

# case studies & tools

A Systematic Review of the Literature on  
Business Adaptation to Climate Change  
*3 of 4*



Network for  
Business Sustainability

Business. Thinking. Ahead.

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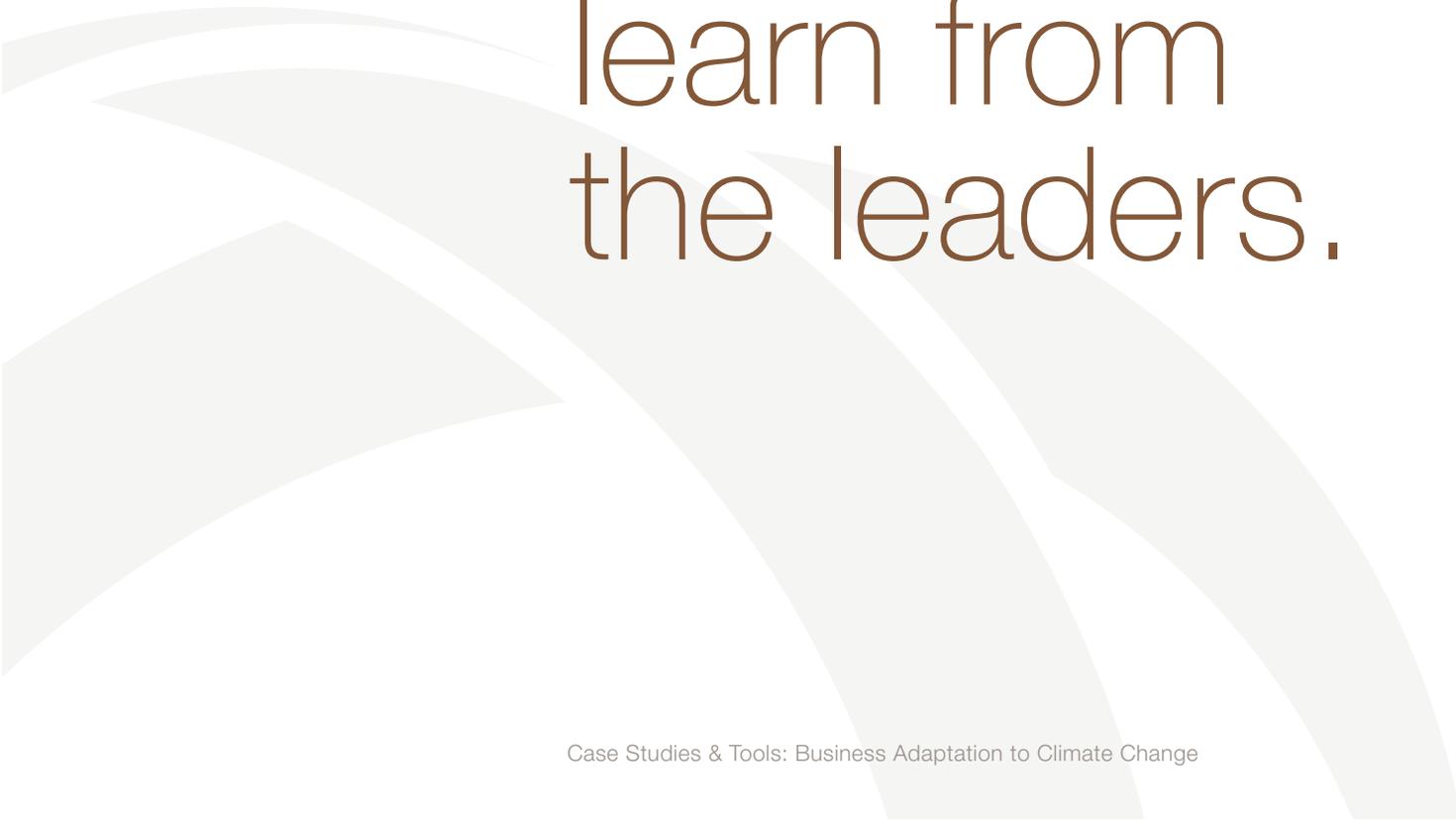
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Business Adaptation to Climate Change  
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Network for Business Sustainability

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Lagging  
sectors can  
learn from  
the leaders.



Risk modelling  
and opportunity  
assessment  
tools are  
needed.

# executive summary

Business adaptation to climate change requires strategic timing, alignment with firm policy, and organizational commitment.

## SUMMARY

Most businesses have yet to undertake substantial adaptation measures, preferring to assume a 'wait and see' approach. They do so at their own peril. Few tools exist to help manage the risks and opportunities related to adaptation – most are risk frameworks. Strategic timing is essential to adaptation, as are ensuring alignment with overall firm policy and commitment within the organization. Much can be learned from case studies, most of which focus on the insurance sector.

## BACKGROUND

There is a growing consensus among researchers and policy makers that adaptation is a central strategy in dealing with the impacts of climate change. Adaptation is most commonly described as 'adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities' (IPCC).

In 2008-2009 the Network for Business Sustainability commissioned a systematic review to synthesize the current state of research and practice of business adaptation to climate change. This report, the third in a four part series, discusses best practices, case studies, lessons learned, and adaptation tools used.

## FINDINGS

Despite limited information on the practice of business adaptation to climate change, clear findings emerged:

- In general business is taking a 'wait-and-see' approach, with adapters being the exception rather than the rule.
- Existing tools deal mostly with risk management. Five types of risk tools were found: risk frameworks, scenario tools, decision trees, costing tools, and computer simulation tools.
- Five types of adaptation tools were identified: adaptation identifiers, step-by-step guides, success measurement, adaptation networks, and adaptation option tools. Most prevalent emphasized education and collaboration networks.
- The studies on lessons learned revealed the importance of the strategic timing of climate action, its alignment with overall firm policy, and its assured commitment within the organization.

