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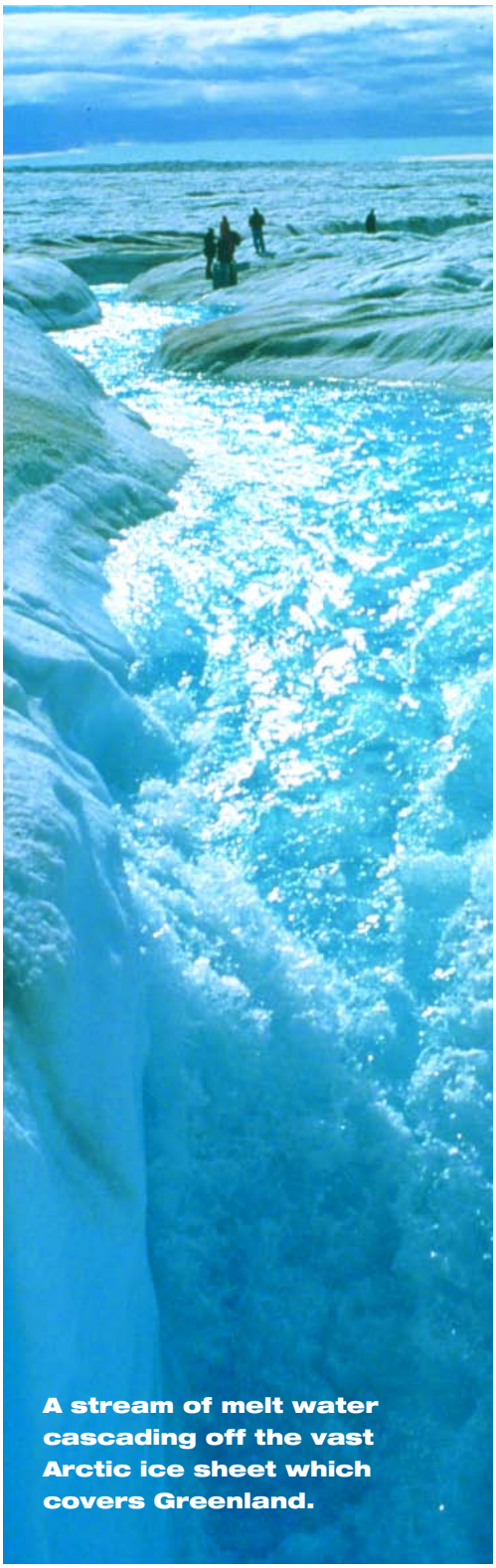

A stream of melt water cascading off the vast Arctic ice sheet which covers Greenland.

Adaptation and Vulnerability to Climate Change: The Role of the Finance Sector

Climate change is now certain, so we must plan for the reality that dangerous changes in weather patterns will disrupt economic activity. On one scenario, disaster losses could reach over 1 trillion USD in a single year by 2040.

The impacts will be worse in developing countries, where capacity to manage disasters is lower, and could impede progress towards achieving the Millennium Development Goals. Adaptation - adjusting to the expected effects of climate change – is therefore a clear imperative and a vital complement to mitigation. At the same time, a new integrated approach is called for to optimise the response of key actors in business, government and civil society. Such an approach should coordinate adaptation, disaster management, and sustainable economic development more systematically.

Already the financial sector is incurring additional costs from adverse climatic conditions, and has developed and refined important techniques to cope with these burdens. The sector is restricted, however, by commercial considerations from applying these measures more widely. A gathering weight of opinion suggests that a combined public-private approach to adaptation could yield worthwhile results. Inevitably, returns would be small to begin with, but could grow rapidly as best practice spreads.

Key Recommendations

Policymakers

- Mainstream climate change – ensure that the responses to projected impacts are integral to policymaking priorities at all levels and in all sectors.
- Integrate adaptation with disaster management and economic development policy to maximise the return on scarce resources, and achieve a "triple dividend". Emphasise capacity building, resilience, and economic diversification.
- Improve the knowledge base about climatic hazards, and specifically ensure the availability of weather data to support the growth in weather derivatives, catastrophe bonds, insurance and other risk transfer products, especially in developing countries.
- Prepare for disasters on the basis that they will be greater than any seen to date. Specifically, work with the private sector to develop seamless, efficient risk transfer systems to deal with climatic disasters.
- Enable the private finance sector to operate more effectively in developing countries, by providing good governance and economic stability.

Financial sector

- Recognise the reality of climate change and mainstream it into all business processes. It is a decision factor for business planning and strategies, portfolio management, and at individual transaction level.
- Develop and supply products and services for the new markets which will come with integrated adaptation e.g. at micro-level in developing countries, and for ecological services.
- Work with policymakers to realise the transition to integrated adaptation.
- Ensure that contingency plans consider "worst case" disasters.

Part I
INTRODUCTION

This briefing paper considers adaptation from the viewpoint of the finance sector. Climatic changes will accelerate if emissions continue on a "business-as-usual" trajectory. Among the effects could be more frequent, extreme weather events and droughts, rapid sealevel rise from icecap melting, breakdown of the marine foodchain and worst of all, feedback effects like large releases of methane from thawing permafrost, or large scale dieback of forests. These risks are real and the economic costs would be huge.

For that reason, the Climate Change Working Group (CCWG) has strongly advocated an aggressive policy of mitigating greenhouse gases. Even with such a policy, however, we cannot avoid further warming, due to the thermal inertia of the oceans. This will be at least 0.6°C, or the equivalent of all the warming we have seen already. The benefits of new emission cuts will not be felt until after 2040. That is why we must adopt vigorous measures to adapt to climatic change even as we strive to cut emissions. Adaptation is a vital complement to mitigation.

A key issue is that adaptation has to be integrated with development policy and disaster management. It is clear that damage from climatic disasters already threatens economic growth in many areas in various ways, and that these stresses will accelerate in coming decades. Even major public insurance schemes have faced technical insolvency, in France from subsidence claims, and in the US from flood claims following Hurricane Katrina. Developing countries require input from other nations to build capacity and finance infrastructure.

The private sector can only participate in large-scale adaptation initiatives on a commercial basis. Image and corporate responsibility are not sufficient. In partnership with the public sector, the barriers to entry can be overcome, and the public sector and those at risk can benefit from the private sector's inherent need to innovate and be efficient. Part II of this Briefing illustrates that with case studies. Part III suggests the way forward.

