. By tackling climate as a systemic issue from all angles with all actors engaged, BSR, together with the CCAC, is activating all levers to limit global warming to the 2°C limit. Today 45 state partners work with 54 non-state partners including BSR to advance action and ambition on this critical part of the climate puzzle.

Together, the pillars of translation, stabilization, and collaboration create a platform that allows BSR to uniquely work with companies at all levels of maturity on climate change, and help all to go faster and further. Our roles include:

- » **Build capability:** Increasing the confidence and ability of companies who are not yet leaders, with the aim of increasing readiness to make commitments. This is especially important in heavy-emitting sectors.
- » **Encourage commitments:** Guiding those ready to make commitments to make smart and ambitious ones. Many companies are on the cusp of taking bold action, but not quite there yet.
- » **Fulfill commitments:** Helping those who have made commitments fulfill them. It is vital that we ensure that companies who make commitments are able to successfully follow through.

<sup>70</sup> The other coalition partners are: CERES, The Cambridge Corporate Leaders Group, CDP, The Climate Group, the B-Team and the World Business Council on Sustainable Development (WBCSD). Learn more about We Mean Business by visiting [www.wemeanbusinesscoalition.org](http://www.wemeanbusinesscoalition.org)

BSR's Business in a Climate-Constrained World strategy is an initiative designed to mobilize BSR's business network, global reach, industry insights, and issue expertise to address global climate change.



## TRANSLATION

We translate climate risks into actionable strategies for resilience.

## STABILIZATION

The core of our strategy involves identifying resilience wedges that combine emissions reductions and enhanced adaptive capacity across a range of industries.

## COLLABORATION

We believe in the transformational power of partnerships to build climate resilience.

In each of these cases, BSR brings a set of tools to help companies address internal barriers, think more strategically, and facilitate difficult but important conversations that are required to make necessary breakthroughs.

## The Core of the Strategy: Climate Stabilization Wedges

The climate stabilization wedges approach was initially developed by Socolow and Pacala in 2004. They argued that a portfolio of technological, scientific, and industrial knowledge already existed and consequently provided a platform for solving the climate challenge.<sup>71</sup> At the heart of their approach was the view that while no single strategy or intervention could achieve sufficient emissions reduction in isolation, the portfolio as a whole, when looked at as cumulative steps, would constitute significant ambition.

Pacala and Socolow argued that it was “important not

to become beguiled by the possibility of revolutionary technology but instead to scale up what we already know.”<sup>72</sup> To illustrate their point, they created a “stabilization triangle” depicting the total amount of emissions reductions they assessed as commensurate with climate stabilization. They divided this triangle into wedges, totaling 25 gigatons of CO<sub>2</sub>e of reduced GHGs over 50 years.<sup>73</sup> The Princeton model advocates for 15 economy-wide wedges dealing with energy efficiency and conservation, shifting toward renewable energy and altering land-use patterns.

Socolow and Pacala’s findings have been challenged in recent years in part because their stabilization target was deemed too high and also because the number of wedges they identified was deemed to be too few. Some critics also suggested that they were too quick to discount the importance of breakthrough energy technologies.<sup>74</sup> However, their method has inspired countless other climate initiatives.

<sup>72</sup> Ibid., p. 968.

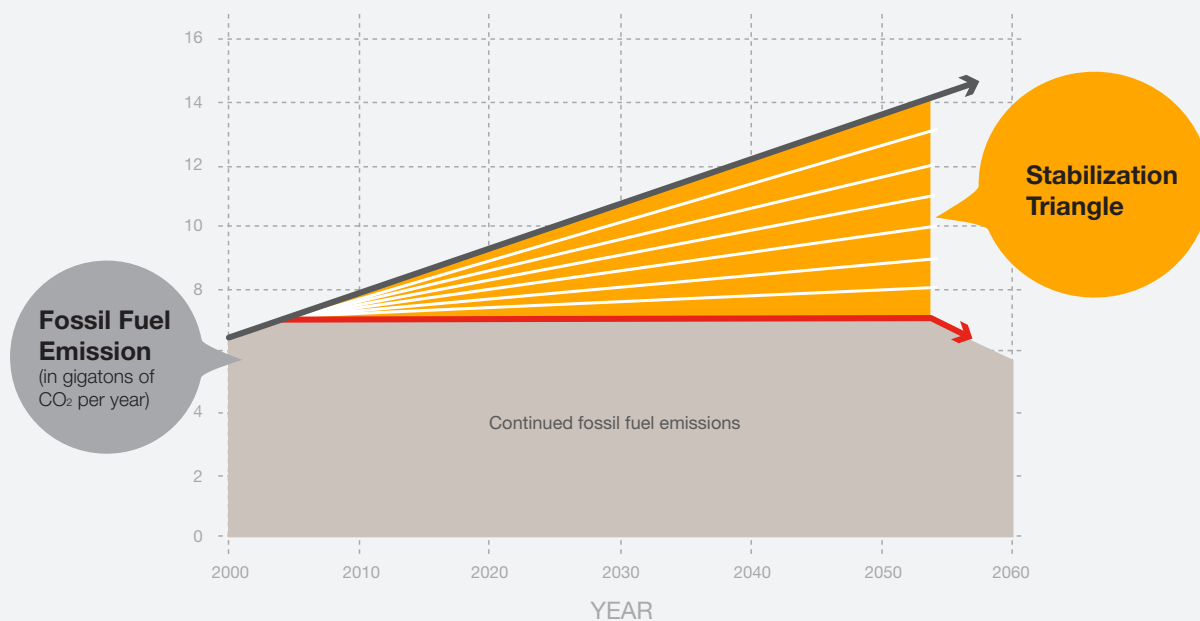
<sup>73</sup> Ibid.

<sup>74</sup> Kintisch, 2013.

<sup>71</sup> Pacala and Socolow, 2004.

FIGURE 5

## The Stabilization Triangle



Source: Science Magazine, Vol. 305, August 13, 2004.



In 2006, McKinsey and the Vattenfall Institute of Economic Research created a global analysis of the microeconomic changes required to reduce GHG emissions using a model building on the wedges. Their resulting cost curve shows the full range of actions that are possible with technologies that are either available today or are likely to be available in the short term. The cost curve offers a scenario in which 27 gigatons of emissions reductions compared to business as usual is achievable by 2030—a quantity that could lead to CO<sub>2</sub> peaking at 500 parts per million. While this figure is higher than the target deemed consistent with a 2°C pathway, it again shows that cumulative technically and economically feasible steps could add up to great ambition.<sup>75</sup>

In 2012, analysts working at Utrecht University and Ecofys proposed an approach called “wedging the gap,” designed to bridge the gap between current emissions trends and the level needed to secure a 2°C pathway. This approach would consist of 21 major initiatives that together would trigger GHG emissions reductions of around 10 gigatons of CO<sub>2</sub> equivalent (Gt CO<sub>2</sub>e) by 2020.<sup>76</sup> Blok and his colleagues reasoned that action by an individual stakeholder could seem insufficient; however, cumulative action scaled across interventions and in collaboration with multiple stakeholders could make bold action by all more attractive and with enough participation could bridge the overall emissions gap.<sup>77</sup>

Variations on the wedges approach have also been used by UNEP,<sup>78</sup> by WWF,<sup>79</sup> and by GeSI in its preparation of the SMARTer 2020 report on the ICT sector’s potential to contribute to emissions reductions.<sup>80</sup>

From our perspective, the wedges approach constitutes what author Clay Shirky describes as a “plausible promise,” a strategy that has sufficient ambition to be truly meaningful, while at the same time being achievable using current technologies and operating within current political economy realities.<sup>81</sup> BSR finds this approach appealing as a conceptual framework for four main reasons:



## BSR Climate Convenings

In the past year, as part of our Business in a Climate-Constrained World strategy, BSR has convened our member companies, partners, and stakeholders around the world.

We hosted events on climate resilience in cities including Copenhagen, Hong Kong, New York, Paris, and San Francisco. We also convened partners alongside major milestones such as Climate Week NYC and COP20 in Lima, Peru.

In so doing, we substantially deepened our engagement with companies and built partnerships with government, philanthropy, and civil society partners interested in leveraging the power of the private sector to advance emissions reductions and build the adaptive capacity of vulnerable populations. This input has been invaluable to shaping the strategy that we outline in this report and to building momentum around our Business in a Climate-Constrained World strategy.

<sup>75</sup> Beinhooker and Oppenheim, 2008.

<sup>76</sup> Blok et al., 2012, p. 1.

<sup>77</sup> Blok et al., 2012, p. 2.

<sup>78</sup> UNEP, 2012.

<sup>79</sup> WWF and CDP, 2012.

<sup>80</sup> Global e-Sustainability Initiative, 2012.

<sup>81</sup> Shirky, 2009, p. 25.

1. **Difficult but achievable:** As Ecofys points out, “Existing scenarios show that it is technically and economically feasible to reduce emissions to zero for roughly 90 percent of current sources of GHG emissions with technological options that are available today and in the near future.” They go on to report that a net phaseout of GHGs by 2050 would ensure a very high likelihood of meeting the agreed-upon 2°C goal.<sup>82</sup> Of course, this approach would still require the right policies and incentives to overcome inertia and provide mutual benefits to action; however, the main message is that the wedges approach does not require us to wait for breakthrough energy technologies or other technological or policy silver bullets.
  
2. **Scalable and manageable:** As McKinsey points out, a significant portion of the costs associated with GHG reductions based on the wedges approach would be at a negative cost to society; in other words, these actions would earn a positive economic return derived largely from savings in energy costs.<sup>83</sup> Moreover, McKinsey also argues that the total annual cost to society would be between €500 billion and €1,100 billion in 2030 or 0.6 to 1.4 percent of expected GDP in 2030. Compare that figure to global spending on insurance in 2005 of 3.3 percent of the GDP.<sup>84</sup> Climate action is a cost-effective way of investing in a low-carbon future while ensuring that we do not find ourselves in a climate-constrained world.
  
3. **Comprehensive and iterative menu for action:** In their original thesis, Pacala and Socolow noted that the portfolio of potential intervention points is large enough that not every component will need to be used.<sup>85</sup> Subsequent studies have noted that the original research significantly underestimated the number of potential wedges. Companies may choose from a broad spectrum of interventions and do not need to slavishly follow any single approach.

*Climate Week NYC 2014:  
Peter Agnefjäll, CEO, IKEA*



*Photo Credit: The Climate Group*

#### CASE STUDY

## Enhancing Resilience Through Business Leadership: IKEA

IKEA is demonstrating that energy efficiency, renewable energy, and sustainability are not only good investments, they can also be affordable and accessible for consumers, thereby hastening the transition to a low-emission economy.

The company is working to help its communities and customers transition by installing renewable energy, including geothermal and wind turbines in its communities; implementing electric-vehicle-charging stations at its retail location; and selling photovoltaic (PV) systems beginning in early 2014. IKEA's energy commitments are not only driving change in its own operations, but also creating impact in its industry and for its consumers.

IKEA has made a broader commitment to more sustainable energy consumption, which also involves collecting solar energy on its rooftops to meet its goal of producing more renewable energy than it consumes by 2020. It has committed to invested €1.5 billion in renewable energy by 2015; in 2014, 34 percent of its energy was supplied from its renewable energy capacity. Seizing opportunities for efficiency improvements and cost savings is fundamental to IKEA's business model.

<sup>82</sup> Hohne et al., 2013.

<sup>83</sup> Beinhooker and Oppenheim, 2008, p. 15.

<sup>84</sup> Ibid., p. 16.

<sup>85</sup> Pacala and Socolow, 2004, p. 968.

#### 4. **Builds from a position of business strength:**

Many of the possible wedges involve doing what business already does best—applying a laserlike focus to innovation, efficiencies, and systemic approaches. Saving energy, making changes across the supply chain, and being innovative with products and services can drive emissions reductions and enhance adaptive capacity.

## MEASURES TO REDUCE EMISSIONS

The Intergovernmental Panel on Climate Change makes it clear that reducing GHG emissions in line with a 2°C target is not only possible but that doing so can be both practical and profitable for business. Opportunities to do so depend on situational factors, most notably the sector and geography, but there are many “cross-industry” wedges that are available to most companies. They include the following measures associated with typical business activities:

1. **Energy:** Reduce energy used from stationary power, increase efficiency of power used, and expand the share of power used from renewables.
2. **Mobility:** Rethink and avoid the need for fuel, shift to low-impact modes when possible, use low-GHG fuel and vehicles, and increase the efficiency of vehicles and driving.
3. **Siting:** Site facilities to make use of renewable energy, reduce the impact of emissions caused by mobility, and avoid negative impacts on bio-carbon.
4. **Resources:** Recycle, reuse, and “upcycle” production materials; use water and other GHG-intensive inputs efficiently; and eliminate fugitive emissions from refrigerants and process chemicals.
5. **Markets:** Develop and commercialize next-generation products and business models, and educate and change the behavior of consumers to encourage public action.
6. **Supply chain:** Encourage suppliers and key business partners to take climate-resilient actions.
7. **Investment:** Direct investments and procurement to sectors and companies that are climate resilient.
8. **Policy:** Advocate for public policies that incentivize action in line with 2°C, and build adaptive capacity.



### CASE STUDY

## Enhancing Resilience Through Business Leadership: Yingli

The use of renewable resources, particularly solar power, is widely accepted as a means to curb the onslaught of climate change. Solar power is less expensive to run, more reliable as an energy source, and more secure. The use of solar power also creates two to three times more jobs than does the use of natural gas or coal industry create. Yet many people, especially lower-income individuals, do not have the means to install these cost-saving, sustainable forms of energy.

Yingli Solar, a China-based global supplier of solar power and manufacturer of photovoltaic cells, has partnered with GRID Alternatives, a nonprofit solar installer, to address this need. GRID's aim is to bring solar power to low-income families across the United States. Using Yingli-donated cells and manpower, the group has been able to provide solar cells to over 1,200 families, saving them an estimated US\$30 million in household electricity costs. This increase in solar power has eliminated 80,000 tons of greenhouse gas emissions and provided hands-on training to thousands of solar-cell engineers. Tim Sears, GRID Alternative's co-founder, praised Yingli as "... an invaluable resource to help [GRID] grow both geographically and in the number of families we've been able to serve."

FIGURE 6

## BSR Resilience Wedges: Driving Emissions Reductions Across Industry Clusters

Certain wedges will be applicable across all these industry clusters, including changes in energy use and mix, emissions reductions in the supply chain, and climate-smart procurement. Other wedges will be specific to each industry.





Using these building blocks, BSR will identify and apply stabilization wedges for ambitious emissions reductions across 11 industries:

- » Consumer Products
- » Energy and Extractives
- » Financial Services
- » Food, Beverage, and Agriculture
- » Healthcare
- » Information and Communications Technology
- » Manufacturing
- » Media and Entertainment
- » Power and Utilities
- » Transportation and Logistics
- » Travel and Tourism

We intend to identify the wedges that are unique to clusters, as well as those that are common across all these industries.

We already anticipate that energy use and mix in facilities and vehicles will loom large across all industries. Many options exist for energy efficiency improvements, and implementing such options could reduce the gap between actual energy use and what could become best practice in many industries. Energy intensity could be reduced by up to 25 percent through the wide-scale deployment of the best available technologies.<sup>86</sup> In addition, one of the top drivers of climate change is transportation fuel, which is responsible for more than 40 percent of global GHG emissions when considering the whole system of production and use.<sup>87</sup>

We are also learning more about the importance of short-lived climate pollutants or SLCPs and their importance as part of the complex climate system. SLCPs are so called because they have a short atmospheric lifetime, spanning a few days to a few decades, compared to CO<sub>2</sub>, which can persist in the atmosphere for several centuries at least. CO<sub>2</sub> is the most important cause of anthropogenic climate change, and SLCPs, which include black carbon (BC), methane (CH<sub>4</sub>), tropospheric ozone (O<sub>3</sub>), and hydrofluorocarbons (HFCs) are second to it, representing up to 45 percent of total warming emissions.<sup>88</sup>

SLCPs' relative short lifetime and substantial role in global greenhouse effects represent an opportunity to slow the rate of global warming while saving millions of lives over the next decades. Focusing mitigation efforts on SLCPs can slow the rate of climate change and improve the chances of staying below the 2°C target in the near term. Indeed, while mitigation by way of acting on SLCPs must be understood as a complement to curbing CO<sub>2</sub> emissions, recent reports have revealed 16 measures that, if deployed by 2030, could slow down the warming expected by 2050 by about 0.5°C and by about 0.7°C in the Arctic by 2040.<sup>89</sup> Furthermore, these measures would have a significant positive impact on especially climate-sensitive regions, reducing disruption of rainfall patterns and slowing the melting of some glaciers.<sup>90</sup>

Tackling SLCP emissions could also have major co-benefits. According to projections, between 0.7 and 4.6 million premature deaths from outdoor air pollution could be avoided annually, while annual crop yield losses of between 30 and 135 million tons could be averted.<sup>91</sup>

BSR is particularly interested in exploring fast mitigation strategies related to SLCPs as we believe the science on these pollutants is clear both in terms of their role as climate forcers and because of the considerable co-benefits including improved air quality and public health that result from stemming the tide of these often overlooked Greenhouse Gases. Moreover, they constitute stabilization wedges applicable across many of our industries including energy and extractives, food beverage and agriculture, transport and logistics, consumer products, and manufacturing.