## IMPLICATIONS FOR MANAGERS

Managers must act now on the issue of adaptation:

- Acknowledge that taking a ‘wait and see’ approach comes with great risks.
- Increase awareness of risks and vulnerabilities associated with climate change.
- Undertake real adaptation measures – beyond short-term measurements and GHG mitigation.
- Develop tools for risk modelling and opportunity assessment.
- Learn from the insurance sector and other leaders.

## IMPLICATIONS FOR MANAGERS

A lack of primary research on companies and their adaptation practices prompts researchers to:

- Focus on primary research in business adaptation to uncover potential case studies, lessons learned, and best practices.
- Focus on developing tools for risk modelling and opportunity assessment.
- Make business aware of the risks and vulnerabilities they face.

## METHODS

A systematic review of multiple and varied resources – from the public sector, the private sector, and academia, dating from 1997 to early 2009 – revealed 201 sources pertinent to business adaptation to climate change. An interpretive narrative synthesis was employed to distil the large volume of varied data into accessible and intelligible frameworks. A total of 39 sources discussed case studies (30), lessons learned (5), and best practices (4) in the area.

## OTHER REPORTS FROM THIS STUDY

This is the third report in a four-part series. The other reports are available from [nbs.net](http://nbs.net). Report 1: Concepts & Theories; Report 2: Current Practices; Report 4: Knowledge Gaps and Future Research; and Study Methodology.

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The EthicScan Canada research team would like to single out in particular Tom Ewart, for extraordinary and consistent Oversight Committee assistance, and Blair Feltmate, Peter MacConnachie, Ed Whittingham. and Monika Winn for insightful, forward thinking, user friendly guidance and advice.

<sup>1</sup> The contents of this report do not necessarily reflect the opinions of Oversight or Advisory Committee members.

# introduction

This report is comprised  
of two sections:  
Section 1 - best practices  
and lessons learned  
Section 2 - tools  
for business.

There is a growing consensus among researchers and a number of policy makers that adaptation should be a central strategy in dealing with the impacts of climate change. In 2008-2009 the Network for Business Sustainability commissioned a systematic review to synthesize the current state of research on business adaptation to climate change, in order to identify and advance the theory and practice in this field.

Three major questions were explored:

- Are businesses incorporating climate change into their business models and strategies? If so, how? And do differences exist across business units in terms of risks, opportunities, processes, and outcomes?
- Are certain sectors ahead of others? If yes, what drivers account for these differences, and what lessons can the leading industries offer the laggards?
- What tools and processes do businesses use to evaluate the opportunities to be gained from adapting to climate change? Are there any examples of businesses creating a competitive advantage by building adaptive capacity?

Multiple biographic databases and resources were searched – including academic studies, industry reports, think tank research, case studies, and newspaper articles – dating from 1997 to early 2009. We used a standard process for systematic reviews: definition of eligibility

criteria; search for eligible titles and abstracts; selection of titles and abstracts that may be eligible; selection of eligible reports from review of full documents; and data extraction and synthesis of the material into a report. The search revealed 201 pertinent sources. An interpretive narrative synthesis method was employed because we considered it the most appropriate to achieve the overall goals of this systematic review, particularly that of distilling an enormous amount of widely varied data into an accessible and intelligible framework for practitioners seeking to advance best practices and understand new developments in this emerging field of theory and practice. (The detailed methodology is described in a separate document, available from [nbs.net](http://nbs.net).)

The research findings are available in four reports (all available from [nbs.net](http://nbs.net)):\*

1. Concepts & Theories
2. Current Practices
3. Case Studies & Tools
4. Knowledge Gaps & Future Research

This report, “Case Studies & Tools,” discusses the knowledge gained during the systematic review – in the form of best practices, case studies, lessons learned, and adaptation tools available for business. This report is comprised of two sections: section 1 – Best Practices, Case Studies, Lessons Learned; and section 2 – Tools for Business.

\*EthicScan has an extensive slide library called An Educators Resource Tool Kit, which covers climate change for 25 industry sectors or activities.” Link: [www.ethicscan.ca/whatsnew/index.html](http://www.ethicscan.ca/whatsnew/index.html)

**Section 1:** discusses the best practices, case studies, and lessons learned uncovered during the literature review, giving context to the sector-by-sector analysis in Report 2, “Current Practices.” The case studies are organized by sector.

**Section 2:** summarizes literature on tools that allow businesses to assess climate risks, to evaluate opportunities, and to identify and implement adaptation options.

Report 4, “Knowledge Gaps & Future Research,” goes on to identify knowledge and research gaps in the literature of the systematic review, and make recommendations for further research that could meet the needs of both academic and business practitioners in the field.

Taking all four reports together, this study captures the current status of this critical subject of business adaptation to climate change and establishes a foundation for future work by both academic and business communities.

# Section 1: best practices, case studies and lessons learned

This sections features sector-based case studies discovered through the systematic review.

The systematic review uncovered only 39 instances where case studies, lessons learned, and best practices in business adaptation to climate change were described or mentioned. In these, case studies and lessons learned often tended towards exemplifying business responses to climate change by way of GHG mitigation and low carbon footprint strategies (e.g. Kolk and Pinkse, 2005; Carbon Disclosure Project, 2008; Bansal and Gao, 2008; Begg et. al., 2005; CCSR, 2007; Cogan, 2006; PEW, 2006; Anglo Gold Ashanti, 2008; Economist, 2006; Economist, 2000). However these findings were excluded from this study as they were outside of the scope of the research questions.