CLIMATE CHANGE SCIENCE: LATEST FINDINGS

Over recent decades the Earth has warmed significantly. The year 2005 was the hottest year recorded since instrumental measurements began[1]. Heatwaves and droughts have increased. A notable example was the European heatwave of 2003, which killed around 50,000 people[2]. The global surface affected by drought has doubled since 1970[3]. Trends in flooding are harder to identify, but there is a highly significant shift to more frequent "100-year" floods on great rivers since 1993 globally[4]. At the same time, the incidence of days of heavy precipitation has increased[5].

The frequency of strong tropical cyclones appears to have risen[6]. Atlantic hurricanes have doubled in power (duration and strength combined) over the past 30 years[7]. This is correlated with the warming of the ocean, which is a consequence of global warming, but other explanations such as natural cycles have also been advanced[8]. Sea ice is disappearing quickly – in just ten years the Arctic icecap thinned by 1 metre[9]. Sealevel is rising at an accelerating pace, now up to 3mm per year as a world average, but even faster in the west Pacific and east Indian Ocean[10]. The acidity of the sea is starting to increase as it absorbs more carbon dioxide[11].

In coming decades, whatever we do, we are committed to a further rise in temperature of at least 0.6°C[12]. The latest research indicates that the sensitivity of the climate system to greenhouse gases is 20 percent more than in the 2001 IPCC report[13], and also that feedback effects from changes to plants and land surface will contribute another 25 percent[14] i.e. the Earth's reaction to emissions will be 50 percent stronger than the previous consensus. Even without accounting for these revisions, realistically the IPCC predictions of temperature in 2100 lie outside the EU's "safety threshold" of 2°C[15]. This means that we need to plan for further, and dangerous impacts. Even with successful abatement of emissions, the risks will deteriorate for a considerable time before they stabilise. There are indications that 2°C may be capable of triggering the collapse of the Greenland and West Antarctic ice sheets, which would more than double the rate of sealevel rise (SLR), to nearly 20 centimetres per decade[16].

Cold spells will disappear in many regions, while heatwaves will become frequent. In the tropics they could become the norm by 2100, and in mid-latitudes, two years in five might be hot[17]. Decreases in precipitation are consistently predicted by the end of the 21st century for the northern and southern subtropics. Decreases are also expected for parts of western North and South America, and southern Europe, with increases for high latitudes. Even where precipitation increases, the land may become drier due to increases in evaporation[18].

The situation for other weather events is less clear. It is possible that the strength of tropical cyclones may increase, though not their frequency[19]. The El Nino and North Atlantic Oscillation patterns will likely become accentuated[20], with major changes in precipitation for many regions. The chemistry of the sea will alter, with adverse effects for basic marine organisms[21]. Sea ice in the Arctic will disappear entirely for some of the year[22].

Up to a rise of 1°C , global GDP might benefit from climate change, due to an aggregate increase in primary food and forestry. Pluses would also include access to polar minerals and waterways. There would, however, be serious negative effects for vulnerable regions like Africa, and the Pacific islands, and Arctic peoples even at low increases. The number of people adversely affected would outweigh those benefiting directly, and inequity would be increased within all societies, as the less wealthy or weaker would be disadvantaged[23].

A key issue is the **rate of change of extreme events**. The extreme heatwave that struck Europe in 2003, will be simply a normal summer occurrence by the 2060's, and

"cooler than average" by the 2080's, according to the respected Hadley Centre[24]. This reflects a well-known statistical phenomenon. When the average value of a factor changes, then the risk of extreme values shifts much faster. In this case, the risk of severe summers will rise by a factor of 200 times within decades- this means that the risk is rising at an annual rate of over 5 percent conservatively. If ignored, this quickly results in gross errors in terms of risk management. The rarer the event, the faster the change in its frequency.

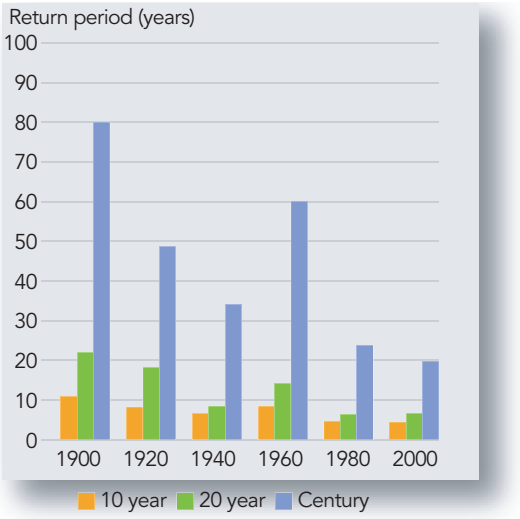

Figure 1

Shrinking return periods:

Hot UK months

Source: Environmental Finance, October 2006

Figure 1 shows that this is already fact. Extreme monthly temperatures that used to occur once every hundred years in the UK now happen every twenty years. Twenty-year events have become six-year ones, and ten-year events recur every four years.

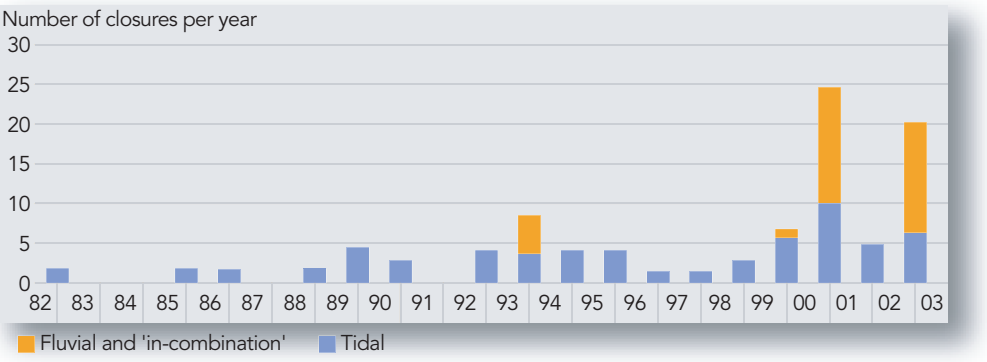

Figure 2

Thames Barrier closures 1982 - 2003

Source: Environment Agency, UK

The same pattern is affecting sea level globally. Figure 2 shows a typical example, relating to the Thames Barrier, which was erected to defend London after the great flood of 1953. When it was built, it was intended to resist even a 1000-year flood, but already from experience and new projections up to the year 2100, it is clear that climate change has invalidated these calculations.