Some of the proposed measures to reach these results involve technologies and practices that already exist and that are in most cases cost-effective.<sup>92</sup> Examples of net-saving or low-cost mitigation measures include using diesel particulate filters for vehicles, reducing leakage from natural gas pipelines, or the recovery of gas emissions. It is estimated that approximately half of the emission reductions resulting from them could be achieved through

86 Bourgoignie, 2014.

87 Cowart et al., 2003.

88 WB 2013.

89 CCAC 2014.

90 WB & ICCL 2013.

91 CCAC 2014.

92 Ibid.

We intend to identify the wedges that are unique to clusters, as well as those that are common across all of these industries:

Consumer Products

Energy and Extractives

Financial Services

Food, Beverage, and Agriculture

Healthcare

Information and Communications Technology

Manufacturing

Media and Entertainment

Power and Utilities

Transport and Logistics

Travel and Tourism

net cost savings over their lifetime.<sup>93</sup> This calculation does not include non-climate benefits on human health protection or energy efficiency. Were these factors to be included, we expect the cost-effectiveness of these measures to be even higher.

Of course, some wedges will be unique to specific industries. For example, we already know that GHGs from the transport sector have more than doubled since 1970 to 7 billion metric tons in 2010, increasing at a rate faster than that of any other energy end-use sector. Around 80 percent of this increase came from road vehicles. The sector produces both CO<sub>2</sub> and non-CO<sub>2</sub> emissions, including black carbon. Mitigation strategies for the transport sector will therefore draw from the following four categories of wedges: modal shifts, demand reduction, improving vehicle efficiency, and lower carbon intensity of fuels.

We have provided a snapshot of wedges across three industry clusters below for illustrative purposes. They are neither definitive nor exhaustive, and further research will be needed to identify the full suite of wedges and each one's mitigation potential.

## MEASURES TO ENHANCE ADAPTIVE CAPACITY

One of this strategy's key innovations is the proposal to develop stabilization wedges for adaptive capacity. While it has long been recognized that business needs to aggressively reduce emissions, the need for adaptive capacity in business has been less evident, and the enormous potential for business to foster greater adaptive capacity in the communities in which it operates has often been overlooked.

As with emissions reductions, we know that there are specific wedges for each industry cluster that can enhance adaptive capacity. In the agricultural sector, enhancing this capacity will require altering cultivation and sowing times, improving the tolerance of crops to high temperatures, breeding additional drought-tolerant crop varieties, improving adaptive water management techniques, and using more suitable livestock breeds or species in regions with changing temperatures and water patterns.



### CASE STUDY

## Enhancing Resilience Through Business Leadership: Verizon

Extreme weather events, such as Superstorm Sandy, cause damage to infrastructure and physical assets, prompting many companies to pursue innovative solutions to mitigate future risks and disruptions in services and operations. Prior to October 2012, Verizon's telephone infrastructure depended on copper-based systems to support its landlines nationally, including those in New York and New Jersey. This infrastructure could not withstand the saltwater flooding caused by Hurricane Sandy, however. As a result, thousands of Verizon customers lost service, and the company lost approximately US\$1 billion.

In response, Verizon decided not to replace the copper wiring, but rather to install its wireless Voice Link as a solution to fortify both landline and wireless systems. Unlike copper-based systems, wireless systems like Voice Link are less susceptible to extreme weather events, such as flooding, and thus are a more reliable source of phone service. The company has also identified Verizon Fios, a system based on fiber-optic cables, as another reliable alternative to copper-based systems that allows the company to forego the costs associated with repairs, replacements, and interrupted service due to the inherent vulnerabilities of copper-based systems. Both solutions demonstrate Verizon's dedication to building resilience within its own operations to mitigate impacts from future storms and other extreme weather events.

93 Ibid.

There will also be wedges for adaptive capacity that are common across all industries. BSR believes that investments in biodiversity and ecosystem services, policies to promote women's empowerment, and adherence to human rights principles will be significant wedges for building resilience. In an era of climate change and extreme weather events, our work on maintaining biologically diverse natural systems is critically important in strengthening the resilience of the areas in which businesses operate. For example, research has shown that offshore coral reefs and coastal mangroves or wetlands can buffer coastal areas from the effects of hurricanes as well as a minor rise in the sea level.

Companies have the opportunity to assess and act on the reality that all businesses and supply chains are embedded within complex systems, which are not merely organizational, economic, or sociocultural. Many businesses fail to understand that corporate systems are embedded within ecological systems, which serve as key green infrastructure. If companies want essential infrastructure (both human built and natural, or gray and green) to be present and functioning over time, then they must invest in restoring and maintaining it. Businesses acknowledge this reality in terms of built (or gray) infrastructure, as they pay fees to use the Panama Canal, Long Beach Harbor, or any airport landing strip around the world.

Yet there is little recognition that a similar approach to financing is essential to maintaining robust and resilient green infrastructure. And few businesses actively consider their reliance on well-functioning ecosystems that provide green infrastructure. Therefore, as one pillar of a corporate climate resilience strategy, BSR recommends that the private sector invest in the maintenance and restoration of robust, biologically diverse, ecological structures around key supply sourcing sites, manufacturing plants, essential transport hubs (or corridors), and other important business infrastructure. It is critical to understand where and how a company relies on a particular landscape—which may be the site of key raw material sourcing, manufacturing, warehousing, or any other purpose—and the “ecosystem malfunction risks” that exist in that area as a function of climate change pressures. If the risk that an ecosystem



#### CASE STUDY

## Enhancing Resilience Through Business Leadership: Nike

In recent years, Nike has proactively pursued measures to understand climate risks. Threats to water availability and extreme weather form the bulk of Nike's risk exposure. In 2008, floods in Thailand forced four of Nike's factories to temporarily shut down. Since the majority of Nike's factories are located in Southeast Asia, a region increasingly susceptible to extreme weather events, the danger of further prolonged disruptions to production are increasingly emerging.

Water is an integral resource for Nike to be able to grow, manufacture, dye, and distribute its products; the company estimates that it takes 100 to 150 liters of water to process 1 kilogram of textiles. Water scarcity has become a major concern for Nike because many of the regions from which it sources its raw materials are becoming more susceptible to drought. In order to manage this risk, Nike has begun using more synthetic fabrics that require less water and has also developed its own color dry process, which eliminates water and chemical use during the dyeing process.



will malfunction is high, then businesses must identify an appropriate green infrastructure, or ecosystem investment approach, to mitigate or even eliminate that risk.

Women are disproportionately impacted by extreme weather events and the health and poverty impacts caused by climate change. By providing women with access to information, steady livelihoods, and financial services, policies that promote women's empowerment can build their resilience. The bulk of the evidence suggests that climate change is hardest on women as they are often constrained by social and cultural norms that prevent them from acquiring appropriate skill sets, restrict their access to assets (including land), prevent them from having adequate access to governance (including access to decision-making and information), place them in inferior social positions, and prevent them from acquiring education and appropriate health care.<sup>94</sup> The results of the 1991 cyclone in Bangladesh illustrate many of these issues. More than 90 percent of the estimated 140,000 fatalities were women; their limited mobility, skill set, and social status exacerbated their vulnerability to this extreme weather event.<sup>95</sup>

A forward-looking approach to human rights will also enable resilience building. The interface between climate change and human rights has become a prominent area of study in recent years.<sup>96</sup> In January 2009, the Office of the UN High Commissioner for Human Rights (UN-OHCHR) published a report on climate change and human rights. The report was based on written and oral submissions by more than 30 states and 35 international agencies, as well as national human rights institutions, NGOs, and academic bodies.

The UN-OHCHR's report clearly asserted that there is an important relationship between climate change and human rights, and it delineated and defined the nature of that relationship. In particular, the UN-OHCHR outlined the many ways in which climate change undermines a range of internationally protected human rights, particularly the rights of vulnerable populations.<sup>97</sup> Subsequent work by the Human Rights Council and a range of international

scholars have highlighted how the application of human rights, particularly those associated with access to information, decision-making, and justice, can build resilience to climate impacts.<sup>98</sup>

## The Wedges in Action: Illustrations for Key Sectors

Over 80 percent of global GHG emissions are associated with just four sectors: energy, transportation, agriculture, and primary industries.<sup>99</sup> These sectors are also vulnerable to the impacts of climate change, with key infrastructure and systems that are highly sensitive to climate conditions expected to be severely stressed.

These sectors are the sources of the vast majority of emissions for companies in other sectors that use them, from retail to manufacturing to financial services to healthcare. For these companies, energy, transportation, agriculture, and materials created by primary industries are basic inputs to the operations (scope 1 and 2) and wider value chains (scope 3). Therefore at least one—if not all—of these sectors are areas of material risk and opportunity for virtually all large companies.<sup>100</sup>

What follows is an illustrative outline of “wedges,” or measures that companies can take to reduce emissions and build adaptive capacity, in these sectors. These wedges are neither definitive nor exhaustive; further research will be needed to identify the full suite of wedges and each one's mitigation potential.

### ENERGY

About 60 percent of global GHG emissions are related to energy, and specifically the burning of fossil fuels.<sup>101</sup> Just over half of GHG emissions from energy are from the “supply” side of energy, which includes centralized generation of electricity and the production and distribution of energy. This represents 35 percent of all GHG emissions. The remainder of energy emissions is associated with final energy demand, or energy combusted onsite for final users, most notably in

94 Cameron, 2010.

95 Ibid.

96 Ibid.

97 UN OHCHR, 2009.

98 Cameron and Limon, 2012.

99 IPCC, 2014

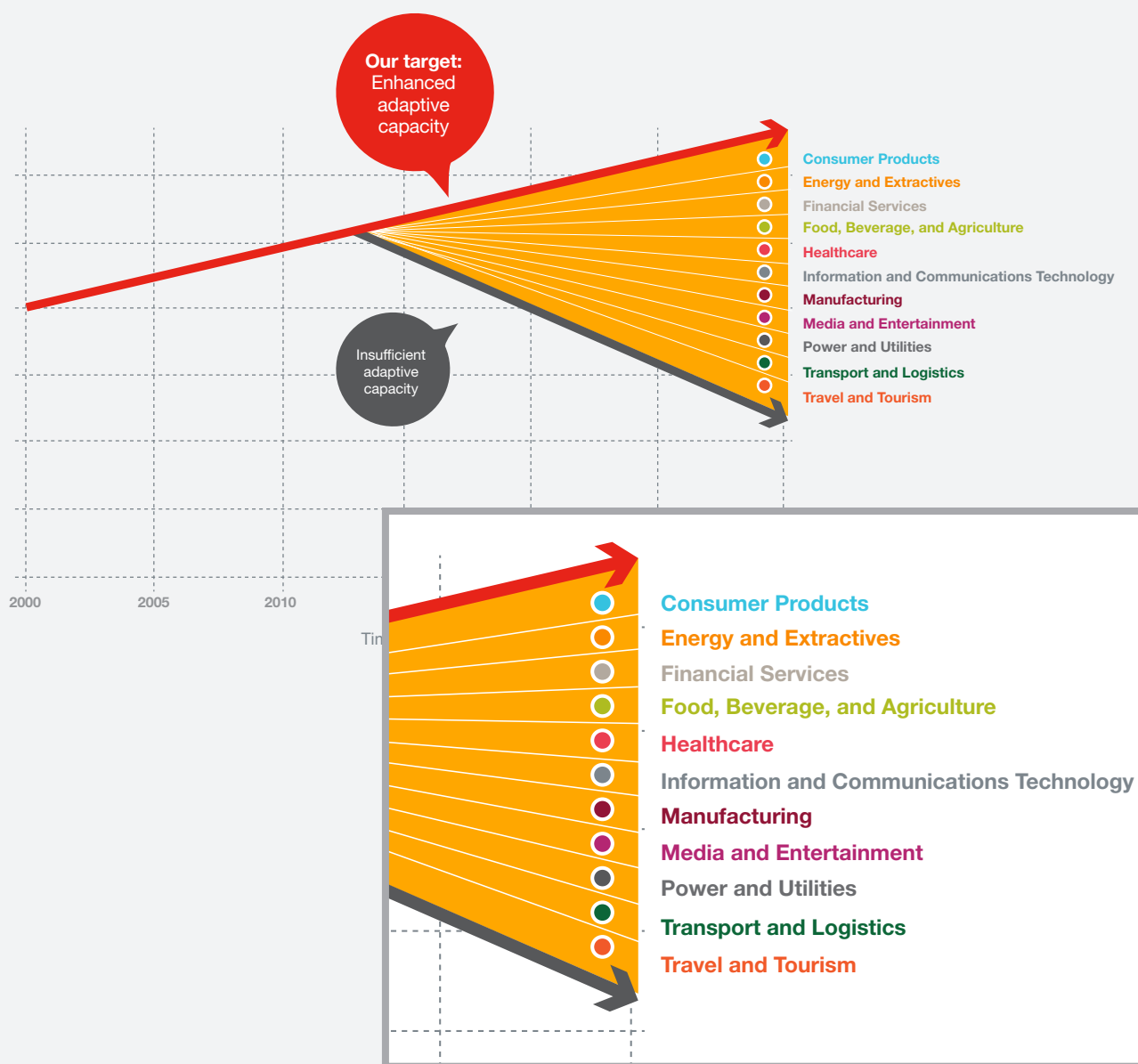
100 WRI and WBCSD (2003). The Greenhouse Gas Protocol Corporate Standard

101 IEA (2013) CO<sub>2</sub> Emissions from Fuel Combustion

FIGURE 7

## BSR Resilience Wedges: Enhancing **Adaptive Capacity** Across Industry Clusters

Certain wedges can enhance adaptive capacity across all industries, including women's empowerment, strengthening of biodiversity and ecosystem services, improving human rights, and adaptive water management. Other wedges will be specific to each industry.



transportation, industry, and buildings. Emissions from energy are primarily CO<sub>2</sub>, but a small and growing share is from short-lived climate pollutants, most notably methane (CH<sub>4</sub>).

In order to reduce emissions in line with the 2°C target, the energy supply system will need to be fundamentally transformed to substitute unabated fossil fuel technologies with low-GHG alternatives. The share of low-carbon electricity supply (i.e., renewables, nuclear and carbon capture) will need to increase from the current share of approximately 30 percent to more than 80 percent by 2050, with fossil fuel power generation without carbon capture phased out almost entirely by 2100.<sup>102</sup>

Emissions from the energy sector are growing due to a long-term increase in energy demand that is projected to increase 37 percent by 2040, combined with “carbonization,” a new trend in recent years in which an increasing share of coal in the energy mix has been causing new emissions that outstrip the reductions made from the deployment of renewables.<sup>103</sup> As a result, from 2000 to 2010, the growth in energy sector emissions outpaced the growth in overall emissions by around 1 percent per year.<sup>104</sup>

The challenge of decarbonizing energy is vast. But it is achievable through a series of discrete wedges, which can be divided into two categories. The first is “Full Steam Ahead Measures,” or measures where there is broad agreement about the benefits of rapidly scaling up technologies. In this category, there are cost barriers, but generally not other significant unmanageable negative tradeoffs. Full Steam Ahead Measures include:

- » **Reducing energy demand** by decreasing the use of energy consumed through conservation and efficiency measures. Demand reduction has been estimated to represent approximately half of the potential reductions from each sector, and has therefore sometimes been called the “first fuel.”<sup>105</sup>
- » **Increasing the share of renewable energy** by dramatically expanding the share of renewables in

electric power in ways that displace and ultimately replace power produced by fossil fuels.

- » **Cutting emissions from fossil fuel extraction and conversion** by increasing the use of renewables and efficiency in the production stage of fossil fuels, and reducing fugitive emissions from flaring and leakage.
- » **Increasing energy efficiency in electricity transmission and distribution** by improving transformers and distributed power generation while deploying dynamic loading, gas-insulated transmission lines, and high-voltage DC transmission.