Most literature on lessons learned, best practices, and case studies tends to be general, discussing only the potential for adaptation or naming limited examples of business adaptation by sector. This literature tends to feature short example summary cases on potential business adaptation responses. The scope of primary research on companies and their adaptation practices is exceptionally narrow (Berkout et al. 2004, Pew 2006, Carbon Disclosure Project 2008), making any generalizations regarding lessons learned and best practices difficult to ascertain. The reasons for this knowledge gap may be threefold: 1) most businesses have yet to undertake adaptation measures despite real risks and vulnerabilities to climate change, possibly due to lack of knowledge, inadequate risk modeling, and poor information on future climate change variability; 2) business that have taken on adaptation measures have done so only recently and it is too early to gather empirical findings or literature in this area; and 3) the focus of business response remains on GHG mitigation.

In this section, we feature sector-based case studies that were discovered through the systematic review. We synthesize lessons learned and best practices wherever possible given the limited findings. Due to the sporadic and insufficient information in this area, we suggest that future studies and research focus on primary research in business adaptation to uncover potential case studies, lessons learned, and best practices.

## **BEST PRACTICES**

Best practices were discussed in only four of the studies gathered during the systematic review. The limited literature reveals that best practices in business adaptation focus on responses to climate risk that either minimize profit loss or turn a climate risk into a profit opportunity. For example, with respect to minimizing profit loss, Dubios and Ceron (2006) note that ‘a wait and see approach’ tends to dominate where short term financial solutions appear to be more efficient, particularly when knowledge on the concrete impacts of climate change is limited. From the literature in business adaptation to climate change reviewed in this study, it appears that the majority of businesses likely fall into this category, with adapters being the exception rather than the rule.

However, where potential market opportunities from climate adaptation arise, there is some activity in the business community. The insurance industry, prone to suffering heavy losses as a consequence of climate change, appears to be a key leader. It has been quick to identify successful elements of adaptation to weather extremes and changes (i.e. Hurricane Katrina 2005, European Heat wave 2003). According to Chemarin

and Picard (2008), insurers have to prepare for adverse climate effects on business and help customers identify potential risks. Insurers have been responsible for building better risk models and providing products and services that mitigate risks to climate change. The insurance industry is increasingly collaborating with other sectors, experts on climate change, NGOs, and policy researchers intent on finding solutions to climate change.

### **CASE STUDIES**

Case studies appeared in thirty sources found through the systematic review. In some instances, there was only brief mention of a particular company taking on climate adaptation strategies or potential adaptation measures by business (Pew 2008, UNEP 2008, Pew 2006). While short snapshots of information on companies were made available in several instances on either risks, opportunities, or adaptation strategies (CBSR, 2007, PEW Centre 2006, Lehman Brothers or Levinson et. al., 2008), it was not common to find comprehensive cases that included all three. In other instances, detailed cases were made available as learning aids and problem

solving exercises for business faculties and their students (Mikes, 2008, Carbon Disclosure Project 2008, Bansal and Gao, 2008), but these provided little information as an example of best practices or lessons learned. In other instances, generalizations were made in case study research without disclosing the identity of the businesses studied (see Berkhourt et. al., 2004).

The data in this area is sporadic and lacks more comprehensive examples of actual adaptation strategies in specific companies. It is recommended that future research focus on the gathering of primary data from companies to produce specific case studies on business adaptation to climate change.

In the following boxes, we have summarized the available information by sector-based case studies in business adaptation to climate. These are direct extractions from the case literature gathered during the systematic review, simplified and copy-edited in places for better readability. The cases were selected based on availability and richness of information.

**Allianz Group<sup>2</sup>**

*Adaptation to climate change is any activity that reduces the negative impacts*

Allianz Group, with business lines in insurance, asset management and banking, has created the first flood catastrophe bond to mitigate the risk of severe, regional floods with a global fund, thereby spreading the risk across clients as a form of climate adaptation. Allianz are providing micro-insurance to vulnerable populations most likely to be affected by climate change. As a result Allianz has acquired 100,000 new customers since 2003.

**Munich Re<sup>3</sup>**

*Collaborating among insurers and stakeholders and leading researchs*

Munich Re operates across the insurance and reinsurance value chain. Munich Climate Insurance Initiative was founded in 2005 by Germanwatch, International Institute for Applied Systems Analysis, Munich Re, Munich Re Foundation, Potsdam Institute for Climate Impact Research (PIK), the Swiss Federal Institute of Technology, the Tyndall Centre for Climate Change Research, and the World Bank. Its aims are to: 1) Develop insurance-related approaches to impacts of climate change, combining resources and expertise of public and private sectors; 2) Support pilot projects for insurance-related solutions in partnerships and through existing organisations and programmes; 3) Advance insurance-related approaches with other organizations, identify success stories, and disseminate information on success factors; and 4) Promote loss reduction measures for climate related risks. As well, Munich Re is undertaking geo-risks research, covering all pertinent disciplines like meteorology, seismology, geology, geophysics, and geography. The Initiative gives advice and provides services for all in-house departments and external users dealing with issues related to natural catastrophes and needing geoscientific knowledge. It has published many reports on the impacts of climate change on the insurance industry

**Swiss Re and BASIX<sup>4</sup>**

*Refinancing of microfinance networks*

In India, a microfinance institution BASIX insured some of its crop lending portfolio against a monsoon deficit during the period July-September 2004 with an Indian insurer, backed by reinsurance into the international risk transfer market with Swiss Re, a reinsurer with expertise in risk transfer. It covered three business units in three districts, with a sum insured of about 0.15 million USD for a premium of around 1,600 USD. The pilot was restricted to only three branches in BASIX in the state of Andhra Pradesh and covered only the crop loan portfolio of these branches. Thanks to this weather hedge BASIX maintained its credit operations in those drought-prone “risky” districts, so benefiting the local economy and farmers. The facility improved the quality of the BASIX portfolio, which makes it a more attractive partner for other financial institutions, and enables further expansion.