KEY ECONOMIC IMPACTS

In the initial stages of climate change, for developed countries the key impact is property damage, and to a lesser extent increased operating costs and lost production. For developing countries the key impacts are basic: agriculture/food, water, health/life, energy supply, loss of infrastructure, social stress, and loss of tourism[25]. If climate change becomes severe, above 2°C, these concerns will affect major economies. In terms of economic activity, the most sensitive sectors are coastal cities, water management, agriculture, tourism, and energy supply. Large-scale industry is less sensitive, but as supply chains lengthen, this will alter, and small-scale businesses in developing countries are vulnerable. Islands are vulnerable, not just because of sealevel rise - Japan imports 80 percent of its energy and 60 percent of its food, so the impacts of climate change elsewhere could be serious[26].

Coastal Cities This is a key area of concern. Currently, 25 percent of the world's population lives in coastal zones. In the US, privately owned coastal assets are valued at about 7 trillion USD[27]. Twelve of the world's 16 megacities (over 10 million inhabitants) are coastal[28], and all are growing rapidly. The impacts of climate change will compound with other stresses like resource scarcity, insecurity, poverty, congestion, and pollution. In the short term, extreme events are the chief threat. Floods affect more people than any other form of natural disaster[29]. Longer term, coastal cities are vulnerable to SLR, storms, water temperature and quality, and inland runoff[30]. Rates of SLR in deltaic areas are double the global mean, due to groundwater abstraction, natural compaction of the fresh silt[31], and construction of inland dams, which prevents the replenishment of silt[32]. This affects cities like Bangkok and Shanghai, and entire countries like Bangladesh.

Figure 3
Major changes expected at regional level
Source: IPCC 2001 regional chapters and more recent scientific papers.

In China, the GDP generated by 2050 from three deltas - Changjiang, Huanghe and Zhujiang- will amount to 80 percent of China's GDP[33]. However, they face an SLR of up to 90 centimetres by 2050. Just 30 centimetres would increase flood risk areas by five or six times[34]. For Egypt, a 50 centimetre SLR would reduce GDP by 14 percent[35]. In Guyana, 90 percent of GDP is

sourced from the coastal zone[36]. Small islands are a special case, at risk of entire destruction, with enforced migration[37].

Without enhanced flood defences, there will be a rapid increase in numbers permanently displaced worldwide, from less than 1 million today, to about 100 million by 2060, almost entirely in developing countries[38]. Developed countries are strengthening defences for cities like Tokyo, Rotterdam and London, or installing new ones, like Project "Moses" for Venice. However, building similar protections for all threatened regions would be impossible, and protecting coastal aquifers is difficult.

Water Globally, only two percent of water is taken for domestic use. The bulk is for agriculture, with other major uses for power generation, industry, transport and leisure. Two billion people live in water-stressed regions like the Mediterranean, Sahel and West Australia. More than 1 billion people in South America and Asia will be deprived of water as glaciers shrink. Some Himalayan glaciers may vanish by 2035[39]. Water scarcity is the major long-term risk facing mainland Asia, compounded by seawater intrusion coastally.

Water systems in developing countries are already strained - less than half of urban water supply in Asia is reliable. Warmer weather will mean higher demand for water, and higher costs to purify water. By the 2020's over 500 million more people may be short of water[40], which would interfere with the Millennium Development Goals (MDGs) - see Box. Demand management will be increasingly important, as well as planning for new levels of high and low extremes. Egypt faces typical problems - the water supply is inadequate, and agriculture is important (20 percent of GDP) and uses 85 percent of the water, but very inefficiently. SLR could cause saltwater intrusion, and temperature rise will increase irrigation demand. Plans include reuse of wastewater and improved irrigation, and reviewing the Nile Waters agreement of 1959 that apportions flow among countries[41].

The UN Millennium Development Goals (MDGs) and Climate Change

1. Eradicate extreme poverty and hunger	Weather fluctuations will impoverish poor farmers and reduce yields
2. Achieve universal primary education	Funding will be diverted to deal with disasters and scarcities
3. Promote gender equality and empower women	Stresses will increase as resources become scarcer
4. Reduce child mortality	Disease, water scarcity and food shortages will impede this goal
5. Improve maternal health	As with child mortality, climate change will hinder progress
6. Combat HIV/AIDS, malaria and other diseases	Water stress and warmer conditions will encourage disease
7. Ensure environmental sustainability	Climate change threatens the stability of the Earth system
8. Develop a global partnership for development	International relations will be strained by climate impacts

Food and forests Until 2050, overall food supply will be sufficient, but imbalances will increase[42]. Drought will be the main risk for agriculture in developed countries like Australia and Europe[43]. Scientists expect declining yields in tropical regions, due to higher temperatures, and insufficient water[44]. On average, 21 percent of Africa's GDP is in the agriculture sector, up to as much as 70 percent in some nations[45]. Forests are important

for biodiversity, as a source of primary materials, and for their capacity to store carbon. To mid-century, northern forests will benefit from a longer growing season, despite more pests and fires[46]. However, some tropical rainforests are predicted to suffer extinction from drought, most notably Amazonia[47].

Energy Climate change affects demand and supply. Heatwaves in Europe and the US in 2006 forced power producers to reduce output and ration power to industrial clients, and power prices soared. Water supply will be problematic. Thermal and nuclear power stations need water for steam to drive the turbines and for cooling. Hydropower is even more sensitive, and is particularly important in many developing countries[48].

Tourism This climate-sensitive sector is critical in many developing countries and big business in developed ones. Approximately 39 percent of Bahamas GDP is tourism. It is one of Australia's highest export earners. The Great Barrier Reef alone supports a 1.5 billion AUD industry. By 2040, 60 percent of the coral could be regularly bleached.

INTEGRATED ADAPTATION TO CLIMATE CHANGE

Forward-looking policy can reduce the effects of climate change by anticipating the future regime of SLR and weather, in order to capitalise on opportunities and minimise harm. Conventionally, this means identifying the planning horizons for key impact areas and sectors, developing plans and planning capability, selecting the best options, and implementing them well. It also entails contingency planning to deal with impacts, and responding effectively to climatic disasters. A fundamental new dimension is emerging: the need to integrate adaptation policies with policies for sustainable economic development and disaster management, to achieve a "triple dividend" from scarce resources.