The second category may be thought of as “Situational Solutions.” These are wedges where significant GHG reduction is possible but where an undirected or mismanaged use may nullify and possibly negate GHG benefits, and where there may be a potential for significant tradeoffs or risks. Situational Solutions represent key potential within a framework of strategic and responsible deployment. Situational Solutions include the following:

- » **Retrofitting coal plants with natural gas** by shifting from current world-average coal-fired power plants to modern natural gas combined cycle (NGCC). This solution can halve emissions, but it has two caveats. First, fugitive emissions from natural gas need to be addressed, and second, natural gas plants—which have operating lives of on average of more than 30 years—need to be phased out or retrofitted with CCS by the second half of the century.
- » **Maintaining and cautiously developing nuclear power** by improving the safety, economics, uranium utilization, waste management, and proliferation of materials, and by leading research and development of next-generation nuclear energy systems. Currently, nuclear represents a sizeable 11 percent of the energy supply.<sup>106</sup> However, there are many concerns that need to be managed, and it is unclear how the economics will play out as new distributed technologies take hold.

<sup>102</sup> IPCC, 2014

<sup>103</sup> International Energy Agency (2014). World Energy Outlook.

<sup>104</sup> IPCC, 2014

<sup>105</sup> Nicholas Stern (need reference)

<sup>106</sup> IPCC, 2014

» **Introducing carbon capture and storage (CCS)**

on existing coal plants. CCS can help to eliminate emissions from baseload power and can help to create negative emissions in the second part of the century when applied to other technologies such as biomass. However, CCS should not be used as an alternative to reduce demand or delay the Full Steam Ahead Measures and should create a “license” to emit. Key policies and pacts are needed to ensure responsible development of CCS.

These Situational Solutions help to create options given that there is uncertainty about the costs and development pathways of the different energy technologies. They have critical roles to play, but they need to be checked with proactive consideration about their different tradeoffs and with clear plans.

The energy sector is also vulnerable to physical impacts of climate change, in particular through a decreasing efficiency of thermal conversion in power plants and physical damage to oil and gas pipelines.

## TRANSPORTATION

Transportation accounts for about 14 percent of direct global GHG emissions, primarily through combusted fossil fuels.<sup>107</sup> These emissions have more than doubled since 1970 and are rising faster than for any other energy end-use sector.<sup>108</sup> Transportation is also responsible for significant indirect GHG emissions that result from the extraction, processing, and delivery of fuels; the manufacture of vehicles; and the construction of infrastructure. These emissions are difficult to measure but could be associated with an additional 10 percent of global GHG emissions.<sup>109</sup>

Emissions from transportation can be categorized as either passenger or freight. On the passenger side, light vehicle ownership stands at 1 billion and is projected to double in the next few decades, with two-thirds of the growth in non-OECD (Organisation for Economic Co-operation



### CASE STUDY

## Enhancing Resilience Through Business Leadership: Coca-Cola

With more than 100 production facilities in North America alone, Coca-Cola relies heavily on water in the manufacturing of its products and in all of the communities in which it operates. The fact that water resources in North America have become increasingly stressed due to climate impacts poses significant risk to Coca-Cola’s business.

In partnership with conservation organizations, academic institutions, and local governments, Coca-Cola is focused on “improving water efficiency, recycling water used in our operations, and replenishing resources through watershed restoration and protection.”

In California’s Sierra Nevada mountains, for example, meadows in the valley have been degraded by more than a century of development and overgrazing, which has resulted in valley streams cutting in deeply and being eroded. The net effect is fast runoff and therefore less effective recharge of underground aquifers. Coca-Cola has invested around US\$200,000 in the Indian Valley, which is the headwaters of the Mokelumne River that supplies water to Coca-Cola’s bottling plant in San Leandro. The results include the slowing of stream rates and the creation of ponds that allow valley meadows to retain water and native vegetation to return, which have helped to recharge aquifers.

Source: <http://www.coca-colacompany.com/our-company/sustainability-update-water-stewardship> and <http://www.coca-colacompany.com/stories/keeping-the-planet-wet-watershed-responsibility>.

<sup>107</sup> Ibid

<sup>108</sup> Ibid

<sup>109</sup> BSR (2015). The Sustainability Impacts of Fuel: Understanding the Impacts of Transportation Fuel for Trucking in North America.



and Development) countries. Around a tenth of the global population accounts for 80 percent of total motorized passenger kilometers.

Emissions from freight are growing dramatically. Emissions from surface are expected to grow 240-600 percent in Asia and 140-350 percent worldwide by 2050.<sup>110</sup> Relatedly, heavy-duty vehicles represent 7 percent of vehicles on road and use over 25 percent of road fuel. Total fuel demand grew 70 percent from 2010-2040.<sup>111</sup>

In order to reduce transportation emissions in line with the 2C°, IPCC recommends reducing energy demand from transport by around 35 percent by 2050, while increasing the share of low-carbon fuels by over 30 percent by 2050.<sup>112</sup>

Wedges for reducing demand include:

- » **Increasing vehicle efficiency** by improving aerodynamics, cutting vehicle weight, and bringing engines up to leading-edge standards.
- » **Selecting transport carriers** that demonstrate the best GHG performance on a per-ton or per-mile basis.

Wedges for decarbonizing fuel supply include:

- » **Expanding the share of low-carbon fuels** with greater use of electrification and hydrogen from renewable feedstocks and biofuels. The IPCC has called for the expansion of such sources from about 3 percent in 2010 to 30 percent by 2050. Opportunities vary by mode and vehicle class (size).
- » **Reducing the carbon intensity of fuel** by managing the lifecycle emissions within various categories of emerging fuel (e.g. natural gas and biofuel) and existing fuel (e.g. petroleum-based diesel and gasoline). There is a wide variance of fuel impacts within different sources.<sup>113</sup>

Wedges for system optimization include:

- » **Locating operations and production** by sites closer to markets.
- » **Designing cities and highways** for integrated urban planning, transit-oriented development, and compact urban form that supports cycling and walking.
- » **Deploying “smart” logistics** such as system-optimized route-handling and computer-assisted telematics.
- » **Shifting to lower-impact modes.** With freight, this can include air to road, road to rail, and rail to ship. With passengers, this means getting people out of cars and onto trains, buses, and bikes.

Efficient, low-carbon transport systems have significant co-benefits, including reduced urban pollution, better health, energy security, better access to mobility services, and time savings. Also integrated, far-sighted planning can create resilient low-carbon transport networks, particularly in new urban areas. Planning is a priority to create “resilient cities.”

Transportation systems are also physically vulnerable to climate change, in particular road, railway, port, and coastal zone infrastructure. Adapting will require different specifications for existing transport infrastructure and greater awareness of projected impacts for new infrastructure resilience. Companies need to assess supply-chain risk and build resilience into logistics networks to account for a higher likelihood of disruption. Efficient design of urban areas and their associated transport networks will play a significant role in the resilience of cities in the future.

## AGRICULTURE

Agriculture contributes to about 10 to 12 percent of global GHG emissions. In addition, the sector is the largest contributor of non-CO<sub>2</sub> GHGs, including methane, accounting for 56 percent of emissions in 2005. About 70

<sup>110</sup> International Transport Forum (2015). Transport Outlook.

<sup>111</sup> BSR (2015). The Sustainability Impacts of Fuel: Understanding the Impacts of Transportation Fuel for Trucking in North America.

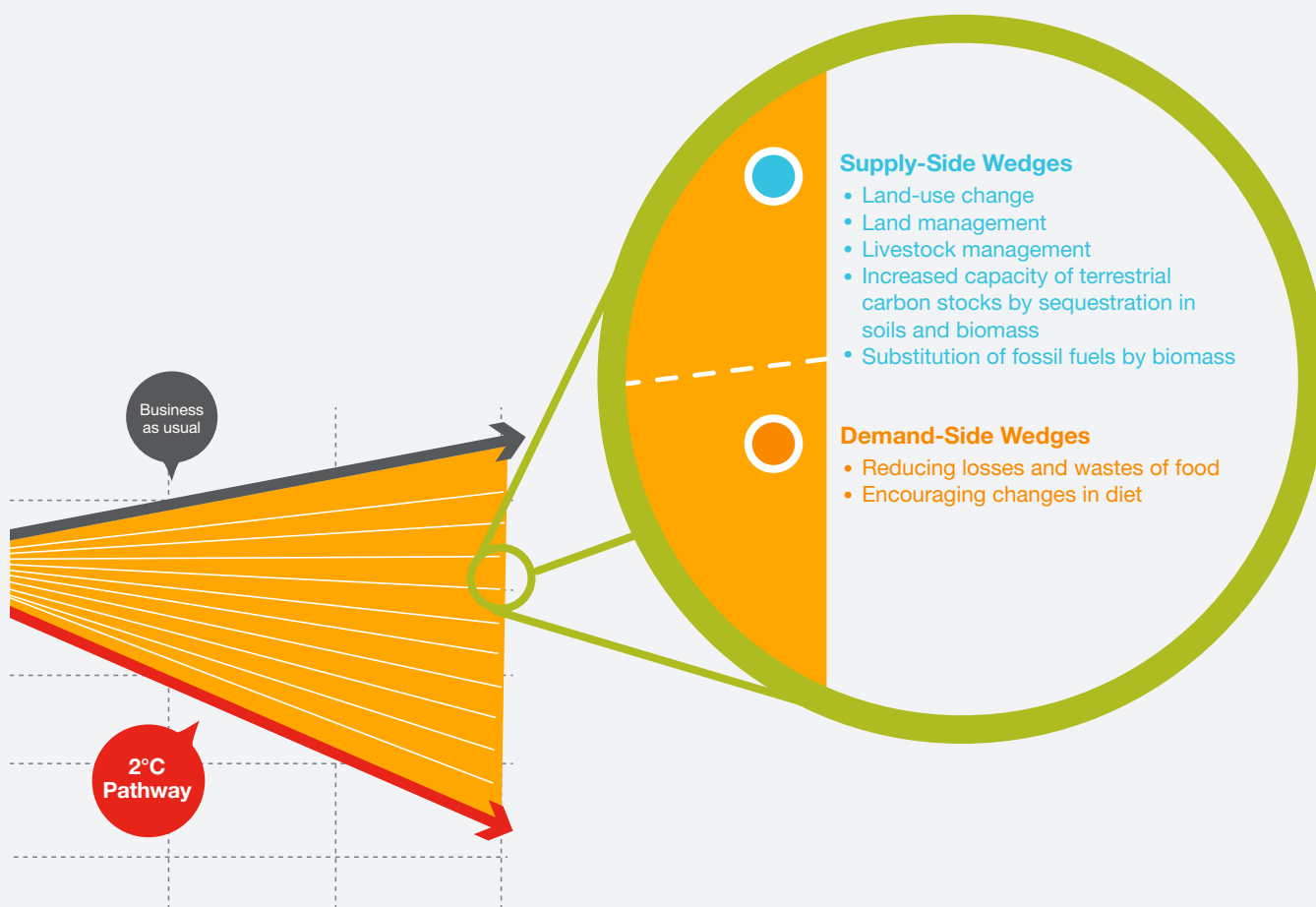
<sup>112</sup> IPCC, 2014

<sup>113</sup> BSR (2015). The Sustainability Impacts of Fuel: Understanding the Impacts of Transportation Fuel for Trucking in North America.

FIGURE 8

## Emissions Reductions Wedges Within the Agriculture Industry

GHG emissions from agriculture comprised about 10-12 percent of global GHG emissions in 2010. In addition, the sector is the largest contributor of non-carbon dioxide (CO<sub>2</sub>) GHGs, including methane, which accounted for 5 percent of emissions in 2005. Recent studies have found that all land-related mitigation strategies from combined action on agriculture, forestry, and bioenergy could contribute 20 to 60 percent of total cumulative emissions reductions by 2030, and an additional 15 to 45 percent by 2100.



percent of total agricultural GHG emissions come from agricultural soils and enteric fermentation (the production of methane in the digestive systems of livestock). Other significant contributions come from paddy rice cultivation (9-11 percent), biomass burning (6-12 percent) and manure management (7-8 percent). Also, the use of synthetic fertilizers is projected to increase over the coming decade, and this will become the second-largest source of agricultural emissions after enteric fermentation.<sup>114</sup>

Opportunities to reduce emissions from agriculture are diverse and include reduction of emissions through management of land and livestock as well as the enhancement of natural biogeochemical removals of emissions. Agricultural companies can draw from a range of stabilization wedges when looking to reduce emissions.

Wedges for the supply side include:

- » **Minimizing land-use change**, including conserving existing carbon pools in forest vegetation and soil by controlling deforestation, protecting forest in reserves, controlling other anthropogenic disturbances such as fire and pest outbreak, reducing slash and burn agriculture, and protecting peat lands.
- » **Improving land-use management**, including improving agronomy, nutrient and fertilizer management, tillage and residue management; establishing agro-forestry systems; and increasing capacity of terrestrial carbon stocks by sequestration in soil and biomass.
- » **Reducing enteric fermentation** by improving feeding and dietary additives.
- » **Using alternatives to fossil fuels, including substituting biomass for fossil fuels** through using waste agriculture production to create bioenergy in solid, liquid, and gaseous forms, and increasing efficiency and renewable sources used for power in fuel with agriculture production.

Wedges for the demand side include:

- » **Reducing the loss and waste of food** in the supply chain and during final consumption.
- » **Encouraging changes in diet** towards less GHG-intensive food (e.g., substitution of animal products with plant-based food), and reducing overconsumption in regions where this is prevalent.

According to the IPCC, recent studies have found that all land-related mitigation strategies from combined action on agriculture, forestry, and bioenergy could contribute 20 to 60 percent of total cumulative emissions reductions by 2030, and an additional 15 to 45 percent by 2100.

Enhancing adaptive capacity in the agricultural sector is complex because adaptation is highly context specific, with no single approach for reducing risk appropriate across all regions, subsectors, and settings. Consequently, food, beverage, and agricultural companies will need to draw from a range of stabilization wedges when looking to enhance adaptive capacity, including inter alia:

- » Improving land management, including altering cultivation and sowing times, improving crop tolerance to high temperatures, breeding additional drought-tolerant crop varieties, and employing adaptive water management techniques.
- » Improving livestock management through matching livestock rates with pasture production, adjusting herd and water point management, managing livestock diet quality, using silage effectively, employing pasture spelling and rotation, using more suitable livestock breeds or species, using biosecurity activities to monitor and manage the spread of pests, weeds, and diseases.

## EXTRACTIVES AND PRIMARY INDUSTRIES

Primary industries—namely mining, cement, chemicals, paper and pulp, iron and steel, and aluminum—contribute to about 30 percent of direct GHG emissions.<sup>115</sup> These

114 IPCC, 2014

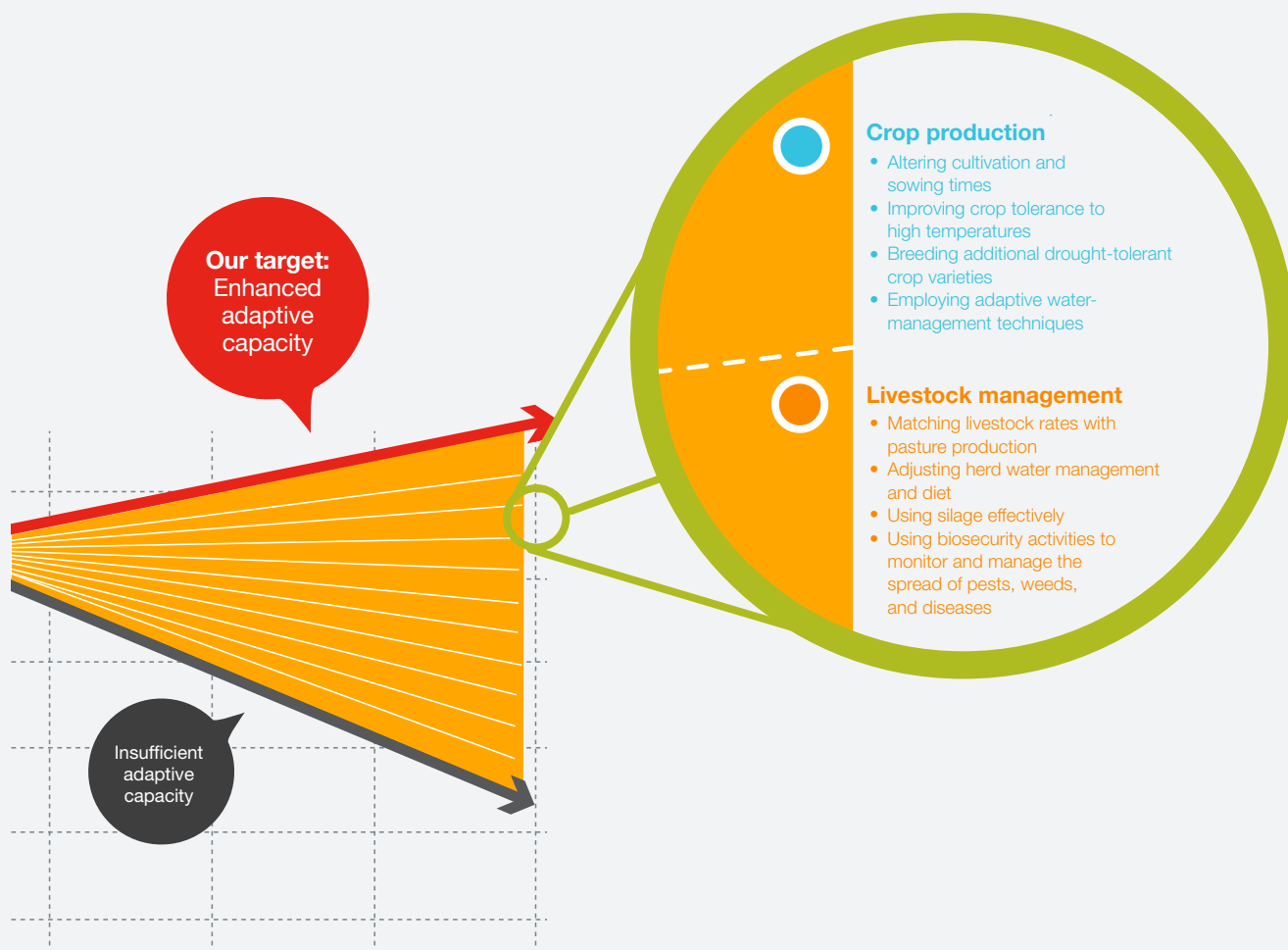
115 IPCC, 2014

FIGURE 9

## Adaptive Capacity Wedges Within the Agriculture Industry

Adaptation is highly context specific, with no single approach for reducing risk appropriate across all regions, subsectors, and settings. Consequently, food, beverage, and agricultural companies will need to draw from a range of stabilization wedges when looking to enhance adaptive capacity.