<sup>2</sup> United Nations Framework Convention on Climate Change, 2008. For all case studies, text copied directly from the reference, then simplified and copy-edited for readability.

<sup>3</sup> Llewlynn, John, 2007

<sup>4</sup> UNEP, 2006,

*Continued from previous page*

### **The Travelers Companies Inc<sup>5</sup>**

*Linking the Interests of Homeowners, Business, and Insurance Providers*

The Travelers Companies Inc. is one of the largest providers of personal and commercial property and casualty insurance products in the United States.

Following the severe 2004 and 2005 Atlantic hurricane seasons, the company determined that a more cohesive and integrated approach to climate risk was needed. Travelers formed a number of new internal working groups and expanded the roles of existing groups to address exposure and risk associated with climate change. Travelers continues to be engaged in initiatives designed to reduce exposures to extreme weather events for itself and its customers. These actions include providing information and price incentives for insured parties to help mitigate personal and commercial losses due to extreme weather events, reassessing its exposure to risk because of changes in climate, and modifying pricing strategies and policy terms and conditions to reflect updated assessments of current and future risks.

Specific actions that Travelers has taken to adapt to climate change include:

**Reassessing coastal underwriting practices:** The definition of coastal areas has been expanded to include counties farther inland than previously considered and contractual terms of coverage now include more sharing of responsibility for both households and businesses.

**Updating catastrophe modeling:** Travelers joined an effort initiated by the Center for Health and the Global Environment at Harvard Medical School that is drawing together a number of business and academic stakeholders to determine how catastrophe models can better integrate climate change science and estimate potential loss.

**Offering “Risk Control” services:** Travelers provides assistance with a range of loss mitigation and adaptation techniques. These include monitoring building code standards and regulations in support of building resiliency, providing assistance in disaster preparedness planning, and delivering business continuity training.

**Redesigning pricing:** Pricing strategies for commercial and personal customers take into account differences such as building age, construction, and loss mitigation efforts, which affect likely losses during extreme weather events due to changes in building codes over time. Travelers has also introduced pricing strategies to encourage environmentally responsible behavior. This includes providing discounts on car insurance for drivers of hybrid-electric automobiles and enhanced coverage for owners of “green” commercial buildings.

**Engaging in community and government outreach:** Broad-based efforts encourage disaster awareness and preparedness among homeowners and commercial customers. These efforts also focus on providing information to governmental organizations about the benefits of long-term loss mitigation strategies, including the adoption and enforcement of more robust building codes, and enhanced land-use planning.

<sup>5</sup>Susmann and Freed, 2008: 23-25

**Sandals, Club Med, SuperClubs, TNT Vacations, and Apple Vacations<sup>6</sup>***Improving customer confidence in attractiveness of destination*

The Caribbean Region and Gulf of Mexico are expected to experience increased summer temperature extremes, changes in demand seasonality, and potential for increased frequency or strength of hurricanes as a result of climate change. The Caribbean Tourism Organization and individual member states have begun to actively market themselves as four-season destinations in the late 1990s with multi-million dollar advertising campaigns that target the honeymoon market and budget conscious families. In combination with marketing messages that downplay the region's summer heat are upgraded air-conditioning, discounted room rates, and new hurricane interruption policies at many resort companies, including Sandals Resorts, Club Med, SuperClubs, TNT Vacations, and Apple Vacations. The hurricane guarantees or waivers differ slightly from company to company, but basically provide a replacement stay of the same duration and equivalent value as the one originally booked. The strategy has proven successful as summer occupancy rates at beach resorts are approaching or equalling winter season in many destinations. The State of Florida allocated US\$30 million to 'hurricane recovery' marketing following the devastating sequence of four hurricanes in 2004 and developed a weather insurance program for convention organizers, where it pays the premiums for US\$200,000 insurance coverage for rescheduling costs associated with hurricane disruption. (UNEP, 2008: 58)

**Fairmont hotels<sup>7</sup>***Implementing a sustainable tourism strategy for today and the future*

The Fairmont hotel chain was looking for a way to reduce negative impacts on the environment and increase operational efficiencies while enhancing their guests' hotel experience. The "The Fairmont Green Partnership Program" includes tracking energy used in each room through the use of sub-meters in the Hotel Vancouver, allowing guests the opportunity to have their sheets replaced less often, reducing water and energy usage, replacing and fixing leaky steam traps and fixing leaks to reduce steam consumption, installing automated climate control systems in Ottawa's Château Laurier to return room temperature to a pre-set point upon guest check out to save energy. Through their efforts the Fairmont reported an increase in cost savings and a reputation as an environmental leader in the hotel industry, giving the hotel chain a competitive advantage

<sup>6</sup> UNEP, 2008: 58

<sup>7</sup> CCSR, 2007

Box 3  
WATER SECTOR CASE STUDIES

**Thames Water<sup>8</sup>**

*Changing infrastructure*

Thames Water, the U.K.'s largest water and sewage company, is adapting operations already by putting new design standard in place to prevent sewer flooding, improving water efficiency, and working with stakeholders to determine how to maintain service levels as climate impacts occur.

**Anglian Water<sup>9</sup>**

*Conserving water, changing infrastructure, and raising awareness*

Anglian Water, part of the Anglian Water Group, provides water and wastewater services to around six million industrial, commercial, and domestic customers in the East of England, and Hartlepool. It has set climate change priorities to mitigate and adapt to climate change impacts, increase the resilience and reliability of water and wastewater service, keep bills at current affordability, secure and conserve water resources and improve the environment in the region. As one of the largest energy users in the region, the company also recognizes its responsibility to reduce its carbon emissions to limit its contribution to climate change. Anglian Water's climate change strategy assesses the impact of the main climatic changes on its operations and identifies what actions are required to continue to deliver its vital service. Anglian Water has developed an adaptation strategy to prepare for the implications of climate change in the East of England.