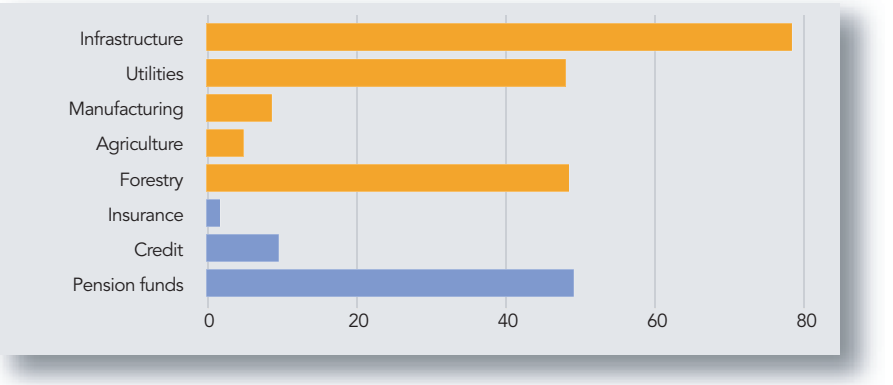

Figure 4

Forward Commitment period by sector (years)

Source: Andlug Consulting

Figure 4 shows that in terms of forward commitments, some of the sectors that were identified as climate-sensitive have capital assets that last for decades (utilities like energy and water, and infrastructure for cities and transportation). That makes them planning priorities. For the financial sector, commitment periods are relatively short. However, pension funds are an exception, since they are committed to provide income for beneficiaries about 50 years into the future, from the time of receipt of funds for investment.

The second step is "adaptive capacity", the potential or ability to respond to the change that is now expected. This requires various resources, including information, skills, finance, a strong regulatory framework, and sometimes new technologies. In Kiribati, a full 80 percent of the adaptation priorities relate to awareness raising, and enforcement of regulations like limiting the quarrying of beaches for building material[49]. Hazard and vulnerability mapping have helped in Samoa to deter property development in such areas[50].

Next, decisions must be made on a cost/benefit basis- it is impossible to do everything, and some losses of unique assets may be unavoidable. Adaptation can reduce impacts by a factor of 10 to 100 for often little cost, for example by designing hurricane-resistance into infrastructure and buildings[51]. In the Pacific Cook Islands, one study showed that reconfiguring runoff channels would generate a benefit:cost ratio of 280:1[52]. Even with a very infrequent occurrence, this would be economically justifiable. The high degree of uncertainty about the exact timing and strength of impacts means that flexibility through resilient infrastructure and economic diversification are essential. The question of how to adapt is particularly sharp in the coastal zone - essentially to retreat or defend. Poorer nations may not have a choice. Ignoring the problem can be catastrophic, because of

disasters. In October 2004, the US Army Corps of Engineers estimated it would take 1 billion USD over 20 years to improve the levee system for New Orleans[53]. Now, post Katrina the cost is much higher. Tools like geographical information systems (GIS) , scenarios, and cost estimation protocols have been developed to assist coastal adaptation, under the banner of Integrated Coastal Zone Management (ICZM) with wide stakeholder engagement to balance competing considerations, as well as long-term and short-term aims.

Some impacts cannot be avoided, because they are too large-scale or too unpredictable. The case studies presented later in this briefing give some insights into the importance of good contingency plans, and how the financial services sector can play an important part.

VULNERABILITY AND COPING WITH IMPACTS

Natural systems and less wealthy populations are often vulnerable to climate change, being exposed directly to impacts, but unable to respond well, particularly if changes occur very rapidly. However, there is limited scope for financial sector involvement unless eco-benefits can be monetised or the poor have access to finance. According to the World Bank, 1.3 billion people live on less than 1 USD per day, and three-fourths depend on agriculture for their livelihood[54]. Natural disasters have a strong impact on agriculture, ruin households, and drain fiscal resources out of developing countries - well over 100 percent of GDP for small nations[55].

Effective adaptation needs to make vulnerable people resilient, and able to return to normal status quickly, even after a major jolt. This means dealing with other causes of vulnerability like low incomes, no title to assets, lack of education, resource depletion, governance, economic instability, disease, demographic factors and poor risk management. For industry, the critical factors are adequate infrastructure and communications, public services, scale, and access to finance. Essentially, providing these is the objective of sustainable development.

Similarly, to deal with disasters, governments need to ensure that the basics of food, water and shelter are available. However, the normal post-event response of disaster relief is unpredictable, often slow, and does not tackle the underlying factors that make communities and businesses vulnerable. The key economic strategies are economic diversification, technical training like soil and water conservation, secure communications and infrastructure and hazard reduction. Market systems can play a part in conserving scarce resources, with appropriate regard for the basic needs of the poor[56].

The solution is to build local capacity and resilience in a way that links sustainable development, risk management, and adaptation for a win-win-win situation. This yields a "triple dividend" in the payback for the scarce resources that are available to invest, as shown in Figure 5. Each dollar takes care of climate impacts, disaster recovery and economic growth. In addition, there may be opportunities to incorporate emissions-reduction measures.

Mainstreaming climate change is key - managing climate change should be integrated into policy like water management, disaster preparedness, or landuse planning at every level of decision-making. For example, there is MACCC (Mainstreaming Adaptation to Climate Change in the Carribbean), which addresses development issues in key sectors (water, agriculture, health) and develops responses at different levels. The Asian Development Bank is integrating climate change into its grant and loan procedures ("climate-proofing"). The AIAAC project has identified Nine Key Messages (see Box).

Nine Messages from AIAAC (Assessments of Impacts and Adaptation to Climate Change)

1. Adapt now (“a stitch in time”).
2. Adaptation IS development (i.e. development without recognising climate change is not sustainable).
3. Adaptation is of direct benefit to the actors, unlike mitigation, so it is a powerful motivator.
4. International finance is needed – developing countries cannot do it themselves.
5. A key factor is creating or strengthening the right institutions to be actors in the process.
6. Involve stakeholders bottom-up.
7. Sectors are different, so a multiple approach is needed, bringing in relevant expertise to the specific problem.
8. Information and awareness are essential.
9. “There are many messages”. Societies will adopt different approaches to tackle the same underlying problem

Governments have adopted eight Millennium Development Goals (MDGs) for sustainable development, with defined aims for 2015. It is often suggested that it would be better to focus efforts on these, rather than the apparently more distant problems of climate change. This is a false dichotomy. If it is ignored, within 20 years climate change will negate progress towards the achievement of the MDG’s, because climate impacts will start to erode economic progress. Tools like cost benefit analysis demonstrate that spending less now, costs more. In fact, pricing resources correctly is a key step in managing risk.