Two broad categories of wedges covering crop production and livestock management are available to the agriculture sector. In addition, policy wedges applicable across both crop production and livestock management may also be appropriate. These include index-based weather insurance, trade reform, public-private finance partnerships, and various payments for environmental services and improved research pricing.





emissions are rising, with global demand for industrial products projected to increase by 45-60 percent by 2050 relative to 2010 production levels.<sup>116</sup>

Energy consumption for mining and quarrying represents about 2.7 percent of worldwide industrial energy use. The energy requirements come largely from crushing and grinding and the use of diesel-powered machinery. Underground mining requires more energy than surface mining due to greater requirements for hauling, ore hoisting, ventilation, air refrigeration, water pumping, etc.

The broad deployment of best available technologies could reduce emissions intensity of these sectors by about 25 percent, with innovation delivering a further potential reduction of 20 percent before technological limits are approached.<sup>117</sup>

Mitigation strategies for the extractives and primary industries sector fall into two categories: supply side and demand side. Supply-side strategies are mainly geared toward improving industrial process efficiencies and are focused in the three areas of emissions efficiency, energy efficiency, and material efficiency.

Demand-side strategies are focused on reducing the overall use of product materials by changing the demand for industrial products through increased reuse and recycling, through substitution of less energy- and GHG-intensive materials, and by using materials more efficiently. There are two main strategies: product-service efficiency and demand reduction.

Numerous approaches to adaptation could contribute to enhanced resilience in primary industries:

- » **Adaptive water-management techniques**, including scenario planning, learning-based approaches, and flexible, low-regret solutions, could address uncertainty due to climate change.
- » **Efficient rationing of electricity** could help limit losses, where power generation is a limiting factor and a risk to the reliability of the energy supply.



#### CASE STUDY

## Enhancing Resilience Through Business Leadership: Walmart

To reduce environmental impacts, increase women's empowerment, improve food safety, and support rural development, Walmart has committed to training more than 1 million farmers in its supply chain, half of whom are women. Walmart China partnered with BSR to implement the Green Farmer program to provide trainings in sustainable agricultural practices for farmers throughout China.

To date, the program has trained more than 2,800 farmers—1,000 of whom are women—on sustainable practices, such as soil testing, integrated pest management, composting, vegetable and pest disease diagnosis, and pesticide selection and safe use. Many participants have experienced an approximately 30 percent increase in crop yields and reduced operating costs due to better disease prevention and decreased pesticide use.

Through this program, Walmart China has demonstrated its leadership in building resilience within its own operations and within its suppliers. Additionally, the program has enabled farmers to protect against climate-related impacts, such as diminished crop production and crop damage from pests, through the use of sustainable agricultural practices.

<sup>116</sup> Ibid.

<sup>117</sup> Ibid.



## 4 PERCENT REDUCTION IN CARBON EMISSIONS INTENSITY BY 2014

### CASE STUDY

## Enhancing Resilience Through Business Leadership: TATA Steel

Tata Steel recognizes that steel is an energy intensive industry. Its progressive position on emissions reduction was initiated by the company's vision to be benchmark in Corporate Citizenship and was fueled by emerging industrial regulations (including a tax on coal and a fledgling cap and trade scheme) as well as by changing customer demand.

The company has focused on investment in process energy efficiency measures and augmented infrastructure to reduce its carbon footprint. For example, in 2013, Tata Steel invested in a waste heat recovery unit in coke ovens. The steam is used for process heating, saving on fuel and expected to save 8,100 tons CO<sub>2</sub>e annually. During the year it has invested in the replacement of a slag granulation facility in one of the blast furnaces to ensure resource conservation.

In 2008, Tata Steel made a decision to replace smaller blast furnaces—the new blast furnace operates with a CO<sub>2</sub> emission intensity that is 7 percent lower.

Tata Steel's Technology and Research and Development team has allocated resources to pursue new product

development for its customers in the automotive and construction sectors and research roadmap for the best use of indigenous raw materials.

### BENEFITS:

- » Direct cost savings from reduced energy use.
- » Indirect savings due to reduced impact of Carbon Tax, Renewable Purchase Obligation, and Energy Cap and Trade Scheme.
- » Benefits of GHG abatement through Carbon Development Mechanism.
- » Attraction of new customers.
- » Growing market share in "green" steel.
- » Improved reputation.
- » Increased credibility within sector.

### PROGRESS:

- » Reduced overall carbon emission intensity by 14 percent over seven years, avoiding approximately 3.7 million tons of CO<sub>2</sub>e emissions in fiscal year 2013-14.
- » 50 percent reduction in energy intensity over last 30 years.

Source: <http://www.wemearbusinesscoalition.org/stories/tata-steel>

- » **Improving extraction methods and increasing recycling rates** could address the depletion of certain materials, including those used in mitigation technologies.
- » **Insurance** is linked to disaster risk reduction and climate change adaptation because it enables recovery, reduces vulnerability, and provides knowledge and incentives for reducing risk.
- » **Technical and political options for infrastructure** include upgraded design specifications during new construction, retrofitting structures, and modified land-use planning in coastal areas.

For mining, energy consumption could be reduced by improving power management technologies and methodologies employed, such as underground water reticulation-based hydropower, more efficient mining equipment, and increased mining efficiencies before comminution. Improving the recovery ratio of valuable ore within the total of material extracted would increase material efficiency for the sector.

## Businesses are Both Actors and Enablers

At BSR, we believe in the transformational power of progressive business leadership on climate change. We are convinced that businesses can catalyze a prosperous transition to a low-carbon future through their investments, procurement, and energy mix and use and by how they develop products and supply chains that meet their customers' changing needs in ways that are effective, sustainable, and stable in a rapidly changing operating environment.

Businesses are both actors and enablers of climate action. They can act to reduce their own emissions and enhance adaptive capacity in their own operations. They also have the capacity to enable other industries to reduce emissions and build adaptive capacity through the products and services they provide. All businesses can build community resilience by empowering their workforce, providing access to goods and services, integrating

### CASE STUDY

## Enhancing Resilience Through Business Leadership: Cemex

CEMEX, the Mexico-based global supplier of cement, ready-mix concrete, and aggregates, has fully integrated sustainability into its business strategy. The company has set itself ambitious targets, including commitments to reduce its carbon emissions from cement production by 25 percent (from a 1990 baseline) by 2015, and to reduce the emissions caused by its products over the full life-cycle of buildings and structures.

Supplying comprehensive information on the environmental performance of concrete (e.g., its advantages over wood-frame homes) and developing new products, such as insulating concrete forms, also allows its clients—builders and developers—to reduce emissions over the life cycle of buildings.

CEMEX is on target to achieve another challenging goal: to reach a 35 percent share of climate-friendly alternative fuels by 2015. And it has made its own substantial investments in clean energy by developing Ventika, one of Latin America's largest wind farm projects.

### BENEFITS:

Ideally positioned to profit from cap and trade, through good progress on reducing carbon emissions; meeting consumer demand for more sustainable products by producing an efficient, long-lasting building material and communicating life-cycle advantages of its products to stakeholders with factual information.

### PROGRESS:

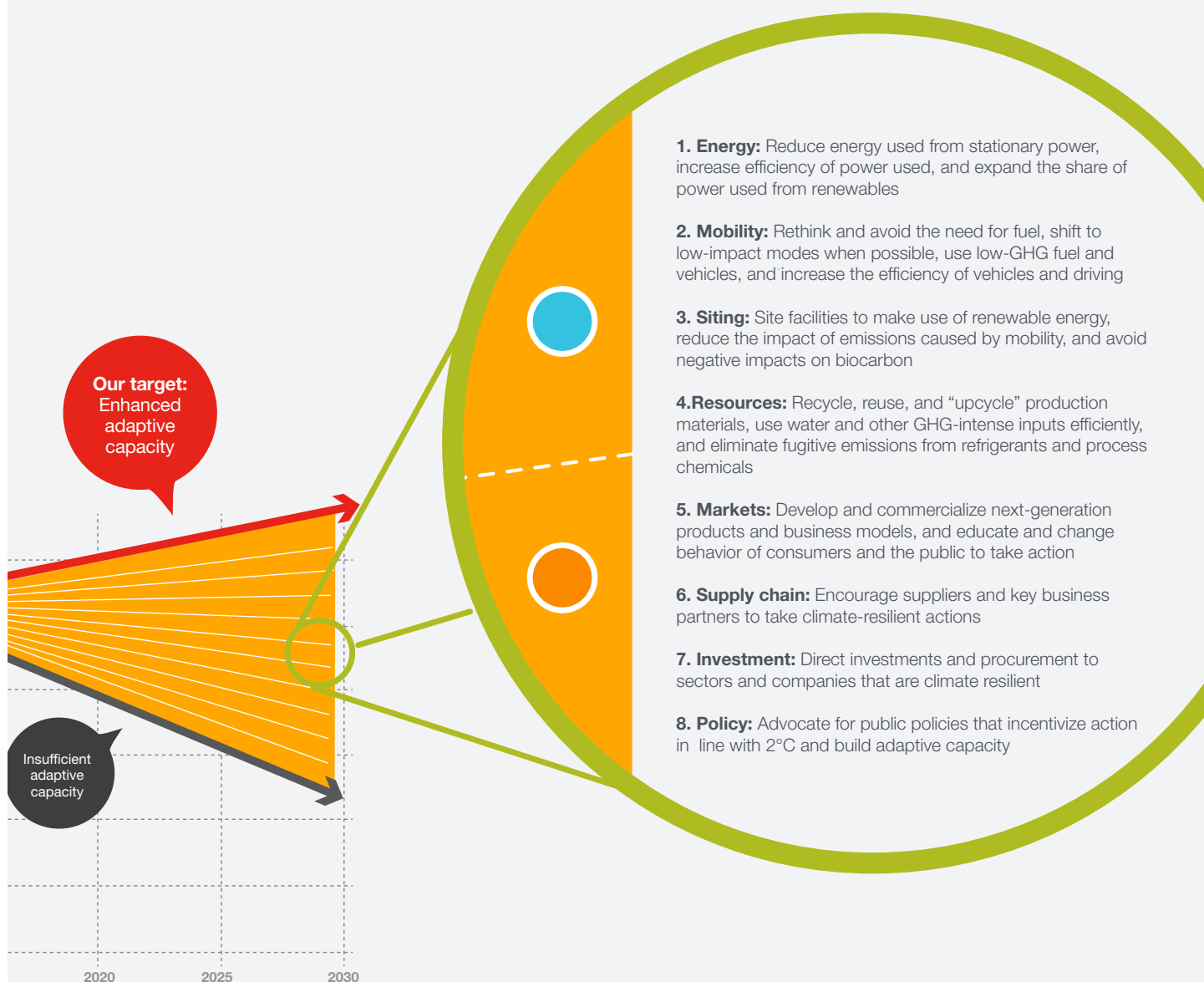
- » US\$635.5 million invested in carbon emissions-reducing activities
- » 1.5 million tons CO<sub>2</sub>e saved annually
- » More than 28 percent of the company's kiln energy supplied by climate-friendly alternative fuels
- » Joint developer of Ventika, Mexico's largest onshore wind farm—US\$640 million facility with 84 wind turbines that will help Mexico meet its 2025 target of 35 percent renewable generation

Source: <http://www.wemeanbusinesscoalition.org/stories/cemex>

FIGURE 10

## Emissions-Reduction Wedges in All Industries

Regardless of the industry, every company has an opportunity to reduce GHG emissions in a way that is practical and good for the business. While specific opportunities vary by different company situations, a core set of common wedges exists that all companies can build strategies to reduce emissions from. The following are common wedges across industries.<sup>1</sup>



<sup>1</sup> Adapted from Greenhouse Gas Protocol (2011). Corporate Value Chain (Scope 3) Accounting and Reporting Standard.



small businesses into global supply chains, and engaging in public-private partnerships for climate-resilient investments. And businesses can avail themselves of the transformational power of collaboration by working across industries to share their knowledge, pioneer new approaches and technologies, and test business-to-business solutions.

## INFORMATION AND COMMUNICATIONS TECHNOLOGIES

The ICT industry is an actor when it comes to climate change. Its footprint is projected to increase at a rate faster than that of the total global footprint between 2011 and 2020—with its GHG emissions rising 3.8 percent per year in that period. Despite expected efficiency gains, the ICT industry's footprint is projected to rise to 1.3 gigatons of CO<sub>2</sub> equivalent (2.3 percent of global emissions) by 2020. The emissions from all three ICT categories—end-user devices, telecommunication networks, and data centers—are expected to increase.<sup>118</sup> However, it is important to note that the growth rate will decrease over time due to innovation in end-user devices.<sup>119</sup> Like all other industries, the ICT industry will not only need to reduce its GHG emissions, but it will also need to become a demander—and consumer—of low-carbon energy sources.

In addition to being an actor, however, the ICT sector is also an enabler of low-carbon development as ICT-enabled solutions deployed in the transport, agriculture and land use, buildings, manufacturing and power, and consumer and service sectors could reduce annual total GHG emissions by an estimated 9.1 gigatons of CO<sub>2</sub> equivalent by 2020, representing 16.5 percent of the projected total in that year.<sup>120</sup> This potential reduction is more than three times the size of the ICT industry's own emissions.<sup>121</sup>

For ICT companies, climate change is first and foremost an opportunity to launch new products and services for climate mitigation and adaptation and enable the creation of a low-carbon economy. BSR's member network includes global companies from the energy, mining, retail, financial services, health care, manufacturing, transportation, media, and hospitality industries—all of them significant users of ICT.



### CASE STUDY

## Enhancing Resilience Through Business Leadership: ADAPT Tool

To help companies manage climate-related risks and build resilience, BSR partnered with Acclimatise and Oxfam America to create the ADAPT (analyze, develop, assess, prioritize, and tackle) tool. The tool encourages businesses to build comprehensive climate resilience approaches across their entire value chains by considering community and ecosystem vulnerability and adaptation needs. It uses a five-step approach to identify emerging market opportunities, develop integrated plans, and build community support.

ADAPT also contains sector-specific modules for three sectors that are especially vulnerable to climate impacts: food, beverage, and agriculture; water and energy utilities; and general manufacturing. The tool includes a business primer and sample questions that businesses can refer to when creating effective, inclusive climate resilience plans. It encourages companies to assess the climate vulnerability for each link within the value chain, identify opportunities for new markets to increase the adaptive capacity of communities, appraise the full lifecycle economic benefit-to-cost ratio, and implement climate resilience actions in partnership with key value chain participants and stakeholders, such as communities and governments.