Anglian Water has been building adaptive capacity within the company through a program of raising awareness with staff, undertaking research to investigate what measures are required to protect critical infrastructure from future flooding events, and undertaking a project with the Tyndall Centre to understand the implications of sea level rise for coastal assets. Adaptation actions are now being delivered on the ground at a number of sites including Great Yarmouth where the company has utilized its knowledge of rainfall intensity changes over recent years to validate an increase in the design capacity of its proposed sewer improvements in the town over the next two years. Other areas include the development of new lagoons at Rutland Water which will provide new wildlife habitat for the internationally important wildlife that may be displaced when more water is abstracted from the reservoir to meet the demands of growth and the impacts of climate change.

Anglian Water has a carbon reduction strategy to save on energy costs and reduce emissions by 60% by 2050, 10% of which will occur by 2010. The most visible benefit of Anglian Water's climate change program in the short term is reducing energy costs. The company has already achieved a 15% reduction (based on 2006/07 baseline of 748 KWh) towards its target of cutting costs by 20% by 2010. Anglian Water has been recognized as an industry leader on energy management which has raised awareness and increased trust amongst key stakeholders.

<sup>8</sup> UNFcc, 2008

<sup>9</sup> Anglian Water, 2008 pages 1-4

Box 4  
ENERGY SECTOR CASE STUDY

**Entergy<sup>10</sup>**

*Adapting to current and future climate change*

Entergy Corporation is an integrated energy company engaged primarily in electric power production and retail distribution operations. In 2001, Entergy set a voluntary goal of stabilizing emissions at 2000 levels through 2005, becoming the first electric utility in the country to announce such a target. After meeting that goal, it set a new target in 2006 to reduce greenhouse gas emissions from its operating plants and stabilize those emissions at a level 20 percent below year 2000 levels from 2006-2010.

After suffering \$2 billion in losses from Hurricanes Katrina and Rita, Entergy considers itself the prime example of the potential negative physical effects of climate change. While Entergy points out that the 2005 hurricanes cannot be clearly linked to climate change, the New Orleans-based energy company believes the storms can be viewed as a sign of things to come if greenhouse gas emissions are not brought under control. Facing significant infrastructure damages and forced relocations of several offices located in New Orleans, the hurricanes prompted CEO Wayne Leonard and other senior managers to begin preparing for potential future climate impacts and adapting to observed changes in climate.

The company has already taken important steps to adapt to the changing climate, but knows it will likely have to do more in the future. Following Hurricane Katrina, Entergy took immediate action to relocate important business centers, including moving a data center to Little Rock, Arkansas, creating redundancy in data storage throughout the service area, and moving its transmission center to Jackson, Mississippi. Entergy made decisions about where to locate these important business centers based in part on information about the climate-related risks in different geographic regions within the service area, and in order to locate centers and buildings in different parts of the service area. In addition, Entergy put together a business continuity group specifically to look at broader implications of climate in the context of other serious business threats, including terrorist acts and a potential flu pandemic. The group, which included both in-house experts and consultants in the fields of security and medicine as well as energy, undertook a three-phase analysis.

The first phase was a scoping study identifying climate and related risk drivers. This study identified likely changes in a number of key climatic and related physical effects over the near term (20 years), medium term (20 to 50 years), and long term (end of the 21st century). Using GIS (geographic information system) techniques, consultants mapped potential changes in climate and physical effects to Entergy's service area and to other areas where Entergy has large-scale investments. The second phase looks at the correlation of each identified risk with Entergy assets or operations, in order to identify candidate threats for response and adaptation. The third phase has not yet begun, and will assess existing risk mitigation plans and seek alternatives to reduce impacts. In the near term, Entergy recognizes that unchecked climate change poses potential long-term risks to the economic viability of Entergy's franchise and asset base, both of which are located in an area that is vulnerable to flooding and hurricanes. The recent intense hurricanes that ravaged the Gulf Coast have put Entergy's business continuity planning to the test and provided valuable lessons on how to manage near term physical risks, restore systems, and recover from devastation.

The next steps will require more careful deliberation as they are likely to be more expensive and taken in anticipation of events expected to occur over a longer time horizon.

<sup>10</sup> Susmann and Freed, 2008 page 25-28

**Rio Tinto<sup>11</sup>***Designing to weather, climate and climate change*

Mining giant Rio Tinto is a member of the U.S. Climate Action Partnership, a coalition of 27 major corporations and six leading nongovernmental organizations calling on the U.S. Congress to pass legislation establishing mandatory limits on greenhouse gas emissions at the earliest possible date.

Rio Tinto's interest in adaptation was first motivated by an internal climate change risk assessment undertaken in 2002, which prompted the company's management to ask, "If the climate is going to change, what does that mean for our operations?" Rio Tinto was already engaged in climate change policy and emissions abatement work, and an evaluation of potential climate impacts seemed a natural extension. The company's first adaptation study was a desk-top review using the IPCC's Third Assessment Report (TAR), knowledge of Rio Tinto operations, and phone interviews with site managers to identify the types of climatic variables that would be important to Rio Tinto's diverse businesses. The study looked at actual impacts of weather events and predicted climate changes described by the TAR. The order of magnitude scoping study concluded that—broadly defined—changes in climate could be important and should be considered more deeply.

Rio Tinto followed up with a second study that focused on the implications of climatic changes at a finer spatial detail. For this study, the company asked the Hadley Center for Climate Change in the U.K. to provide a summary of how climate variables might change over the next 25 to 50 years to assist in understanding the geographic regions where Rio Tinto has mining interests, or relies on supporting infrastructure and services, such as electricity supply, water, shipping lanes, and roads. Included in this study was an examination of weather insurance and Rio Tinto's actual exposure to weather-related events. As part of this study Rio Tinto also commissioned external engineering consultants to undertake a review of how potential climate change had been incorporated into engineering design standards and what the greatest vulnerabilities were. This study was completed in 2005.