It is futile to debate whether climatic disasters are due to “merely” natural variability. We know that extreme events will be more frequent, and they can set development back years. We can learn from those that have happened. Whatever the cause.

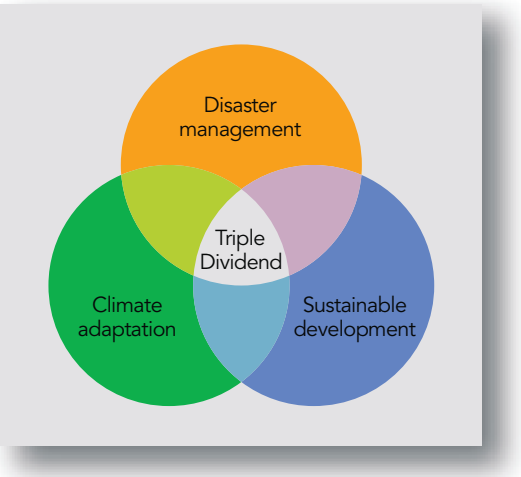

Figure 5

Effective Adaptation Means Multiple Objectives

It is important to avoid perverse adaptation e.g. air conditioning, or water pumping or artificial snow-making that increases greenhouse gas emissions. On the other hand, mitigation policies can complement adaptation and development. For example planting forests to sequester carbon can also stabilise soils and avoid floods, rural electrification can support sustainable development, and planting trees can reduce urban heat-island effects.

A SCENARIO OF FUTURE COSTS

Comprehensive estimates of the costs or benefits of climate change do not exist, because of the great technical difficulties in setting values for many of the non-monetary issues, and equating values far into the future, across a range of possible economic and scientific scenarios. This is further complicated by the question of how to assess the effect of mitigation policies, which may be more important for some sectors than impacts.

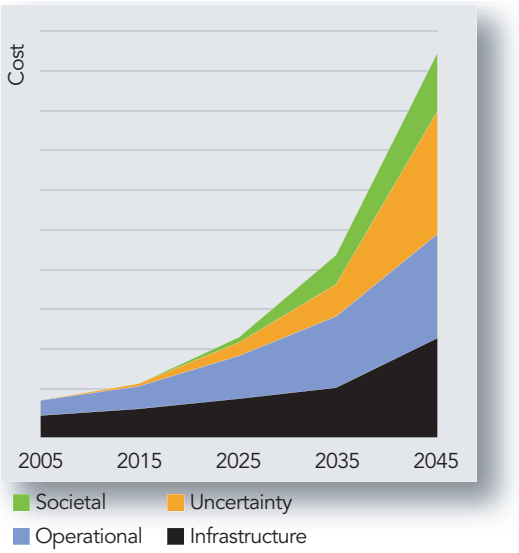

Figure 6

Progressive onset of climate change costs

Source: Andlug Consulting, loosely based on Kemfert (2005)

A typology of impact costs

As climate change spreads it generates costs in a number of ways (Figure 6 is a schematic illustration). Changing weather patterns and rising sealevel increase the operating costs of consumers and businesses. As of 2005, considerable damage is also occurring to public and private infrastructure. This affects insurers via claims, and also banks indirectly via changes in client behaviour. In future, damage and operating costs will rise faster, to the extent that a third burden, "opportunity cost", will emerge, the deferment of decisions due to uncertainty - as the realisation grows that climate change is a key decision factor.

There is also a fourth category of societal costs, where those who are economically active have to support others who are inactive, or have to contribute to the remedial costs of environmental damage. These act as a drag on economic growth generally, and so impede sustainable development[57].

We can get a feel for the costs by looking at the statistics on damage that are published by Munich Re and Swiss Re. For example, Figure 7 shows the Munich Re figures for large weather disasters from 1950 to 2005.

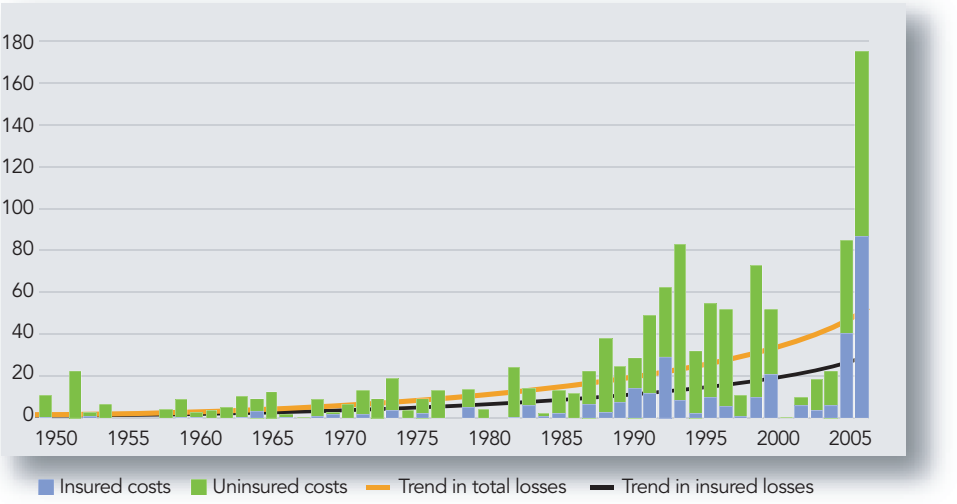

Figure 7:

Cost of great weather disasters 1950-2005

Costs in USD billion, 2005 values. Source: Munich Re.

The data only covers "infrastructure" and part of "operational" costs, and does not include "small" incidents, which are reckoned to be as costly in aggregate as the great disasters. Yet, even then, the cost reported in 2005 came to 165 billion USD, of which half was insured. The underlying trend in the costs is shown as 6 percent per year. Recent analysis of similar costs trends by RMS (Risk Management Solutions) suggests that there is an underlying "climate change" trend of 2 percent per year, and the remainder is due to the fact that modern economies are more vulnerable to climatic variability.

The following scenario constructed by Andlug Consulting presents one possible pathway that climatic losses might follow in coming decades, and suggests how the financial sector might be affected. It is NOT a prediction, but like all scenarios, is intended to explore the future so that better plans can be made.