<sup>118</sup> Global e-Sustainability Initiative, 2012, pp. 21–22.

<sup>119</sup> Ibid.

<sup>120</sup> Ibid., pp. 9–10.

<sup>121</sup> Ibid.

As a result, we are able to provide significant insights into the sustainability and corporate responsibility priorities of the ICT companies' key enterprise customers and connect the dots as to how ICT can be leveraged as a climate solution.

## EXTRACTIVES

Similarly, the mining sector has an important role to play in reducing its own emissions while enabling the transition to low-carbon alternatives. Currently, 10 percent of the energy consumed worldwide is used for the extraction and processing of mineral resources. Without extraordinary advances in mining and refining technology, this fraction is set to rise as poorer, more remote deposits are tapped.<sup>122</sup>

On the enabling side, building the wind turbines, solar power stations, and other facilities necessary for a low-carbon economy will require vast amounts of metals and other raw materials, including selenium, neodymium, iron, copper, and aluminum, which will then be sequestered for several decades.<sup>123</sup> As Vidal and his colleagues outline, solar and wind facilities require up to 15 times more concrete, 90 times more aluminum, and 50 times more iron, copper, and glass than a facility with an equivalent capacity that is run by fossil fuels or nuclear energy.<sup>124</sup> If the contribution from wind turbines and solar energy to global energy production is to rise to 5 to 18 percent annually, the global production of these vital metals must increase over the next 40 years.<sup>125</sup>

<sup>123</sup> Vidal et al., 2013, p. 894.

<sup>124</sup> Ibid., p. 895.

<sup>125</sup> Ibid.

<sup>122</sup> U.S. Energy Information Administration, 2013.

### CASE STUDY

## Enhancing Resilience Through Business Leadership: Lenovo

Lenovo is committed to producing energy-efficient products as well as reducing the carbon footprint of manufacturing those products.

Lenovo is focused on developing more energy-efficient IT products to satisfy both increased customer demand and regulation changes to product labeling (such as the U.S. EPA's Energy Star label and the Green Electronics Council's EPEAT labeling system). The company has developed software that helps optimize energy used by its products, such as Power Manager and Cisco EnergyWise. Currently, 98 percent of all notebooks, 71 percent of desktops, 92 percent of workstations, 50 percent of server platforms, and 96 percent of monitors meet ENERGY STAR requirements. Lenovo also offers numerous EPEAT Gold-rated products across the globe. In addition, Lenovo is committed to developing low-carbon products and is collaborating with MIT University Materials Lab and other ICT industry leaders to develop a tool that simplifies the calculation of Product Carbon Footprint (PCF). It hopes this could become an industry standard.

Benefits include increased sales and improved reputation.

### PROGRESS:

Energy efficiency is a targeted attribute of the Lenovo product development process. Improvements in product energy efficiency are consistently part of its key environmental objectives and targets. The energy efficiency of Lenovo's products improves from generation to generation. Lenovo PCs come with built-in energy-efficient tools and eco-friendly features that include:

- » For Win8 systems, the "Lenovo Settings" app provides power management features for the user (i.e., Connected Standby).
- » For other operating systems, Power Manager helps optimize energy used by a running machine and saves up to 69 percent on energy consumption per desktop, per year.
- » Adaptive Thermal Management adjusts system power and fan speeds based on ambient levels.
- » Active Directory and LANDesk supports remote deployment of power schemes and global settings to allow administrators the ability to control and enforce ThinkPad energy savings company-wide.
- » Cisco EnergyWise software application allows Cisco networks to control and perform energy management and enables customers to monitor, control, and report on the energy use of building equipment and IT devices using a Cisco EnergyWise enabled network.
- » Lenovo EasyResume gives quick recovery from computer lid close, balancing low power state by suppressing CPU usage at lid close.
- » Intelligent Cooling balances thermal performance to adjust settings to provide a cooler surface for comfort while optimizing product energy performance.

Source: <http://www.wemeanbusinesscoalition.org/stories/lenovo>

Recognizing the twin roles of business as enabler and actor is critical to catalyzing private-sector action. As we work toward climate resilience, all sectors must have a stake in and feel welcome in the transition to a low-carbon future. Ensuring that business sees this transition as both an opportunity and an obligation will therefore be important.

## FINANCIAL SERVICES

The New Climate Economy Report published in 2014 estimates that between now and 2030 around US\$90 trillion will be invested globally in urban development, land use, and energy infrastructure.<sup>126</sup> If we use this money wisely, we will create sustainable livelihoods, secure health benefits, improve social mobility, and build climate resilience. If we use the money carelessly, we will be locked into warming, with dangerous consequences for biodiversity, ecosystems, food security, human rights, and long-term development.

Similarly, the mining sector has an important role to play in reducing its own emissions while enabling the transition to low-carbon alternatives. Currently, 10 percent of the energy consumed worldwide is used for the extraction and processing of mineral resources. Without extraordinary advances in mining and refining technology, this fraction is set to rise as poorer, more remote deposits are tapped.

<sup>126</sup> The Global Commission on the Economy and Climate (2014)



*BSR Conference 2014 session, "Lessons in Resilience: Learning from Extreme Weather Events": Carrie Grassi, Senior Policy Advisor, NYC Mayor's Office, Recovery and Resiliency; Francis Bouchard, Group Head of Government and Industry Affairs, Zurich Insurance Group; and Jackie Roberts, Chief Sustainability Officer, The Carlyle Group*



### CASE STUDY

## Enhancing Resilience Through Business Leadership: Sompo

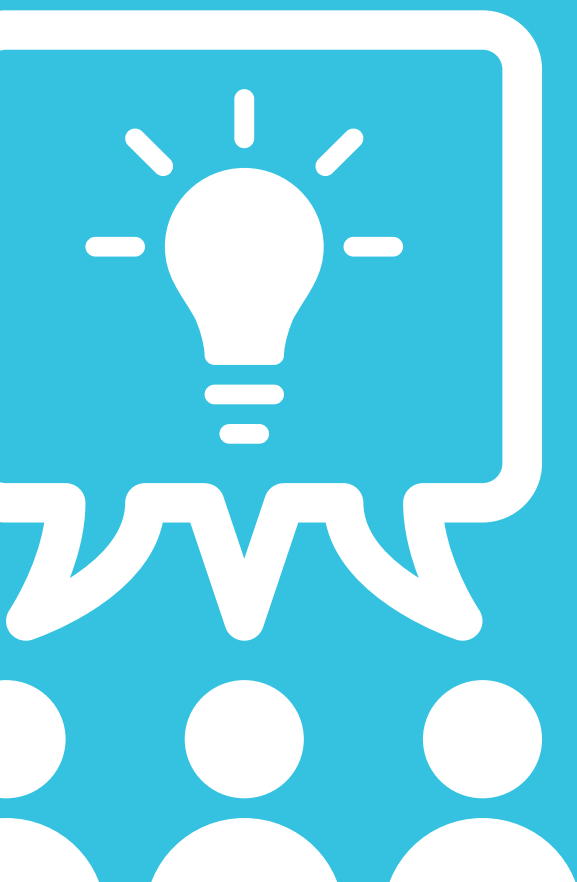
Thailand faces extreme climate risk due to increasing surface temperatures, floods, droughts, severe storms, and sea level rise that threaten its agriculture and tourism industries. In order to build the adaptive capacity of farmers affected by extreme weather events in Thailand, Sompo Japan—the second-largest property insurance company in the country, with almost 20 percent market share—launched a new weather index insurance product in 2010. The company developed this product as a result of engagement in a collaboration led by the Japan Bank for International Cooperation three years prior.

Weather derivatives and weather index insurance products provide compensation and/or insurance payments when temperature and rainfall breach certain thresholds or when other extreme weather events occur. Though they gained popularity in the United States, and subsequently spread to other developed countries, they have not been widely available in many developing countries that are most vulnerable to climate impacts. For this reason, Sompo's investment in these products in Thailand provides a leading example of how weather derivatives and weather index insurance products can advance adaptation efforts for those most vulnerable to climate impacts.



# 04

Driving New Ideas  
and Collaboration  
on Climate Resilience



*BSR Spring Forum 2014: Johannes Meier, Chief Executive Officer, European Climate Foundation, and participants at the We Mean Business breakout session*



# Driving New Ideas and Collaboration on Climate Resilience

BSR works with its global network of more than 250 member companies to build a just and sustainable world. From its offices in Asia, Europe, and North and South America, BSR develops sustainable business strategies and solutions through consulting, research, and cross-sector collaboration. Our existing skills, honed over 20 years, will drive this strategy forward.

## Translating Good Ideas Around the Globe

Working from farm to factory to the boardroom, we engage with more than 250 major corporations across eight industry clusters, integrating sustainability into strategy and operations, and promoting collaboration with business and stakeholders to produce systemic progress. We promote individual company leadership and innovation, collaborative change across business networks, and cross-sector solutions for systemic change. We understand the connections among social and environmental issues, as well as the need to integrate social expectations and business implementation.

The race to secure the global climate will be won or lost in emerging economies in Asia and South America and in the historical emitters of North America and Europe. These regions are where the bulk of GHG emissions have been produced historically and/or will be produced over the coming decades. They are also the regions where the majority of consumers are based, the largest volume of investment decisions are reached, and in the case of Asia, where the most vulnerable populations to climate impacts are based. BSR's presence in each of these markets

means that we have access to the key stakeholders and corporate decision-makers in these vital regions.

We have specialized expertise on climate change, energy, supply chains, finance, human rights, women's empowerment, biodiversity, and ecosystem services, as well as experts and member companies spanning eight industries. We work with business to redefine productivity in the value chain by improving use of resources and demanding low-carbon options from suppliers.

## Driving Collaboration

Tackling the challenge of global climate change is an enormous task—too large for any single company or organization. In light of this challenge, BSR engages in four ways that we think have the potential to both simplify and amplify the efforts of our member companies. We will:

- » Provide tangible industry guidance on climate priorities and approaches via the wedges strategy.
- » Integrate new tools and content into our core sustainability services from strategy to stakeholder engagement and reporting.



*BSR Conference 2014: Ryan Schuchard, Associate Director, Climate Change, and Edward Cameron, Managing Director, Partnership Development and Research, BSR*

#### CASE STUDY

## Enhancing Resilience Through Business Leadership: The Future of Internet Power

The information and communication technology (ICT) industry is an important enabler of sustainability solutions. Yet, it is also a significant driver of sustainability impacts, comprising about 1-2 percent of global greenhouse gas emissions. Within the sector, data centers and network equipment (hereafter called “infrastructure”) is a large and growing part, due to its rising energy footprint. Fortunately, such infrastructure is becoming much more efficient, with operators having a cost-saving motive to reduce energy use and regularly upgrade equipment and operating techniques.

However, overall energy use is expanding even more greatly. A growing global population and increasing affluence will add hundreds of millions of new computer users in the next two decades, while advances in computer applications are multiplying the energy intensity

required per user. The effect is that growing cumulative energy demand is outstripping gains from even rapidly-improving efficiency.

For this reason, a key sustainability theater for infrastructure operators—and one where there is a dearth of solutions—is the supply of power (e.g., the mix of coal, natural gas, renewables, and other feed-stocks) that determines the level of climate impact resulting from a given unit of electricity. Increasingly, there is reason for companies to invest in driving more sustainable, low-carbon power sources from the grid through engagement with local utilities and policymakers.

Some companies have started to do this on their own. But BSR, recognizing the power of collective action, has created the Future of Internet Power

Collaborative Initiative, uniting major players in the sector such as Adobe, eBay, Facebook, HP, salesforce.com, and Symantec, in order to develop a common understanding of opportunity areas for data center operators; address obstacles to collaboration with utilities and policymakers in driving new low-carbon, sustainable power in select locations; facilitate stakeholder forums to promote greater awareness, understanding, and alignment among internal and external stakeholders on shared opportunities; create a network of experts and advocates to pursue public-policy advocacy initiatives; and establish a buyer’s group for developing collaborative investments in sustainable, low-carbon power generation.

- » Expand our Collaborative Initiatives to help our members work with one another—and with partners across sectors—in areas ranging from energy and transportation to supply chain practices and public policy engagement.
- » Involve external stakeholders in a dialogue about climate change action to articulate a clear voice on private-sector needs as well as commitments to enable ambitious climate goals.

Today, research is conclusive about the value of collaboration. The findings of MIT, The Boston Consulting Group (BCG), and the UN Global Compact's recent joint report are unequivocal: "No single company can surmount [ecological] risks by itself." The endemic and systemic nature of these risks calls for action at their root, and this action can only be designed and deployed collectively, for indeed, "the path to sustainable success is travelled with others."<sup>127</sup> BSR's vision has from its outset incorporated this, and much of its impact has demonstrated not only the merit but also the necessity of joining forces to tackle climate change. That both MIT and BCG's research should confirm this is a further impetus to keep chartering the territory of collaboration.

For more than 20 years, BSR has brought companies together to address sustainability challenges that are too systemic and complex for any single company to tackle alone. In addition, we have sought partners beyond the private sector ranging from governments to multilateral organizations in our constant effort to enrich collective understanding and amplify action.

Recently BSR joined forces with like-minded organizations including The B Team, CDP, Ceres, the Climate Group, the Prince of Wales Corporate Leaders Group, and the World Business Council on Sustainable Development, along with corporate partners, to launch the We Mean Business coalition in the spring of 2014. The aim of the coalition, which by uniting these organization brings together thousands of business leaders and investors, is to accelerate the transition to a low-carbon economy. By creating a joint platform, We Mean Business is able to amplify the business voice and strengthen its push for



#### CASE STUDY

## Enhancing Resilience Through Business Leadership: Future of Fuels

Between 2013 and 2030, world energy use is projected to rise about 40 percent, with transportation fuels comprising about one-third of all energy consumption. Future of Fuels, a BSR-led multistakeholder initiative, catalyzes partnerships and advances best practices and policies for fuel production, consumption, and distribution. Participants include CSX, Coca-Cola, the GE Foundation, Nike, PepsiCo, Shell, Suncor, UPS, Volvo Group, Walmart, and Westport Innovations. Together, these organizations aim to promote a total lifecycle framework to understand the sustainability impacts of transportation fuels and advance a common roadmap for identifying improvement opportunities within the transportation fuels sector and its supply chain.

Future of Fuels is a leadership initiative that brings together experts from the private, nonprofit, public, and academic sectors to help companies understand the greatest impacts of their transportation fuel and what they can do to mitigate those impacts. Through a series of research papers, facilitated discussions, and innovative technology partnerships, Future of Fuels explores and addresses key impacts from the "well-to-wheel" lifecycle of fuels, while bringing better transportation fuels to scale. The initiative is identifying opportunities for industry players within the transportation fuels sector to diversify their energy mixes, particularly in terms of low-carbon alternatives and renewable energy, and to incorporate low-carbon technologies throughout their value chain. Through this work, the group promotes a transition to low-carbon fuels, while simultaneously creating jobs and other economic benefits, enhancing energy security, and facilitating local and rural development.

<sup>127</sup> MIT 2015

ambitious corporate action and smart policy frameworks. Specifically, We Mean Business has spawned several offshoots focusing on targeted issues. RE100, for instance, is a program whereby companies make the bold commitment to use 100 percent renewable energy by 2020, while the Tropical Forest Alliance 2020 addresses the drivers of tropical deforestation using a range of market, policy, and communications approaches. These are two of several topical engagements, all harnessed by We Mean Business's strong policy engagement in the United States, Europe, and emerging economies on framework issues such as carbon pricing or EU energy policy.

Our collaboration with the Climate and Clean Air Coalition (CCAC) is another example of joining forces to reach pragmatic and effective solutions by engaging in multilateral dialogue. Focused on mobilizing resources for fast mitigation of short-lived climate pollutants (SLCPs), the coalition unites governments, intergovernmental organizations, representatives of the private sector, environmental actors, and other members of civil society. Since its launch in 2012, the voluntary and government-led coalition has provided a platform for knowledge-sharing and research into opportunities to act on SLCPs, bolstered existing efforts aimed at the diversity of fast mitigation benefits, and harnessed resources to hasten effective action. BSR joined the Coalition in January 2015, committing to promote fast mitigation on SLCPs among its members, leveraging a network of more than 250 companies with considerable operations in major emerging economies. Many of the industry clusters we work with are primary sources of this pollution, making them critical influence targets and agents of change in securing substantive outcomes. By convening in North America and Europe in 2015, BSR hopes to raise awareness about the opportunities to increase climate resilience and reduce GHG emissions in the private sector and to lead policy engagement aimed at promoting enabling policy frameworks.