Rio Tinto concluded from these studies that regions in which it operates will experience changed climate regimes. In the near term the changes are minimal, but are expected to increase over the longer term. Consequent impacts to its businesses are likely to occur gradually, allowing time for operations to learn and adapt. The work also indicated that building and engineering codes and standards have been slow to incorporate climate change risks. The studies indicated that, properly applied, current standards would provide adequate protection to weather events and so major upgrades of existing structures would not be required in the short to medium term. Over the longer term, Rio Tinto's exposure to climate risk is likely to vary by location. North American assets, for example, appear less vulnerable than those in the southern Hemisphere, where increased intensity of cyclones and drier conditions are both predicted.

This work is now being followed up with very detailed site assessments for many of Rio Tinto's higher priority sites. The sites have been selected based on their remaining life, prospective developments and expansions, and their location in climate sensitive parts of the world. The assessments are underpinned by high resolution climate modeling (down to 20 kilometer by 20 kilometer grids), which are able to provide some indication of changes in cyclonic activity and topographic effects.

Rio Tinto's chief climate change concerns are about water: either having too much (floods) or too little (drought). While Rio Tinto does not ascribe any individual weather event to climate change, it believes the more extreme events it experiences could occur more frequently. In addition, Rio Tinto is concerned with reports that climate change will induce deeper and/or more frequent droughts. Partly as a result, it has developed a strong water strategy to respond to various aspects of droughts and floods.

<sup>11</sup> Susmann and Freed, 2008: 25-28

Continued from previous page

### **Anglo Gold Ashanti<sup>12</sup>**

*Preparing to mitigate and adapt to climate change*

Anglo Gold Ashanti is a global mining company, headquartered in Johannesburg, South Africa. The company has 21 operations and a number of exploration programs in both the established and new gold-producing regions of the world ([www.anglogold.com](http://www.anglogold.com)). Anglo Gold's climate change strategy began with a carbon footprint analysis and set a stretch target for reducing greenhouse gas emissions on a per ounce basis of 25 to 30% (AngloGold 2007: 186). The vulnerabilities of Anglo Gold to climate change include: more frequent and more intense storm events requiring more costly engineering safeguards for tailings facilities, waste rock dumps and other vulnerable structures, reduced water availability which will have an impact on processing capacity at some sites, higher insurance premiums, and increased expectations from host governments for corporate involvement in managing the challenges of adaptation to climate change. However, climate change also presents several opportunities including cost savings from energy switching and efficiency projects, enhanced relationships with key stakeholders as the company develops grass-roots adaptation projects, and working with host governments and industry to develop wide-ranging adaptive capacities and technology changes.

Box 6

### **TECHNOLOGY SECTOR CASE STUDY**

### **Siemens<sup>13</sup>**

*Developing solutions in infrastructure for climate change adaptation*

Siemens, a diversified electronics and electrical engineering company, developed a portable water purification system that does not require electricity or purification chemicals, but is low cost and easily available. This has opened a market opportunity to cater to the needs of disaster risk communities, a market that may grow as climate extremes become more prevalent. They have also formulated state-of-the-art infrastructure for buildings, which can reduce energy consumption up to 30%.

<sup>12</sup> Ashanti Gold, 2007

<sup>13</sup> UNFCCC, 2008

**Meinert Enterprises<sup>14</sup>***Adapting to climate change through changing growing patterns and spreading risks*

Meinert Enterprises is a south-western Saskatchewan agriculture operation concerned with dryland farming. Meinert produces cereals, pulses, and forages in a continental climate on approximately 6,000 acres of land. Conditions are semi-arid and challenging due to both annual and seasonal variability and unpredictable frosts. Typically, there are 110 frost-free days, an average of 15 inches of moisture and an abundance of sunlight in the region. Noting that farm decisions must include managing several factors at once, challenges include economic risks related to interest rates, dollar value, energy costs, and the need to maintain a consistent cash flow in a highly variable environment related to marketing and income. Uncertainty in these factors is exacerbated with the uncertainty in climate and weather conditions. In recent years, the major concerns pertain to moisture levels. Meinert Enterprises employs several farm practices to lessen the negative effects from moisture deficits including: trapping snow with stubble from the crops (some crops leave more desirable stubble than others); diversifying crops to include those with greater drought resistance, varying maturation lengths, and different stubble heights; enhanced early moisture infiltration; and employing crop rotation to improve soil quality. Meinert also employs different strategies for managing farm finances in light of climate/economic risks, including taking part in income stabilization programs, buying crop insurance, relying on help from family, and earning off-farm income.

<sup>14</sup>C-CARIN 2004: 5

**Toronto-Dominion Bank Financial Group<sup>15</sup>***Improving environmental risk assessments*

TD Bank offers personal, commercial and wholesale banking, insurance, and wealth management services. With the June 2007 release of its Environmental Management Framework, TD is helping to set the bar in Canada on what banks can and should be doing to mitigate climate risk. The Environmental Framework now includes a statement on climate risk, and addresses carbon intensive industries including oil and gas, coal, electricity generation, and metals production. Significantly, TD has called for governments to implement a carbon tax to provide incentives for GHG emissions reductions. To begin the process of climate risk mitigation, TD is committed to a carbon audit and an assessment of climate risks faced by their clients. The Environmental Framework indicates that their climate change policy will extend beyond lending to underwriting and equities research. TD's framework also addresses risks associated with loss of biodiversity, which extends to financing, underwriting, and advisory services. TD is engaging clients to increase the Bank's understanding of the risks involved in conducting operations in high conservation value forests. For clients involved in logging operations, TD is asking for third party sustainable forest management certification. TD categorically states it will not finance operations that significantly degrade critical natural habitats. The protection of high conservation value forests is particularly important. Canada's boreal forest represents a crucial opportunity for protection. To guide implementation of the Environmental Framework, the risk committee of TD's board of directors oversees all environmental policies, including climate. TD also has a high level Environmental Steering committee made up of business directors from across the bank. To build capacity, TD has assigned staff to implement and further evolve its climate-related policies. TD is committed to supporting organizations working on technical issues to better enable conservation assessment and planning.