The trend value for economic losses in 2005 is 50 billion USD (Figure 7). Industry analysts reckon that this is about half the total losses, which therefore are 100 billion USD. The long-term trend of six percent annual growth means the costs double every 12 years, taking them to 800 billion USD by 2041, in 2005 values. However, great disasters always appear in clusters: Figure 7 shows that one year in three, the costs are 50 percent higher than the trend-line. In fact they were more than double the trend value in 1992, 1993 and 2005. Making allowance for such clusters, and for the inclusion of all societal and opportunity costs, it seems very likely that the there will be a "peak" year that will record costs of over 1 trillion USD before 2040. In fact, since so much development is taking place in coastal zones, the figure may arrive considerably before 2040.

As the costs rise, they will progressively affect the financial sector and its clients. It is not possible to predict exactly what will occur, and of course institutions will continue to innovate and react as the situation unfolds. Figure 8 gives one possible scenario. The actual dates are judgmental, but the effects are based on the climate science and physical impacts described earlier. For comparison, the likely rise in CO_2 levels is shown.

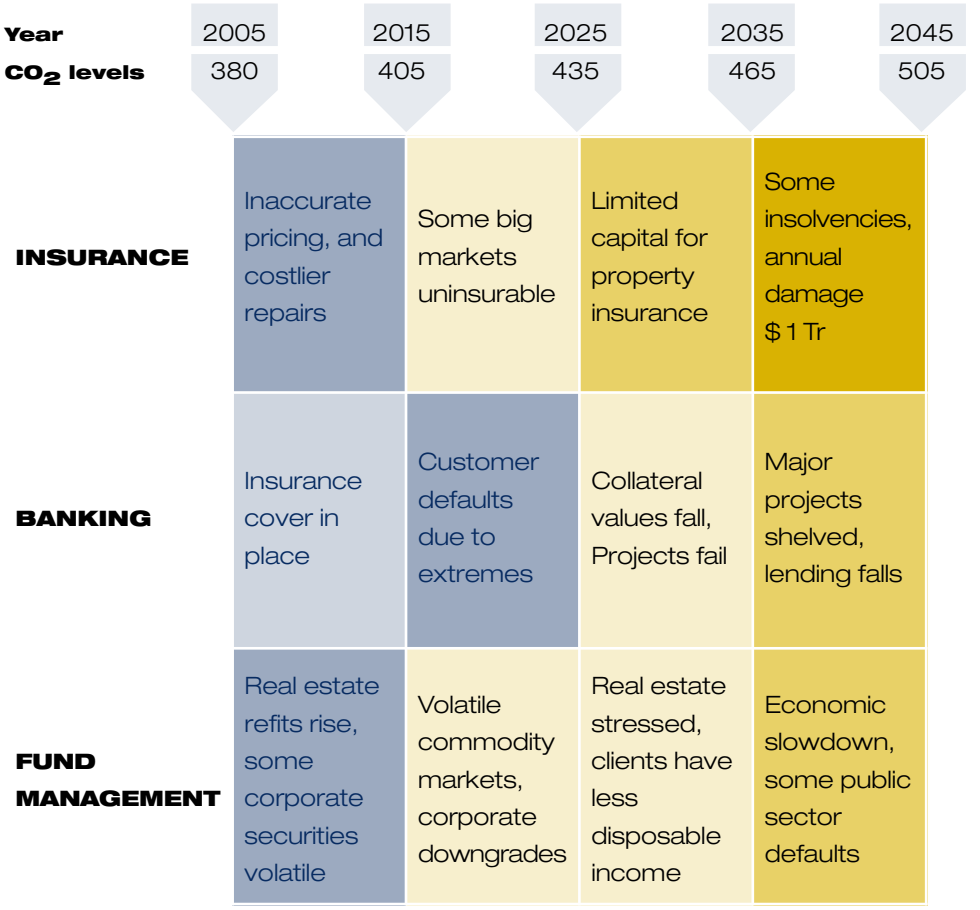

Figure 8

Indicative timeline of key impacts on financial sector without adaptation

Source: Andlug Consulting

No real problem | Frequent performance deviation

Subsector unprofitable | Major sectoral problems | Business model threateed

In the decade to 2015, banks are unlikely to be much affected. A study by the North American Task Force of UNEP FI found that bank loans to the corporate sector are generally under three years in duration, which limits their exposure, though it is higher for utilities (six years)[58]. Insurers are already being affected by uncertainty in their pricing, as seen by the upward shift in reinsurance prices after the 2005 hurricane season. Asset managers encounter some problems due to the effect of abnormal weather on corporate results for example.

In the decade to 2025, insurers may withdraw from some markets as the risks become too high for the pool of premium available, as happens in the US periodically. This will result in defaults by banking customers. In turn this will affect funds in some sectors. Extreme events will also make commodity markets more volatile.

In the decade to 2035, property insurers may find it difficult to maintain returns on capital for investors as losses rise and reinsurance becomes expensive. Banks find the value of property used as collateral falling due to lack of insurance. Some major projects fail due to climate impacts. This reflects the current lack of awareness reported by The World Bank[59].

In the decade to 2045, at least once the direct cost of climatic extremes exceeds 1 trillion USD (at 2005 values) in a single year. This has major repercussions on financial markets, as the future prospect sinks in. Major projects are shelved, confidence falls, some public sector loans default, and the fall in asset values jeopardises even prudent insurers who have underwritten client risks thoroughly.

CLIMATE CHANGE IMPACTS AND THE FINANCIAL SECTOR

Risks and opportunities

Climate change presents the financial sector with a range of challenges and opportunities. Figure 10 lists these in detail for insurance, banking and investment. In practice, many of the effects are likely to be negative, and to swing increasingly that way as emission levels rise, but there are also positive opportunities connected with adaptation (and mitigation, not shown here). These risks and opportunities can also be profiled in the classical six-point risk analysis that banks use to review proposals for credit (see Figure 9).

Market If the price or cost of the basic material is volatile, that constitutes a market risk. The obvious concern here is that climate-related catastrophes will happen more frequently and cost more than anticipated, which would make all types of financial services connected with property riskier.

Operational Clearly extreme events will make operations more difficult, as for all businesses.

Reputational A report by The Carbon Trust[60] concluded that the banking sector was highly exposed to reputational risk on climate change, because of its size and the intangible product offering. During disasters, insurers and banks ease their usual terms of business, which helps clients and improves their own image.

Counterparty In banking, this might be client default during a drought. In insurance it could be moral hazard (inattention to risk), anti-selection (selective purchasing by high-risk clientele), or failure of a reinsurer.

Political/legal The regulatory framework can increase costs for financial companies, or undermine markets. Lax control of development or construction results in a stock of property that is more vulnerable to damage. Conversely, regulations that promote hazard management will reduce risk and promote growth. Soft government loans after a disaster can reduce client defaults, but also make clients disinclined to buy insurance.