Within our own network, BSR engages more than 250 companies. In particular, our Collaborative Initiatives provide a standing forum for them to share knowledge and insights, take action, and engage with their stakeholders as a collective, rather than as individual companies.



*BSR Conference 2013:  
Clean Cargo Working Group members*

#### CASE STUDY

## Enhancing Resilience Through Business Leadership: Clean Cargo Working Group

The ocean shipping industry contributes approximately 3 percent to global greenhouse gas emissions, which affects climate change, sea and land acidification, and poor air quality. The industry also impacts the oceans' environmental health through chemical cargo residues, cleaning agents, and nonindigenous species from ballast water. Ten years ago, few standards existed to quantify the environmental impacts and performance of shipping.

In 2002, BSR, global brands, and global container cargo carriers came together to establish the Clean Cargo Working Group (CCWG) to develop standardized tools that meet the needs of both shipping customers and cargo carriers to measure, report on, and evaluate environmental impacts. Today, over 85 percent of the container ship industry uses CCWG methodology to report environmental performance. CCWG's annual reporting process shows that average CO<sub>2</sub> emissions per container per kilometer for global ocean transportation routes have declined by more than 7.7 percent from 2012 to 2013 and by over 22 percent since 2009. In addition, the majority of global buyer members—including companies such as Electrolux, IKEA, Marks & Spencer, and Nike—have used CCWG metrics and tools to improve environmental performance in their supply chains.

Given the group's industry recognition, CCWG engages regularly with the World Shipping Council as well as with regulatory bodies such as the European Commission, as they seek to develop a globally recognized legal framework for maritime companies to measure, report, and reduce carbon-dioxide emissions. Already, the U.S. EPA and other transport sustainability initiatives have used our methodologies and results as the standard for environmental performance in ocean container transport.





## Robust Analysis

BSR is committed to preparing robust analysis on climate change that is accessible to a business audience, contains actionable insights, and is constructed on a solid evidence base drawn from prominent institutions and thought leaders around the world.

In 2014, we produced business translations of the IPCC 5th Assessment Reports in partnership with the University of Cambridge and the European Climate Foundation. We also generated new research from our Collaborative Initiatives. In 2015, we will build on these foundations with new research on “fast mitigation” developed in partnership with UNEP.



### CASE STUDY

## Enhancing Resilience Through Business Leadership: HERfinance

More than 2.5 billion adults, or 75 percent of the world's poor, do not use formal financial services to save or borrow money. Helping vulnerable populations—particularly women, who are often hit first and hardest by the effects of climate change—build the financial resources they need to invest in natural, physical, and other types of assets is essential to building their adaptive capacity in the face of climate impacts.

In 2012, with a founding grant from the Walt Disney Company, BSR piloted HERfinance in India with participation from Ann Inc., Levi Strauss Foundation, Nordstrom, Primark, and Timberland. The mission of HERfinance is to build the financial capability of low-income workers in global supply chains by providing workplace-based financial education and connecting factory employees to appropriate financial services.

HERfinance is part of BSR's broader efforts to empower women in the global economy known as HERproject. To date, HERfinance has reached more than 10,000 workers through a pilot program in India, with plans under way to expand to Indonesia, Brazil, and Mexico.

Companies participating in Collaborative Initiatives benefit from BSR's commitment to driving best practices, leveraging the strengths and skills of different participants and functions, and fostering transparency, trust, and mutual learning. Participants recognize that effective action to curb CO<sub>2</sub> emissions and build resilience requires engaging collaboratively across sectors, industries, and geographies. With a view to action, BSR's Collaborative Initiatives bring together relevant perspectives to find collective solutions to endemic or systemic problems. These Collaborative Initiatives continue to establish industry-wide and cross-sector tools, standards, and approaches for companies to improve sustainability performance in supply chains and drive progress on frontier issues, such as the future of fuels, ecosystem services, regional adaptation, and other complex global challenges.

Many of these initiatives have an important role to play in catalyzing emissions reductions. For example, the Clean Cargo Working Group creates practical tools for measuring, evaluating, and reporting the environmental impacts of global goods transportation. Ocean freight carriers track and benchmark their performance and, as a result, they can easily report to their customers in a standard format. This standardization allows shipping customers to review and compare carriers' environmental performance when reporting and making informed buying decisions. As a result of this work, we are now providing reliable annual emissions performance data for 23 of the world's leading ocean carriers, representing more than 85 percent of global ocean container ship capacity.<sup>128</sup> Moreover, 95 percent of cargo transport buyers participating in the initiative use our data and tools in procurement decisions and in supplier relationships with cargo carriers.<sup>129</sup> In practical terms, the participating carriers have reduced their CO<sub>2</sub> emissions per kilometer an average of 16 percent since 2009. From 2014, data reported from ocean cargo carriers will represent more than 80 percent of the global container ship capacity, as more carriers join the initiative.<sup>130</sup>



#### CASE STUDY

## Enhancing Resilience Through Business Leadership: Regional Adaptation Initiative

Recent extreme weather events have devastated global supply chains and communities—particularly in coastal cities in emerging economies. While these climate risks are well understood, solutions require system-wide intervention and collaboration. The Regional Adaptation Initiative brings together companies to address shared challenges and build resilience.

With a focus on making practical use of the latest authoritative climate science, READI helps companies understand their exposure to risk and how they can build adaptive capacity to address that risk. By means of research papers, facilitated discussions, and partnership building, the group will identify areas of common climate vulnerability, while collectively devising and advocating solutions in targeted regions.

Focusing on regional contexts, for instance, the Regional Adaptation Initiative explores opportunities for climate change adaptation in key geographical areas and drives collaborative action among companies, suppliers, and governments to invest in climate resilience. With a science-based approach, this initiative seeks to identify areas of common climate vulnerability, comparing the latest climate science against company investments and commitments.

<sup>128</sup> According to the AlphaLiner Top 100 index, [www.alphaliner.com/top100/](http://www.alphaliner.com/top100/).

<sup>129</sup> Farrag-Thibault, 2014.

<sup>130</sup> Farrag-Thibault, 2014. Carrier make-up, data quality and market conditions are also factors in the emissions reductions reported.

Similarly, the Future of Fuels initiative aspires to a sustainable, resilient, and affordable transportation fuel system in which companies can account for and effectively improve the impacts of fuel. Specifically, it is developing a tool to enable fleet owners and other fuel buyers to understand the sustainability impacts of fuel from a business perspective and hence to accelerate deployment of low-carbon, sustainable fuel. Our achievements to date include publishing a comprehensive study on the sustainability impacts of fuel in 2012 (updated in 2015) as well as a roadmap for sustainable fuel in 2013.

These outputs not only take into consideration diverse stakeholder views—including fleet operators, transporters, and their customers—but also integrate the latest science available from the IPCC Fifth Assessment Report as well as from the Low Carbon Fuel Standard bill in the United States.<sup>131</sup> In addition, we have convened a series of forums that have brought members together with more than 300 thought leaders and practitioners to discuss enhancing public dialogue on fuels, and we continue to bring stakeholders together to promote better fuels, practices, and enabling market developments.

Recognizing that collective action strengthens buyer power is also the catalyst behind the Future of Internet Power Collaborative Initiative, which unites industry peers to increase their capability for renewables procurement. Thorough analysis of current practices, combined with knowledge-sharing among industry and value chain partners, alliances emerge to facilitate renewables transactions and expand options as the technology sector unfolds. Through the development of a multi-company initiative advancing utility investments, onsite electric power generation, and policy support in service of more sustainable, low-carbon power supply for data centers and network equipment, this Collaborative Initiative establishes the enabling conditions for pragmatic, ambitious, and effective collective action with a long-term vision.

Moreover, there is considerable scope for enhancing adaptive capacity and for strengthening resilience in the face of climate change by acting collaboratively on targeted regions. Focusing on regional contexts, for instance, the Regional Adaptation Initiative explores



#### CASE STUDY

## Enhancing Resilience Through Business Leadership: Climate Science Initiative

A science-based approach is central to successful collaboration among stakeholders, and BSR carries out this commitment by placing climate in context and conveying its implications for business by way of its Climate Science Initiative. With a base in science, multiple stakeholders are able to identify chances for individual and collective action to respond to emerging threats and opportunities, by integrating climate resilience in company operations and supply chains and by demonstrating cross-industry and cross-sector commitment to addressing climate change.

By helping companies understand risks and opportunities related to climate change, their basis in climate science, and options for response, the Collaborative Initiative aims to develop a framework for understanding and communicating climate change's relevance to business, to share learning on corporate approaches to climate strategy, to elevate ambition levels for companies driving progress on climate, and to demonstrate industry's commitment to addressing climate change.

It is a cross-sector and cross-geography initiative, uniting BNP Paribas, Gap, Lockheed Martin, Standard Chartered, and Unilever, convening on a quarterly basis.

<sup>131</sup> U.S. Congress, 2009, and Bourgoignie 2014.



opportunities for climate change adaptation in key geographical areas and drives collaborative action among companies, suppliers, and governments to invest in climate resilience. With a science-based approach, this initiative seeks to identify areas of common climate vulnerability, comparing the latest climate science against company investments and commitments with a view to engage, advocate, and partner for solutions in targeted regions.

A science-based approach is indeed central to successful collaboration among stakeholders. BSR carries out this commitment by placing climate in context and conveying its implications for business by way of its Climate Science Initiative. With a base in science, multiple stakeholders are able to identify chances for individual and collective action to respond to emerging threats and opportunities. They are able to integrate climate resilience in company operations and supply chains and demonstrate cross-industry and cross-sector commitment to addressing climate change.

Our work on biodiversity and ecosystem services is critically important, as ecosystems can help mitigate climate change by strengthening existing carbon sinks, such as forests or oceans that are able to absorb carbon dioxide, in order to increase sequestering of GHG emissions. They can also serve an important adaptation function by strengthening natural defenses in the face of climate-related extreme weather events. In this arena, collectively seeking new tools for measuring corporate impacts on ecosystems



*Climate Week NYC 2014: Aron Cramer, President and CEO, BSR, and Peter Bakker, President and CEO, World Business Council for Sustainable Development*

#### CASE STUDY

## Enhancing Resilience Through Business Leadership: We Mean Business

An alliance of seven like-minded organizations including The B Team, CDP, Ceres, the Climate Group, the Prince of Wales Corporate Leaders Group, the World Business Council on Sustainable Development, as well as BSR, along with corporate partners, launched the We Mean Business coalition in the spring of 2014. The aim of the coalition, which by uniting these organizations brings together thousands of business leaders and investors, is to accelerate the transition to a low-carbon economy. By creating a joint platform, We Mean Business is able at once to amplify the business voice and to strengthen its push for ambitious corporate action and smart policy frameworks.

In addition, We Mean Business has spawned several offshoots focusing on targeted issues. RE100, for instance, commits companies to the bold target to use 100 percent renewable energy by 2020, while the Tropical Forest Alliance 2020 addresses the drivers of tropical deforestation using a range of market, policy, and communications approaches. These are two of several topical engagements, all harnessed by We Mean Business's strong policy engagement in the United States, Europe, and emerging economies on framework issues such as carbon pricing or EU energy policy.

Collaboration is the backbone of We Mean Business's success in engaging corporations on the path to decarbonization and in addressing policymakers on the role of business on this path. Each partner organization brings its own network, human resources, and regional expertise to ensure that the voice of business be heard distinctly and that corporate climate action be pragmatic, realistic, and ambitious.



*BSR Spring Forum 2014: Marie-Claire Daveu, Chief Sustainability Officer and Head of International Institutional Affairs, Kering*



# Our Impact

Over the past decade, we have led

# 100+

**companies to be more ambitious  
on climate change**

Meanwhile, we have reached

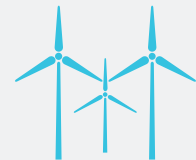
# 1,000+

**suppliers to improve climate performance**

## Our impact includes:



**Direct GHG reductions**  
in companies and industries



**Culture change**  
through evolved company thinking  
and action on emissions reduction  
and adaptation



**Improved dialogue**  
between business and other partners



**Public policy change**  
prompted by amplifying the voice of  
progressive businesses



**System changes**  
through enhanced industry  
standards and supplier practices



Panel discussion at the U.S. Department of State on the Climate and Clean Air Coalition (from left): Helena Molin Valdes, Executive Director, Climate and Clean Air Coalition; Beata Jaczewska, Undersecretary of State and Minister for the Environment, Poland, and CCAC High-Level Assembly Co-Chair; Achim Steiner, Executive Director of UNEP; and Jonathan Pershing, Principal Deputy Director of the Office of Energy Policy and Systems Analysis, U.S. Department of Energy

Photo Credit: Climate and Clean Air Coalition (CCAC)

#### CASE STUDY

## The Climate and Clean Air Coalition

The Climate and Clean Air Coalition (CCAC) was launched in 2012 by the United Nations Environment Programme and six countries—Bangladesh, Canada, Ghana, Mexico, Sweden, and the United States—to address short-lived climate pollutants (SLCPs) and options for fast-mitigation. Today it also includes close to 50 non-state members, such as the World Health Organization, the Environmental Defense Fund, and the Carbon Disclosure Project.

SLCPs are so called because they have a short atmospheric lifetime, spanning a few days to a few decades, compared to CO<sub>2</sub>, which can persist in the atmosphere for several centuries at least. CO<sub>2</sub> is the most important cause of anthropogenic climate change, and SLCPs, which include black carbon (BC), methane (CH<sub>4</sub>), tropospheric ozone (O<sub>3</sub>), and hydrofluorocarbons (HFCs), are second to it, representing up to 45 percent of total warming emissions.<sup>1</sup> In addition to having a warming effect on the planet, SLCPs represent risks for human health, agriculture, and ecosystems.

SLCPs' relative short lifetime and substantial role in global greenhouse effects represent an opportunity to slow the rate of global warming while saving millions of lives over the next decades. The science on these pollutants is clear both in terms of their role as climate forcers and because of the considerable co-benefits, including improved air quality and public health, that result from stemming the tide of these often overlooked greenhouse gases.

Focused on mobilizing resources for fast mitigation of SLCPs, the CCAC unites governments, intergovernmental organizations, representatives of the private sector, environmental actors, and other members of civil society. Since its launch, the voluntary and government-led coalition has provided a platform for knowledge-sharing and research into opportunities to act on SLCPs, bolstered existing efforts aimed at the diversity of fast mitigation benefits, and harnessed resources to hasten effective action.

The CCAC has spurred several initiatives based on its identification of 16 fast-mitigation measures, such as reducing black carbon emissions from heavy-duty diesel vehicles and engines, accelerating methane and black carbon reductions from oil and natural gas production, and reducing SLCPs from household cooking and domestic heating. In addition, it has engaged in cross-cutting activities such as financing SLCP mitigation measures and by merging its own initiatives with other health, environment, and economic actors to achieve significant results in reducing SLCPs in cities.

BSR joined the Coalition in January 2015, committing to promote fast mitigation on SLCPs among its members, leveraging a network of more than 250 companies with considerable operations in major emerging economies.

The actions of the CCAC displays the power of collaboration across regions, governance levels, and organizations, ensuring maximum impact by aligning goals and identifying synergies.

<sup>1</sup> WB 2013.

and opportunities to reduce or reorient these impacts bolsters corporate climate change adaptation strategy, as does sharing knowledge about scientific and policy uptake of ecosystems services. It comes as no surprise that understanding the interconnectedness of ecosystems translates into acknowledging that collaboration among diverse actors is central to preparing for and engaging in climate action.



*BSR Connect climate event in San Francisco: David Tuft, Director, Public Engagement Program, Energy Foundation; Melissa Fifield, Director of Environmental Affairs, Gap Inc.; Chris Wellise, Manager, Global Environmental Sustainability, HP; Ryan Schuchard, Associate Director, Partnership Development and Research—Climate Change, BSR; and Edward Cameron, Managing Director, Partnership Development and Research, BSR*

Collective action on the ground is key to strengthening climate resilience. BSR's HERproject aims to empower low-income women workers through workplace-based programs that improve knowledge and access to services. To date, we have trained more than 250,000 women on matters related to health and access to services, including increasing access to health clinics, knowledge of maternal health, increased knowledge of HIV prevention, and improvements to women's financial literacy. HERproject is indirectly transformative by helping to strengthen the adaptive capacity of women, who are by far the most vulnerable population to climate impacts, particularly in Asia and Africa.