<sup>15</sup> Credit risk, Biodiversity and Climate Change, 2008

## LESSONS LEARNED

The systematic review revealed only five studies<sup>16</sup> that discussed lessons learned in business climate change strategies. Like in the case of best practices, these lessons focused on GHG mitigation, even though the general findings could potentially be applied to adaptation given their broad nature. The Pew Center's 2006 study identified four overarching lessons from a 100 question survey distributed to 27 members of the Business Environmental Leadership Council (BELC). These lessons cut across all elements of climate-related strategies and involve timing, commitment, policy development, and business opportunity (PEW, 2006: 6). Ensuring the strategic timing of climate action is critical: while there is danger in pursuing initiatives too early, there is also danger in starting too late and losing competitive advantage and opportunity, given that resources and lead time are required to develop effective climate strategies. Establishing appropriate levels of commitment to climate strategies is an important lesson learned from corporate experience with GHG mitigation. And given that the policy and market impacts of climate change are still very uncertain, it would be unwise for any single company to get too far ahead of the general business community in mitigation and adaptation, and pursue initiatives that may not yield financial or strategic benefits (PEW, 2006: 6). Moreover, it is important that a company should not pursue new climate opportunities independent of its overall competitive strategy.

<sup>16</sup> Hofmann, (2006); Ross, et. al. (2007); Sussman and Freed (2008); Hoover and Roberts (2007); Hunt, (2008)

## SUMMARY OF KEY POINTS

- Best practices in business adaptation focus on a response to climate risks that either minimizes profit loss or turns a climate risk into a profit opportunity. Despite that, a 'wait and see' approach still dominates practice.
- There is very limited information on case studies, lessons learned, and best practices in business adaptation to climate change. Most lessons learned and case studies often tend towards exemplifying business responses to climate change by way of GHG mitigation and low carbon footprint strategies, not adaptation. Most of the literature names exemplary businesses without detailed information on best practices and lessons.
- The reasons for this knowledge gap are hypothesized to be threefold:
  - 1) Businesses have yet to undertake adaptation measures despite real risks and vulnerabilities to climate change. This may be due to lack of knowledge, inadequate risk modeling, and poor information on future climate change variability.
  - 2) Businesses that have taken on adaptation measures have done so only recently and it is too early to gather empirical findings or literature in this area.
  - 3) The focus of business remains short-term and on GHG mitigation.
- The Insurance sector had the highest number of case study examples in business adaptation to climate change.

## Section 2: tools for business

This sections includes tools to help businesses assess risks, evaluate opportunities and implement adaptation options.

The systematic review found 17 sources in which tools for business adaptation were mentioned. These tools allow businesses to assess climate **risks**, to evaluate **opportunities**, to identify and implement **adaptation** options, and finally to **disclose** actions and outcomes. The sources of these tools for business are presented in Tables 1 and 2.

In the area of risk tools, various risk screening processes, decision making frameworks, and potential impact assessments are available that allow companies to 'plug in' their own variables. The literature review identified five types of climate change risk tools. The most widely identified, appearing in nine studies, is risk frameworks. A risk framework is a step-by-step risk management process which allows companies to screen particular risks to their business practice, analyze and evaluate those risks, and finally treat those risks by identifying and implementing adaptation options. Another type of risk tool is a scenario tool, which appeared in five studies. Scenario tools allow businesses to use projections of potential climate change scenarios to assess potential risk to their operations. Decision trees were presented as a risk tool in two studies, and are another type of step-by-step risk management process that take the format of yes/no questions which guide the reader to suggestions for action. As well, costing tools were identified in two studies. Costing tools allow businesses the ability to assess what the potential

financial impact of climate change may be on various aspects of their business. Finally, one study used a computer simulation tool to identify risks. This tool uses a behavioral software model that attempts to identify the likely points at which companies will form a 'belief' in climate change as a priority for organizational adaptation.

With respect to tools for evaluating climate change opportunities, there are very few tools identified in the literature. Only one study identified an existing opportunity tool to give businesses a framework of current and potential opportunities made available by climate change. This tool was a list of current opportunities across sectors that businesses could scan to locate those applicable to their operations and strategies.

In general, there are five types of adaptation tools identified in the literature: adaptation identifiers, step-by-step guides, success measurement, adaptation networks, and adaptation option tools. Adaptation identifiers appeared in eight studies. These tools allow businesses to identify adaptation options via a set of questions that businesses can use to make a self assessment of what category of adaptation options might be suitable for their particular situation, such as available resources to devote to adaptation, human capital and knowledge within the firm capable of executing adaptation, and available technology. Step-

by-step guides appeared in seven studies and are a comprehensive adaptation tool that typically also incorporates some type of risk framework. They allow businesses to identify and choose appropriate adaptation options, and suggest a form of monitoring or feedback to self-assess the appropriateness of the adaptation in practice. Tools for measuring adaptation success were found in six studies. These are typically benchmarking tools that provide businesses points for testing the effectiveness of adaptation measures to evaluate its success. The review also identified six adaptation

networks which allow businesses to connect to networks concerned with adaptation. Finally, five studies made note of adaptation option tools that allow businesses to pick adaptation options best suited to particular risks they are already facing or likely to face from climate change.