Business Companies that ignore advances in knowledge underperform. Insurance underwriters have to use geographical information systems (GIS) for natural hazards. In investment, adding socially responsible factors, including climate change, into stock assessment and portfolio management gives a more reliable performance.

Figure 9

Climate impacts and the finance sector: Risk analysis by source

Risk Driver	Examples of Issues	Sector Affected
Market	Unexpectedly large economic disasters	Insurance, banking, fund management
Operational	Lengthy local interruptions due to disasters	Insurance, banking
Reputational	Service quality at time of disaster	Insurance, banking
Political/legal	Changes to the law on disaster relief Changes to regulations on property design Lax control of land development	Insurance, banking Fund management Insurance, banking, fund management
Counterparty	Defaults after a disaster	Insurance, banking
Business	Introduction of climate impacts into portfolio risk management Screening individual client transactions for climate change risk	Insurance, banking, fund management Insurance, banking

Figure 10

Key climate impact risks and opportunities for the private financial sector

INSURANCE	THREAT (climate impacts, inappropriate adaptation)	OPPORTUNITY (adaptation or climate impacts)
PROPERTY	• Inaccurate risk pricing • Misinformed response from public sector (e.g. rigid product control) • More costly repair-work • Some markets become uninsurable • Lack of capital/reinsurance • Unprecedented disasters threaten solvency/liquidity	• More demand for risk transfer • Risk differentials can be segmented • Administration of disaster recovery • Climate-resilient infrastructure
CASUALTY	• Unexpected claims for duty of care, product failures • Disruption to transport (extreme events)	• More demand for risk transfer
LIFE/HEALTH	• Episodic impacts on human health	• More demand for health cover
OTHER UNDERWRITING	• More business interruption, e.g. failure of public utilities • Disruption to leisure activity • Increased losses in agro-business • Novel technology in energy sector	• Alternative products e.g. catastrophe bonds and weather derivatives • Programmes to reduce disaster relief • Consulting/advisory services • Carbon becomes an insurable asset

BANKING	THREAT	OPPORTUNITY
Corporate Banking and Project Financing	• Uninsured damage to corporate/project assets	• Adaptation infrastructure projects
Investment Banking	• Higher costs due to weather e.g. in the utilities sector	• Offering weather derivatives
Retail Banking	• Customer defaults due to climatic extremes	• Finance for climate-resilient purposes

FUND MANAGEMENT	THREAT	OPPORTUNITY
General	• Unpredictable impacts on global markets • Uninsured damage to assets • Macroeconomic downturn hits business volume	• Upsurge in socially responsible investment • More saving for "rainy day"
Corporate securities	• Climate impacts affect market value of securities	• Outperformance by climate leaders • Major adaptation projects
Property	• Unplanned refit costs	• Outperformance by climate-resilient stock
Government Securities	• Ability to repay impaired by pressure on public purse from disasters	• Increased need for publicly funded adaptation
Other	Compounded climate risk across diversified funds	• Mezzanine finance for adaptation projects

ADAPTATION IN THE FINANCIAL SECTOR

Explicit adaptation to climate change is now happening in some areas of insurance. Elsewhere it is slower, because insurance often protects other financial liabilities. However, risk management tools are already in place throughout the sector to ensure good corporate governance, so the additional risks of climate change can be accommodated readily. In addition, experience with recent extreme events, and communication between industry leaders and scientists through programmes like IPCC, has alerted forward-thinkers.

Insurance

Because of the catastrophic nature of climatic risks, insurers have developed strategies for managing them (see Figure 11). Often they are defensive, seeking to avoid loss or preserve profit, but they can also provide a basis for growth. They are continually refined in the light of experience and new knowledge. Effort has been focussed on regulatory, business and market risks, but also with good attention to counterparty, operational and reputational risks. Until recently, concern was driven by natural variability, but the techniques are equally valid for climate change, and are applicable to the wide variety of insurance systems that exist at national and even subnational levels. As yet, few insurers have taken climate change on board. In the US, only seven of 104 insurers listed in New York identify climate change as a relevant risk for their shareholders[61]. Insurers are not generally willing to underwrite flood risk, or slow-onset hazards in agriculture. CERES, a US-based NGO, has identified a growing move by insurers to reduce coverage in the coastal zone[62].

Figure 11:

Adaptive measures in use by insurers

Source: Andlug Consulting

Strategy	Regulatory Risk	Market risk	Business Risk
Reduce risk	Engage with government on flood defence funding and land zoning (UK), and building standards (USA, Fiji)	Withdraw from high-risk areas (USA). Avoid catastrophic risk like flood (most countries)	Understand the sensitivity of new industries and locations (reinsurers)
Price risk correctly	Seek approval to modify prices based on risk modelling (USA)	Seasonal forecasts for hurricane risk (reinsurers) Trend allowance for climate change (rare)	Use GIS to discriminate risks (UK, USA)
Transfer risk	Seek government back-up (France)	Reinsurance (universal)	Seek alternatives to reinsurance (brokers)
Check aggregate	Stress-test exposure by disaster scenarios (rating agencies, licensing authorities – common)	Internal capital-rationing (risk-based capital - common)	Consider asset-liability correlation (rare)
Control loss	Defend actions that seek to expand coverage (USA)	Contingency planning, pre-event deployment (USA)	Advanced techniques for subsidence repairs (UK)
Diversify risk Base	Open up new markets e.g. rainfall insurance and reinsurance (India)	Multiline insurance portfolio (universal)	Mine data to exploit new markets (some reinsurers)

A recent development has been the use of alternative risk transfer (ART) products to handle more difficult risks, like captive insurance companies for corporate risks, weather derivatives for non-catastrophic variability, and catastrophe bonds[I] (cat bonds) for catastrophic risks like earthquake and hurricane.

Banking

Climate risks are still not a major concern. Although attitudes are changing due to the massive damage to infrastructure in the US and Europe recently, banks were shielded because many customers had insurance or received public assistance. Mandating insurance for climatic damage to infrastructure or production sites is becoming more important. However, this is applied rather weakly, and insurance coverage can be amended at short notice during the currency of these liabilities. In the US, banks have coped with disasters like Hurricane Andrew smoothly, due to the inflow of funds from insurance claims and government relief funds. However, Hurricane Katrina, which is a new dimension of disaster, may leave the local banking industry impaired through a shrunken franchise[63].