Our Human Rights Working Group seeks to implement the UN Guiding Principles on Business and Human Rights (UN GPs) across all industries. The goal is to create a safe space for a cross-sector group of companies to openly share their best practices, challenges, questions, and experiences implementing the UN GPs. Together, participants have tackled a range of human rights issues, including human rights risk assessments, training, reporting, grievance mechanisms, and supply chain, among others. These issues are particularly relevant because the interface between climate change and human rights has become a prominent area of study in recent years.<sup>132</sup>

## Creating an Architecture of Participation

We foster enhanced climate collaboration through our multistakeholder activities, thereby building an “architecture of participation.” In practice, this strategy means exploring every opportunity to build cross-industry and cross-stakeholder partnerships in pursuit of our goals. It also means finding ways to contribute to existing initiatives within the wider climate community of practice. Around the globe, new multistakeholder initiatives designed to build climate resilience are emerging rapidly. Some of these are private sector in focus and link existing business networks with exciting climate portfolios. Others are issue specific (e.g., dealing with climate-smart agriculture and/or short-lived climate pollutants) and in need of a private-sector component to enhance ambition, strength, and innovation and bring them to scale.

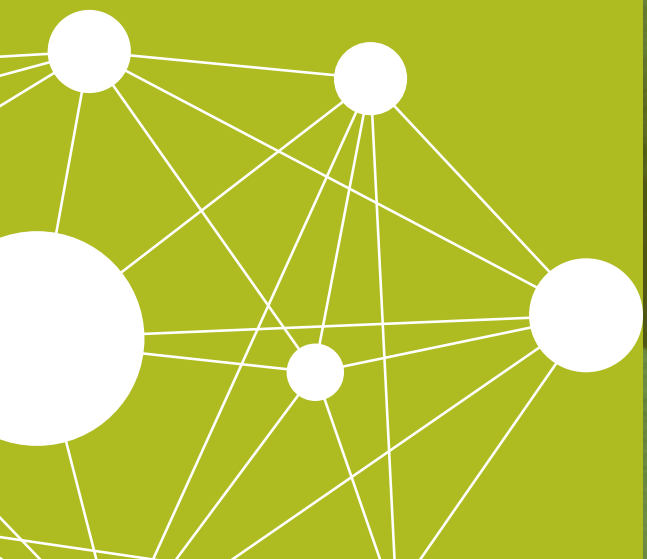
In the past, the climate community has been fragmented with too many worthy initiatives that were working in silos, duplicating each other's efforts, and lacking in coherence, all leading to a lack of scale. We actively work to build support for and participation in our strategy. We also continue to assess other initiatives, encouraging them to connect and act together and to seek out suitable opportunities for private-sector engagement.

<sup>132</sup> Cameron, 2010.



# 05

The Road to Paris  
and Beyond



*Climate Week NYC 2014: Christiana Figueres, Executive Secretary, UNFCCC*

*Photo Credit: The Climate Group*



# The Road to Paris and Beyond

The strategy we have outlined in these pages is about being better, smarter businesses. We believe the future of business success depends on limiting the global mean temperature rise to 2°C above preindustrial levels, while also meeting societal development needs and exercising adaptive capacity in the face of expected changes in climate. This is a critical year for realizing this vision of success.

In December of this year, ministers from 196 countries will convene in Paris to conclude a new international climate agreement that has arguably been 20 years in the making. Formally, the new agreement will conclude a round of negotiations launched in Durban in 2011. Informally, these negotiations are arguably the most significant since the United Nations Framework Convention on Climate Change first emerged at the Rio Earth Summit in 1992. The significance of this agreement is in part a product of timing. The science of climate change is clear, as is the need for urgent action. The global community simply does not have more time to waste. The Paris summit is particularly important because it provides an opportunity to foster the widest possible cooperation in addressing climate change by bringing all the major players into an action agenda for the very first time.

For decades a limited number of industrialized countries have carried the burden of climate action. Paris looks set to herald a new dawn on collective action across all governments. The United States, having stood on the sidelines for so long, now appears ready to lead by example with ambitious emissions reductions as well as

important contributions to climate finance. And in a radical breach with the past, major emerging economies led by China look set to develop emissions reductions pathways, including commitments to peak emissions before the end of the next decade.

The new action agenda also includes an open invitation for business leadership. For two decades international climate action has been an intergovernmental process with little scope for business involvement. Today the private sector is not only invited to join a spectrum of cross-sectoral initiatives designed to reduce emissions, but it is also helping to shape the contours of the new climate agreement. This includes coming forward with tangible and practical ideas for the types of incentives that can catalyze business leadership in pursuit of a low-carbon future.

The new action agenda also includes an open invitation for business leadership. For two decades international climate action has been an intergovernmental process with little scope for business involvement. Today the private sector is not only invited to join a spectrum of cross-



*BSR Spring Forum 2014: Peder Michael Pruzan-Jorgensen, Vice President, Partnership Development and Research, BSR, and Johannes Meier, CEO, European Climate Foundation*

sectoral initiatives designed to reduce emissions, but it is also helping to shape the contours of the new climate agreement. This includes coming forward with tangible and practical ideas for the types of incentives that can catalyze business leadership in pursuit of a low-carbon future.

In recent months BSR has engaged in an ongoing dialogue on climate change with businesses across the globe. Three principal “asks” have emerged from those favoring an ambitious deal in Paris:

- » First, a long-term decarbonization pathway is required in order to reduce uncertainty and provide effective signals to the market. Business leaders understand that the goal of limiting average global temperature increases to below 2°C above preindustrial levels requires ambitious greenhouse-gas emissions reductions consistent with climate science. They also know this requires net-zero emissions well before the end of the century. Business wants a climate policy environment that is consistent and predictable—factors that encourage long-term investments and coherent planning. To this end, business leaders are looking to governments to make emissions-reductions contributions that

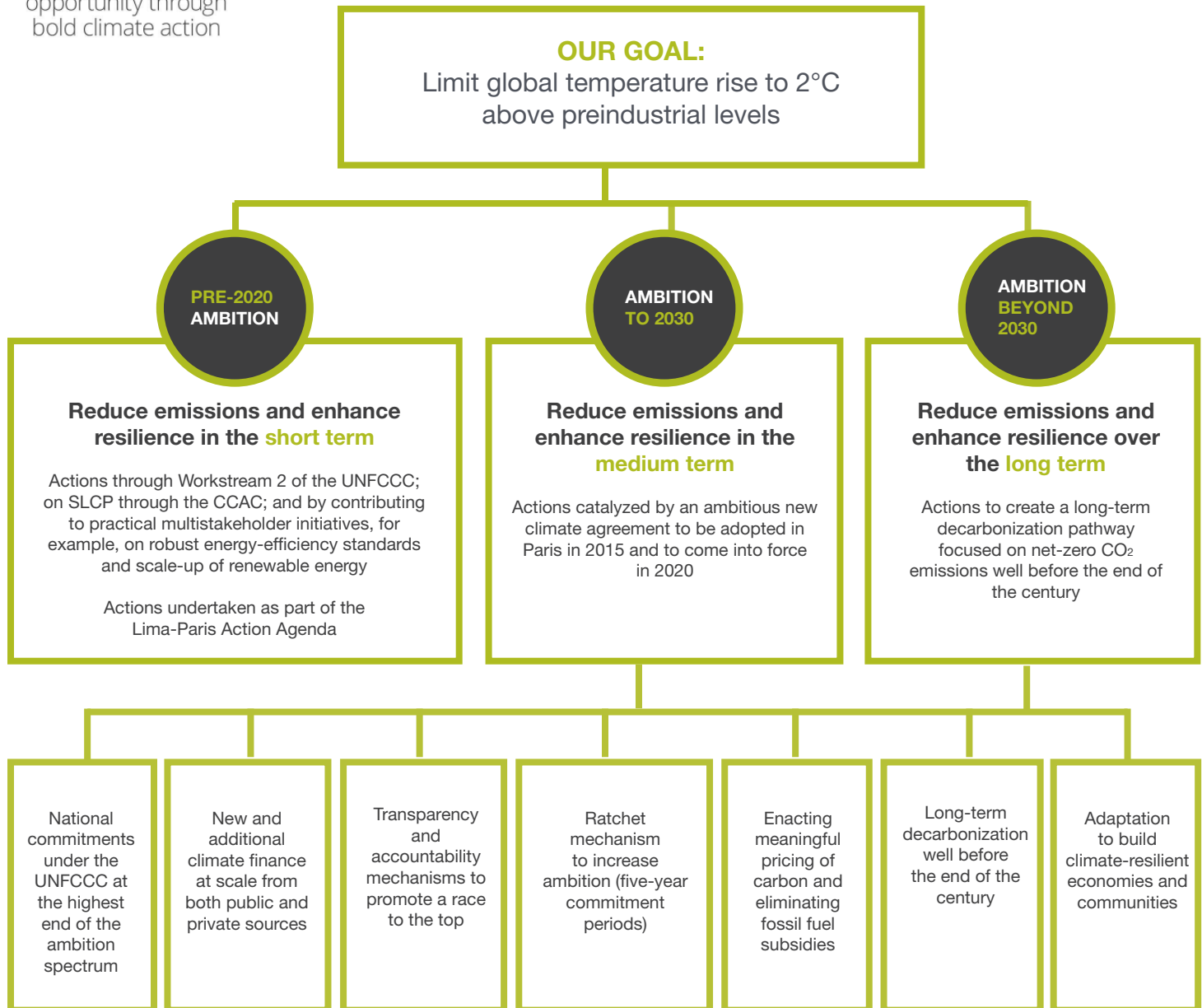
are ambitious and can be increased over time. How will we know if the contributions add up? Effective mechanisms for transparency and accountability lead to contributions that are quantifiable, comparable, and therefore capable of being aggregated to ensure consistency with the long-term goal of decarbonization.

- » Second, business supports new, additional, adequate, and predictable climate finance from both public and private sources. Recognizing that the private sector is complementary to, not a substitute for, public-sector financing, business leaders here have asked for this support to catalyze investments in emissions reductions and enhanced adaptive capacity. To heed this call, governments should ensure that policies aimed at encouraging private-sector finance contain incentives for business to invest in climate projects and support for companies to manage financial risk.
- » Third, business is looking for short-term ambition to complement the long-term vision in the new agreement. Currently, there’s a significant gap between the level of greenhouse gas emissions we are predicted to reach by 2020 and the current

# WE MEAN BUSINESS

economic  
opportunity through  
bold climate action

## POLICY ENGAGEMENT STRATEGY INFLUENCE DIAGRAM



Business advocacy to create momentum and encourage greater ambition from governments on the road to Paris

Business alternatives including decision text related to key business asks to ensure an effective and catalytic outcome in Paris

Business agenda-setting to elevate top-tier policy asks to the top of the decision agenda

Business education and engagement to build the capacity of the private sector to influence key decision-makers and advance WMB policy goals at the UNFCCC

Over the coming years, we will conduct research in areas where we find gaps and work collaboratively where our expertise can fuel ambition.

pathways that would hold the temperature increase to below 2°C. Business wants government help to close that gap by initiating practical multistakeholder collaboration that will drive collective action, innovation, and economies of scale.

As a co-founder of the We Mean Business coalition, BSR will work to ensure the voice of business is heard as preparations for Paris continue. Working with our partners we have developed an international policy engagement strategy that suggests ideas for raising ambition in a manner that facilitates business action.

## Looking Beyond Paris

Irrespective of the outcomes in Paris, our approach is to clarify and reappraise climate risk, emphasize that smart business requires climate resilience, and highlight that climate resilience can be achieved through our approach to translation, stabilization, and collaboration.

Creating the conditions to succeed requires us to look beyond the status quo. Business leaders must create a unified voice that cannot be ignored—that proactively and collaboratively takes part in shaping solutions to the challenges posed by global climate change into opportunities for all.

Stakeholders around the world, including businesses, are acting on climate change. The time has come to become more ambitious and increase the volume of activities. Concerted action based on a menu of appropriate

stabilization wedges provides the best options for meaningful action through manageable steps. We further believe that collaboration across industries and with multiple stakeholder partners creates an ecosystem for climate action, allowing industries to support each other and the communities in which they operate.

While our framework is still in development, we already know that some wedges will be common across all industries. They include reducing emissions in the supply chain, changing the use and mix of energy that fuels industry and transportation, and shifting corporate finance toward low-carbon goods, services, and technologies through procurement and investments related to energy and resource efficiency. Over the coming years, we will conduct research where we find gaps and work collaboratively where our expertise can fuel ambition.

A low-carbon, climate-resilient future requires bold collective action by all stakeholders: government, civil society, and business. If we are successful, by 2020, business leadership on climate change will contribute to effective programs that promise to hold the projected global average temperature rise to less than 2°C above preindustrial levels. BSR members across our eight industry sectors will be taking steps to reduce GHG emissions and build adaptive capacity. Our members will be revealing a greater understanding of the downside risks of runaway climate change and a heightened awareness of the upside opportunities of the transition to a low-carbon economy, and they will be implementing policies and approaches that are in line with climate-compatible development.





*COP20 in Lima, Peru: Ryan Schuchard, Associate Director, Partnership Development and Research—Climate Change, BSR*



*BSR Conference 2014: Eric Olson, Senior Vice President, Advisory Services, BSR*



*BSR Spring Forum 2014: BSR staff*

## References

- Adger, Neil. 2001. "Social Capital and Climate Change." Tyndall Centre for Climate Change Research. Working Paper 8. Univ. of East Anglia: Norwich, U.K.
- Arndo, Jean-Christophe, Peter Adams, Heather Coleman, and Ryan Schuchard. 2012. "Value Chain Climate Resilience: A Guide to Managing Climate Impacts in Companies and Communities." Oxfam, Acclimatise, and BSR: Boston, Montreal, and San Francisco. [www.bsr.org/reports/PREP-Value-Chain-Climate-Resilience\\_copy.pdf](http://www.bsr.org/reports/PREP-Value-Chain-Climate-Resilience_copy.pdf).
- Ashton, John. 2013. "Motorbike Receding Reflections on Art, Politics, and Climate Change—A Speech by John Ashton." Sustain RCA Talks: Breaking through the Barriers, Royal College of Art: London, Oct. 30. [www.e3g.org/news/events-and-speaking/motorbike-receding-reflections-on-art-politics-and-climate-change01](http://www.e3g.org/news/events-and-speaking/motorbike-receding-reflections-on-art-politics-and-climate-change01).
- Bapna, Manish. 2012. "4 Key Factors for the Sustainable Development Goals." World Resources Institute Blog: Washington, D.C., Oct. 19. [www.wri.org/blog/4-key-factors-sustainable-development-goals](http://www.wri.org/blog/4-key-factors-sustainable-development-goals).
- Barrett, Paul M. 2012. "It's Global Warming, Stupid." Bloomberg Businessweek, Nov. 1. [www.businessweek.com/articles/2012-11-01/its-global-warming-stupid](http://www.businessweek.com/articles/2012-11-01/its-global-warming-stupid).
- Beinhocker, Eric, and Jeremy Oppenheim. 2008. "The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth." McKinsey Global Institute: London. [www.mckinsey.com/insights/energy\\_resources\\_materials/the\\_carbon\\_productivity\\_challenge](http://www.mckinsey.com/insights/energy_resources_materials/the_carbon_productivity_challenge).
- Blok, Kornelis, Niklas Hohne, Kees Van der Leun, and Nicholas Harrison. 2012. "Bridging the Greenhouse Gas Emissions Gap." *Nature Climate Change*, Vol. 2, pp. 471–474.
- Bodansky, Dan. 2012. "The Durban Platform: Issues and Options for a 2015 Agreement." The Center for Climate and Energy Solutions (C2ES): Arlington, VA. [www.c2es.org/docUploads/durban-platform-issues-and-options.pdf](http://www.c2es.org/docUploads/durban-platform-issues-and-options.pdf).
- Boykoff, Maxwell T., and Jules M. Boykoff. 2007. "Climate Change and Journalistic Norms: A Case Study of U.S. Mass-Media Coverage." *Geoforum*, Vol. 38, pp. 119–1204.
- Bourgouin, France. 2014. "Key Findings from Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC AR5) for Extractives and Primary Industries." BSR and the Univ. of Cambridge Institute for Sustainability Leadership and Judge Business School: Cambridge.
- Cameron, Edward. 2011. "Development, Climate Change, and Human Rights: From the Margins to the Mainstream?" *Social Development Working Papers*, No. 123. World Bank: Washington, D.C., February.
- \_\_\_\_\_. 2013. "Human Rights and Climate Change: Moving from an Intrinsic to an Instrumental Approach." *Georgia Journal of International and Comparative Law*, Vol. 38, No. 3, Spring 2010, pp. 673–716.
- \_\_\_\_\_. 2013. "It's Time to Join the Low-Carbon Parade: Signals from Germany and the United States." BSR: San Francisco. [www.bsr.org/en/our-insights/blog-view/its-time-to-join-the-low-carbon-parade-signals-from-germany-and-the-united](http://www.bsr.org/en/our-insights/blog-view/its-time-to-join-the-low-carbon-parade-signals-from-germany-and-the-united).
- \_\_\_\_\_. 2014. "Key Findings from Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC AR5) for Agriculture." BSR and the University of Cambridge Institute for Sustainability Leadership and Judge Business School: Cambridge.
- Cameron, Edward, and Marc Limon. 2012. "Restoring the Climate by Realizing Rights: The Role of the International Human Rights System." *Review of European Community and International Environmental Law*, Vol. 21, No. 3. Blackwell Publishing Ltd.: Oxford.
- Cameron, Edward, Tara Shine, and Wendi Bevins. 2013. "Climate Justice: Equity and Justice Informing a New Climate Agreement." World Resources Institute, Working Paper Series: Washington, D.C., and Mary Robinson Foundation Climate Justice: Dublin. [www.wri.org/sites/default/files/climate\\_justice\\_equity\\_and\\_justice\\_informing\\_a\\_new\\_climate\\_agreement.pdf](http://www.wri.org/sites/default/files/climate_justice_equity_and_justice_informing_a_new_climate_agreement.pdf).
- Cameron, Edward. 2013. "Two Degrees of Responsibility: Business in a Climate Constrained World." BSR, Insight Article: San Francisco. [www.bsr.org/en/our-insights/bsr-insight-article/business-in-a-climate-constrained-world](http://www.bsr.org/en/our-insights/bsr-insight-article/business-in-a-climate-constrained-world).
- Campanale, Mark, and Jeremy Leggett. 2012. "Unburnable Carbon—Are the World's Financial Markets Carrying a Carbon Bubble?" Carbon Tracker Initiative: London. [www.carbontracker.org/wp-content/uploads/downloads/2011/07/Unburnable-Carbon-Full-rev2.pdf](http://www.carbontracker.org/wp-content/uploads/downloads/2011/07/Unburnable-Carbon-Full-rev2.pdf).
- Carbon Tracker and the Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. "Unburnable Carbon 2013: Wasted Capital and Stranded Assets." [www.carbontracker.org/wastedcapital](http://www.carbontracker.org/wastedcapital).