In addition, there was one study that provided a tool to guide managers in disclosing their adaptation activities. This tool was a short guide of possible climate related disclosures that investors may be concerned with, and a list of resources that businesses can tap into to disclose those risks.

Table 1 CLIMATE CHANGE RISK AND OPPORTUNITY TOOLS FOR BUSINESS

SOURCE	SOURCE TYPE	SECTOR	TOOLS FOR	RISK TOOLS					OPPORTUNITY TOOLS	
				Risk Framework	Decision Tree	Scenarios	Simulation	Costing	Current Opportunity	Future Opportunity
Australian Greenhouse Office (2006)	Government Report	All	Private Sector	◆						
Blenda & Shackley (2008)	Peer-Reviewed Journal	All	Academics/ Private Sector				◆			
UK Climate Impacts Prog. (2009)	Government Report	All	Private Sector	◆		◆		◆		
Sullivan et. al. (2008)	Think Tank	All	Gov/Private Sector	◆						
UNEP (2008)	International Organization	Tourism	Gov/Private Sector							
AXA Insurance (2006)	Industry Rep.	Small Business	Private Sector	◆		◆				
Chartered Accountants of Canada (2009)	Industry Rep.	All	Private Sector							
Eldis (2009)	Website	All	All							
UNDP (2007)	Website	All	All	◆		◆				
Deutsche Bank (2009)	Private Sec	All	Private Sector	◆				◆		
Conference Board of Canada (2008)	Industry Rep	All	All							

Continued from previous page

SOURCE	SOURCE TYPE	SECTOR	TOOLS FOR	RISK TOOLS					OPPORTUNITY TOOLS	
				Risk Framework	Decision Tree	Scenarios	Simulation	Costing	Current Opportunity	Future Opportunity
Toled et. al. (2008)	Dissertation	All	All	◆						
Berkhout et. al. (2004)	Think Tank	All	Private Sector	◆		◆				
CBSR (2007)	Think Tank	All	Private Sector	◆		◆				
Freed and Sussman (2006)	Think Tank	Water	Gov/Private Sector							
ICF International (2007)	Think Tank	Water	Gov/Private Sector			◆				
Lash and Wellington (2007)	Non-Peer Rev, Journ.	All	Private Sector			◆			◆	
Pew Center (2008)	Think Tank	All	Private Sector	◆						

Table 2 CLIMATE CHANGE ADAPTATION AND DISCLOSURE TOOLS FOR BUSINESS

SOURCE	ADAPTATION TOOLS					DISCLOSURE TOOLS	
	Adaptation Identifiers	Adaptation Options	Success Measurement	Step-by-step guide	Adaptation Networks	What to Disclose	How to Disclose
Australian Greenhouse Office (2006)							
Blenda & Shackley (2008)							
UK Climate Impacts Prog. (2009)	◆	◆	◆				
Sullivan et. al. (2008)							
UNEP (2008)	◆	◆	◆	◆	◆		
AXA Insurance (2006)							
Chartered Accountants of Canada (2009)					◆	◆	◆
Eldis (2009)					◆		
UNDP (2007)	◆	◆	◆	◆	◆		
Deutsche Bank (2009)							
Conference Board of Canada (2008)							◆
Toled et. al. (2008) (2007)	◆			◆			

Continued from previous page

SOURCE	ADAPTATION TOOLS					DISCLOSURE TOOLS	
	Adaptation Identifiers	Adaptation Options	Success Measurement	Step-by-step guide	Adaptation Networks	What to Disclose	How to Disclose
Berkhout et. al. (2004)	◆	◆	◆	◆			
CBSR (2007)	◆	◆	◆	◆			
Freed and Sussman (2006)	◆			◆			
ICF International (2007)							
Lash and Wellington (2007)							
Pew Center (2008)	◆		◆	◆			

## SUMMARY OF KEY POINTS

- Risk tools dominate the literature and, of those, risk frameworks (a step-by-step risk management process) are the most common. There are a few limited scenario-based tools and computer simulation tools, which suggests a need among businesses for more sophisticated risk modeling tools. The overwhelming focus on risk tools is most likely due to the fact that risk management frameworks already exist and can be easily modified to include climate risks.
- Only one opportunity tool was identified in the study. This represents a significant gap in the tools available for business adaptation to climate change. This tool focused on current opportunities, and there were no tools for identifying potential opportunities. The very limited availability of opportunity tools might speak to the fact that climate opportunities depend on the idiosyncrasies of individual firms and their strategies, making generalizations around climate opportunities difficult to summarize.
- The few adaptation tools identified mostly tend towards climate change education or collaboration networks available to business to learn and connect with other businesses concerned with adaptation. It is hypothesized that the overwhelming tendency for adaptation tools to focus on networks speaks to a preliminary stage of business climate change adaptation, and the need to first learn ‘what is out there’ before developing any models of climate change adaptation by individual businesses.

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1 & 2 are listed in the  
following pages.

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An exhaustive list of references for the entire study (Reports 1-4) is available in the study [Methodology report](#).

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# about the network for business sustainability

## MISSION

The Network for Business Sustainability enables business sustainability by fostering collaboration between industry and academia.

## VISION

We envision a world where Canadian enterprises contribute to prosperous economies, healthy ecosystems and strong communities.

## OBJECTIVES

1. Build and grow a community of researchers and practitioners of business sustainability.
2. Develop a database of state-of-the-art business sustainability knowledge that is relevant to practice.
3. Create opportunities to develop new knowledge that spurs innovation in enterprises.

## ACTIVITIES

The Network funds projects to move knowledge between the communities of research and practice, organizes events that bring the members of those communities together, and enables ongoing interaction and knowledge exchange through online tools.

## FUNDING

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Social Sciences and Humanities  
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# about the network's leadership council



Note: The contents of this report do not necessarily reflect the opinions of the Network's Leadership Council.