Carrington, Damian. 2013. "Carbon Bubble Will Plunge the World into Another Financial Crisis—Report." *The Guardian*. [www.theguardian.com/environment/2013/apr/19/carbon-bubble-financial-crash-crisis](http://www.theguardian.com/environment/2013/apr/19/carbon-bubble-financial-crash-crisis).

Carson, Rachel. 1962. *Silent Spring*. First Mariner Books: New York.

CDP. 2013a. "Global 500 Climate Change Report 2013." CDP: London. [www.cdp.net/cdpresults/cdp-global-500-climate-change-report-2013.pdf](http://www.cdp.net/cdpresults/cdp-global-500-climate-change-report-2013.pdf).

\_\_\_\_\_. 2013b. "Use of Internal Carbon Price by Companies as Incentive and Strategic Planning Tool." CDP: New York.

Ceres. 2012. "Investors Are Acting on Climate Change." Ceres: Boston. [www.ceres.org/files/investor-files/investors-climate-change/view](http://www.ceres.org/files/investor-files/investors-climate-change/view).

Choi Grande, Hannah, Farese Jon Creyts, and Ken Ostrowski. 2010. "Energy Efficiency: A Compelling Global Resource." McKinsey Sustainability and Resource Productivity: New York.

Cowart, William, Veronika Pesinova, and Sharon Saile. 2013. "An Assessment of GHG Emissions from the Transportation Sector." U.S. Environmental Protection Agency: Washington, D.C.. [www.epa.gov/ttnchie1/conference/ei12/green/pesinova.pdf](http://www.epa.gov/ttnchie1/conference/ei12/green/pesinova.pdf).

"Drying Times: The 2012 Drought Will Dent Farm Profits and Push Up Food Prices." *The Economist*, July 19, 2012, [www.economist.com/node/21559381](http://www.economist.com/node/21559381).

Edelman. 2009. "Edelman Trust Barometer: Executive Summary." Edelman: New York. [www.edelman.com/assets/uploads/2014/01/2009-Trust-Barometer-Executive-Summary.pdf](http://www.edelman.com/assets/uploads/2014/01/2009-Trust-Barometer-Executive-Summary.pdf).

Farrag-Thibault, Angie, and Jonathan Morris. 2013. "Collaborative Progress: Clean Cargo Working Group Progress Report 2013." A Clean Cargo Working Group report, BSR: Paris. [www.bsr.org/en/our-insights/report-view/collaborative-progress-clean-cargo-working-group-progress-report-2013](http://www.bsr.org/en/our-insights/report-view/collaborative-progress-clean-cargo-working-group-progress-report-2013).

Farrag-Thibault, Angie. 2014. "Key Findings from Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC AR5) for Transport." BSR and the University of Cambridge Institute for Sustainability Leadership and Judge Business School: Cambridge.

Fransen, T., S. Nakhooda, et al. 2013. "Mobilizing International Climate Finance Lessons from the Fast-Start Finance Period." Overseas Development Institute (ODI), World Resources Institute (WRI), Institute for Global Environmental Strategies.

General Electric. 2011. "Ecomagination 2010 Annual Report: Solutions for the World's Toughest Challenges." GE Reports: Fairfield, CT. [http://files.gecompany.com/ecomagination/progress/GE\\_ecomagination\\_2010AnnualReport.pdf](http://files.gecompany.com/ecomagination/progress/GE_ecomagination_2010AnnualReport.pdf).

\_\_\_\_\_. 2011. "Keeping it Green: GE's \$85 Billion Ecomagination Portfolio Hits 130 Offerings." GE Reports: Fairfield, CT.

The Global Commission on the Economy and Climate. 2014. "Better Growth, Better Climate: The New Climate Economy Report." Global Commission on the Economy and Climate: London.

Global e-Sustainability Initiative (GeSI). 2012. "GeSI SMARTer 2020: The Role of ICT in Driving a Sustainable Future." GeSI and The Boston Consulting Group, Inc. <http://gesi.org/assets/js/lib/tinymce/js/tinymce/plugins/ajaxfilemanager/uploaded/SMARTer%202020%20-%20The%20Role%20of%20ICT%20in%20Driving%20a%20Sustainable%20Future%20-%20December%202012.pdf>.

Hoggan, James, and Richard Littlemore. 2009. *Climate Cover-Up—The Crusade to Deny Global Warming*. Greystone Books: Vancouver, B.C..

Hohne, Niklas, Pieter Van Breevoort, Yvonne Deng, Julia Larkin, and Gesine Hansel. 2013. "Feasibility of GHG Emissions Phase-Out by Midcentury." Ecofys: Cologne.

Intergovernmental Panel on Climate Change (IPCC). 2007a. "Climate Change 2007: Synthesis Report." IPCC: Geneva.

\_\_\_\_\_. 2007b. "Climate Change 2007: Impacts, Adaptation, and Vulnerability." Geneva: IPCC.

\_\_\_\_\_. 2014. "Climate Change 2014: Impacts, Adaptation, and Vulnerability, Technical Summary." Cambridge Univ. Press: Cambridge and New York.

\_\_\_\_\_. 2012. "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change." Cambridge Univ. Press: Cambridge and New York.

\_\_\_\_\_. 2013. "Summary for Policymakers." In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P. M. Midgley. Cambridge Univ. Press: Cambridge and New York.

- International Energy Agency (IEA). 2013. "World Energy Outlook 2013." IEA: Paris.
- International Union for the Conservation of Nature (IUCN). 2008. "Wildlife in a Changing World: An Analysis of the 2008 IUCN Red List of Threatened Species." IUCN: Gland, Switzerland.
- Kintisch, Eli. 2013. "Climate Study Highlights Wedge Issue," *Science*, Vol. 339. American Association for the Advancement of Science: Washington, D.C., Jan. 11.
- McCrone, Angus, and Nicole Aspinall. 2012. "Global Trends in Clean Energy Investment." Bloomberg New Energy Finance: New York.
- Mercer. 2011. "Climate Change Scenarios—Implications for Strategic Asset Allocation." Mercer LLC, Carbon Trust, and International Finance Corporation: New York.
- National Disaster Risk Reduction and Management Council (NDRRMC) of the Republic of the Philippines. 2013. "Situation Report Number 61: Effects of Typhoon Yolanda (Haiyan)." NDRRMC Update: Quezon, Philippines, Dec. 13.
- Nicholls, R. J., S. Hanson, C. Herweijer, et al. 2007. "Ranking of the World's Cities Most Exposed to Coastal Flooding Today and in the Future: Executive Summary." Organisation for Economic Co-operation and Development: Paris.
- Office of the UN High Commissioner for Human Rights (UN-OHCHR). 2009. "Report of the Office of the United Nations High Commissioner for Human Rights on the Relationship between Climate Change and Human Rights." UN Doc. A/HRC/10/61. UN-OHCHR: Geneva.
- Oxfam International. 2008. "Rethinking Disasters: Why Death and Destruction Is Not Nature's Fault But Human Failure." Oxfam International: Oxford.
- Pacala, Stephen, and Robert Socolow. 2004. "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies." *Science*, Vol. 305. American Association for the Advancement of Science: Washington, D.C., pp. 968–972.
- Romani, Mattia, James Rydge, and Nicholas Stern. 2012. "Recklessly Slow or a Rapid Transition to a Low-Carbon Economy? Time to Decide." Centre for Climate Change Economics and Policy and Grantham Research Institute on Climate Change and the Environment London School of Economics and Political Science: London, 2012.
- Schuchard, Ryan. 2012. "Climate 2.0: What Is Expected of Business Now?" BSR Insight. BSR: San Francisco, August 7. [www.bsr.org/en/our-insights/bsr-insight-article/climate-2.0-what-is-expected-of-business-now](http://www.bsr.org/en/our-insights/bsr-insight-article/climate-2.0-what-is-expected-of-business-now).
- Schwartz, Peter. 2003. *Inevitable Surprises: Thinking Ahead in a Time of Turbulence*. Gotham Books: New York.
- Shirky, Clay. 2009. *Here Comes Everybody: The Power of Organizing without Organizations*. Penguin: New York.
- Siemens. 2013. "Germany Can Save More Than €150 Billion with Its Energy Transition." Press release. Siemens: Berlin, June 5. [www.siemens.com/press/pool/de/pressemitteilungen/2013/corporate/AXX20130635e.pdf](http://www.siemens.com/press/pool/de/pressemitteilungen/2013/corporate/AXX20130635e.pdf).
- Silver, Nate. 2012. *The Signal and the Noise: Why So Many Predictions Fail—But Some Don't*. Penguin: New York.
- Spedding, Paul, Kirtan Mehta, and Nick Robins. 2013. "Oil and Carbon Revisited: Value at Risk from 'Unburnable' Reserves." HSBC Global Research: London, 2013.
- Stern, Nicolas. 2006. *The Economics of Climate Change: The Stern Review*. Cambridge Univ. Press: Cambridge.
- Third Generation Environmentalism Ltd. (E3G). 2010. "Building a Sustainable and Low-Carbon European Recovery: How Moving to a 30 Percent Emissions Target Is in the European Interest." E3G: London.
- "Tilting at Windmills: Germany's Energiewende Bodes Ill for the Country's European Leadership," *The Economist*, June 15, 2013. [www.economist.com/news/special-report/21579149-germanys-energiewende-bodes-ill-countrys-european-leadership-tilting-windmills](http://www.economist.com/news/special-report/21579149-germanys-energiewende-bodes-ill-countrys-european-leadership-tilting-windmills).
- Townshend, Terry, et al., eds. 2013. "The GLOBE Climate Legislation Study: A Review of Climate Change Legislation in 33 Countries." 3rd edition. Global Legislators Organisation (GLOBE) International: London.
- "Unilever Sustainable Living Plan: Progress Report 2012." Unilever: London, 2013.
- UN Development Programme (UNDP). 2007. "Fighting Climate Change: Human Solidarity in a Divided World." Human Development Report, 2007–2008. UNDP: New York.
- UN Development Programme (UNDP). 2005. "Sustaining the Environment to Fight Poverty and Achieve the MDGs: The Economic Case and Priorities for Action." UNDP: New York.
- UN Environment Programme (UNEP). 2012. "The Emissions Gap Report 2012." UNEP: Nairobi.



UN Environment Programme (UNEP). 2010. "The Emissions Gap Report: Are the Copenhagen Accord Pledges Sufficient to Limit Global Warming to 2°C or 1.5°C?" UNEP: Nairobi.

\_\_\_\_\_. 2008. "Green Jobs: Towards Decent Work in a Sustainable Low-Carbon World." UNEP: Nairobi.

UN Foundation. 2007. "Confronting Climate Change: Avoiding the Unmanageable and Managing the Unavoidable." UN Foundation: Washington DC. [www.globalproblems-globalsolutions-files.org/unf\\_website/PDF/climate%20change\\_avoid\\_unmanagable\\_manage\\_unavoidable.pdf](http://www.globalproblems-globalsolutions-files.org/unf_website/PDF/climate%20change_avoid_unmanagable_manage_unavoidable.pdf).

UN Framework Convention on Climate Change (UNFCCC). 2010. "Decision 1/CP.16, The Cancun Agreements: Outcome of the Work of the Ad Hoc Working Group on Long-Term Cooperative Action Under the Convention." UN Doc. FCCC/CP/2010/7/Add.1. UNFCCC: Bonn.

\_\_\_\_\_. 2012. "Report of the Conference of the Parties on Its Seventeenth Session, Held in Durban from 28 November to 11 December 2011." UN Doc. FCCC/CP/2011/9/Add.1. UNFCCC: Bonn.

\_\_\_\_\_. 2013. "Press Release: UN Climate Change Conference in Warsaw Keeps Governments on a Track Towards 2015 Climate Agreement." UNFCCC: Bonn. [https://unfccc.int/files/press/news\\_room/press\\_releases\\_and\\_advisories/application/pdf/131123\\_pr\\_closing\\_cop19.pdf](https://unfccc.int/files/press/news_room/press_releases_and_advisories/application/pdf/131123_pr_closing_cop19.pdf).

UN-OHCHR. 2009. "Report of the Office of the United Nations High Commissioner for Human Rights on the Relationship between Climate Change and Human Rights." (UN Doc. A/HRC/10/61. UNOHCHR: Geneva.

Univ. of Cambridge Judge Business School. 2013. "The UN Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5): Implications for Business." University of Cambridge Institute for Sustainability Leadership: Cambridge.

U.S. Energy Information Administration (EIA). 2013. "International Energy Outlook 2013." EIA: Washington, D.C..

U.S. SIF Foundation (The Forum for Sustainable and Responsible Investment). 2003. "The Impact of Sustainable and Responsible Investment." US SIF Foundation: Washington, D.C. [www.ussif.org/files/publications/ussif\\_impactofsr\\_i\\_aug2013\\_final.pdf](http://www.ussif.org/files/publications/ussif_impactofsr_i_aug2013_final.pdf).

Vidal, Olivier, Bruno Goffé, and Nicholas Arndt. 2013. "Metals for a Low-Carbon Society," Nature Geoscience, Vol. 6, November, pp. 894–896.

Waage, Sissel, and Kit Armstrong. 2013. "Seeing the Future Business Context: Scenarios of How Ecosystem Services Issues May Play Out and Affect the Private Sector." BSR: San Francisco.

Waage, Sissel, and Edward Cameron. 2013. "Thinking the Unthinkable: Is It Time to Divest from Unburnable Fossil Fuels?" BSR Insight. BSR: San Francisco. [www.bsr.org/en/our-insights/bsr-insight-article/thinking-the-unthinkable-is-it-time-to-divest-from-unburnable-fossil-fuels](http://www.bsr.org/en/our-insights/bsr-insight-article/thinking-the-unthinkable-is-it-time-to-divest-from-unburnable-fossil-fuels).

World Bank. 2012. "Turn Down the Heat: Why a 4-Degree Celsius Warmer World Must Be Avoided." International Bank for Reconstruction and Development: Washington, D.C..

World Business Council for Sustainable Development (WBCSD). 2010. "Water for Business: Initiatives Guiding Sustainable Water Management in the Private Sector." WBCSD: Geneva.

World Economic Forum (WEF). 2013. "Global Risks 2013, 8th Edition." WEF: Geneva.

WWF and Carbon Disclosure Project (CDP). 2012. "The Three-Percent Solution: Driving Profits Through Carbon Reduction." WWF: Washington, D.C.



BSR®

The Business of a Better World

Copenhagen

Guangzhou

Hong Kong

New York

Paris

San Francisco

Shanghai

Tokyo

[www.bsr.org](http://www.bsr.org)