In terms of operational risk, Katrina provided valuable lessons. Many banks had not prepared for a disaster of that scale, including the absence of power, mail, premises, staff access and all types of communication. Back-up sites often under-performed, or were inaccessible. Customers used internet services. Banks had difficulty with a local cash-only economy, but relaxed their procedures and contractual terms for clients under stress[64].

Banks have been tardy to see climate change as a risk for project finance. The World Bank found that about a quarter of its portfolio of project finance is subject to a significant degree of climate risk, but only two percent of them consider it in the project design documents[65]. The Caribbean Development Bank is one of the first to integrate climate change into its project planning process. In the private sector, the Equator Principles on sustainable project finance focus on avoiding damage done by a project, with no mention of climate change as a risk to the project. However, they do provide a framework into which climate change impacts could be wrapped.

Lastly, the availability of natural resources is affected by climate change. There was even a global shortage of oil and gas due to the 2005 hurricane season. Investment bank trading activities strongly depend on fluctuations in the commodity market. Thus, derivatives are expected to be used more frequently in this area.

Fund Management

The average UK pension fund has nearly three-quarters of its assets invested in equities, which are exposed to varying degrees to climate impacts. Including their property assets, the portfolios are therefore climate-sensitive. Yet, fund managers have been slow to recognise the relevance of environmental, social and governance issues (ESG) to responsible investment (RI). A survey by Mercer's showed that while 63 percent of EU fund managers think RI techniques will be common within five years, the figure drops to 11 percent in the US[66]. Even among RI activists, climate change has no priority, and is treated as a mitigation issue, not adaptation. However, The Carbon Trust[67] and CERES[68] have produced protocols to manage climate risk explicitly. One group of investors sees climatic risk as an opportunity. Given the lack of capital for reinsurance, and the consequent increase in returns available, hedge funds are helping to fill the gap by financing catastrophe bonds (cat bonds). These pay higher yields because investors may lose their entire stake in the event of a contractually defined disaster occurring. Another attraction is that they are "non-correlated'' i.e. they do not follow the stock and bond markets.

I Cat bonds act like reinsurance to remove the volatility of climate risks, which is a major concern for solvency and shareholder returns. The principal obstacles to greater use of the capital markets are the higher prices, the possibility of "basis risk", because the bond is triggered by objective conditions, not actual losses to the insurer, unfamiliarity, and regulatory limitations as a result of accounting rules.

THE ROLE OF FINANCIAL INSTITUTIONS IN INTEGRATED ADAPTATION

The sums required for comprehensive adaptation are very large. The private sector can provide a portion if the conditions are right. But, more importantly, it can apply the skills it has honed in commercial markets to complement the public sector and other stakeholders in areas of vulnerability (see Figure 12).

Figure 12

Public-private partnership roles in adaptation

Issue	Role of government	Role of private sector
Hazard reduction	Basic data and research Awareness-raising	Risk modelling
Resilience-enhancing measures	Regulation and enforcement	Incentives in product design
Vulnerable sectors/ communities	Infrastructure Pilot adaptation scheme funding Diminishing livelihood support	Micro-finance and –insurance backed by reinsurance Pooled development funds
Risk transfer	Guarantee fund Volatility smoothing	Insurance if conditions of insurability are met Otherwise services for public schemes
Disaster relief	Restricted, using hazard reduction and pre-funding	Relaxed terms of business during emergency. Services for public schemes Claims under climatic impact insurance
Capacity building	Funding	Technical assistance
Technology for adaptation	Basic research Incubator stage funding	Finance and insurance for consumers and operators Venture capital
Public goods - ecosystems, heritage	Conservation policy and funding	Technical advice, flagship funding
Economic stability	Security. Sound financial policy	Availability and accessability
Financial markets	Policy and governance	Product design, distribution and marketing “After-sale” customer service e.g. claims Administration

Sources of funding

The World Bank has tentatively put the incremental annual costs to adapt capital expenditure to climate change in the 10 billion to 40 billion USD range globally, of which about a third is associated with public finance[69]. This estimate will be refined, but there is clearly a challenge to find additional funds. Most of the initial funding could come from the public sector including overseas development assistance, if project appraisal methods alter to recognise climate change, and budgets are revised accordingly.

Funding disasters is much greater. The entire capital of the global insurance industry is around 700 billion USD. Perhaps 200 billion is earmarked for catastrophe, including earthquake. This provides security for only 20 percent of today's economic losses, so to fully fund disaster risk needs around 1 trillion USD. Allowing for economies of scale might reduce this by one-third, but still the gap is enormous. The sector's contribution would be principally through skills, but more capital would flow as local capacity builds and commercial viability is demonstrated.

To capitalise microfinance for the world's poorest billion would also require massive amounts. Taking an average family of five, and an advance of 50 USD per family, would imply aggregate credit of 10 trillion USD, which implies capital of 200 billion USD at a reserve ratio of two percent.

There are UNFCCC adaptation funds but currently the committed funds remain at around 200 million USD annually[70]. Other sources include disaster relief, which could be switched to hazard reduction. The net effect on donors would be an increase at the beginning, then a fall as capacity grows, vulnerability reduces and resilience improves. Also, a portion of revenue raised under mitigation actions like emissions trading and CDM could be earmarked for adaptation, possibly via the adaptation funds.

Motivation of the private sector

The most important attractions are the prospect for a positive profit margin, and size. Image and corporate social responsibility alone do not justify sizeable commitments of resources. Assessing the profit margin requires good knowledge of the basic costs. For climatic risks there is a high degree of volatility, so the probable maximum loss (PML) is uncertain. If it is possible to create synergy by marketing adaptation products with other ones, that improves the margins. Also, if the regulatory regime permits flexibility in product design, that allows the provider to incorporate experience quickly and improve profitability. Corporates will look carefully at the long-term viability of the market before entering- is the public sector willing and able to perform its role? What is the likely size of the market, and what restrictions are there on foreign entrants?

Advantages of the private sector

Using the private sector has advantages. It applies cost/benefit to its actions to avoid inefficiency. In the context of climate risk, this means that high hazards are priced out as an option. Competition gives it an incentive to innovate. Global corporates can rapidly spread best practice. Numerous specialisms have evolved so that a variety of solutions can be tried out. In particular, insurers can provide efficient administration for climate risks, even when they do not carry the risk. But to achieve truly integrated adaptation, financial institutions need to work closely with other stakeholders to make a difference (See Figure 13).

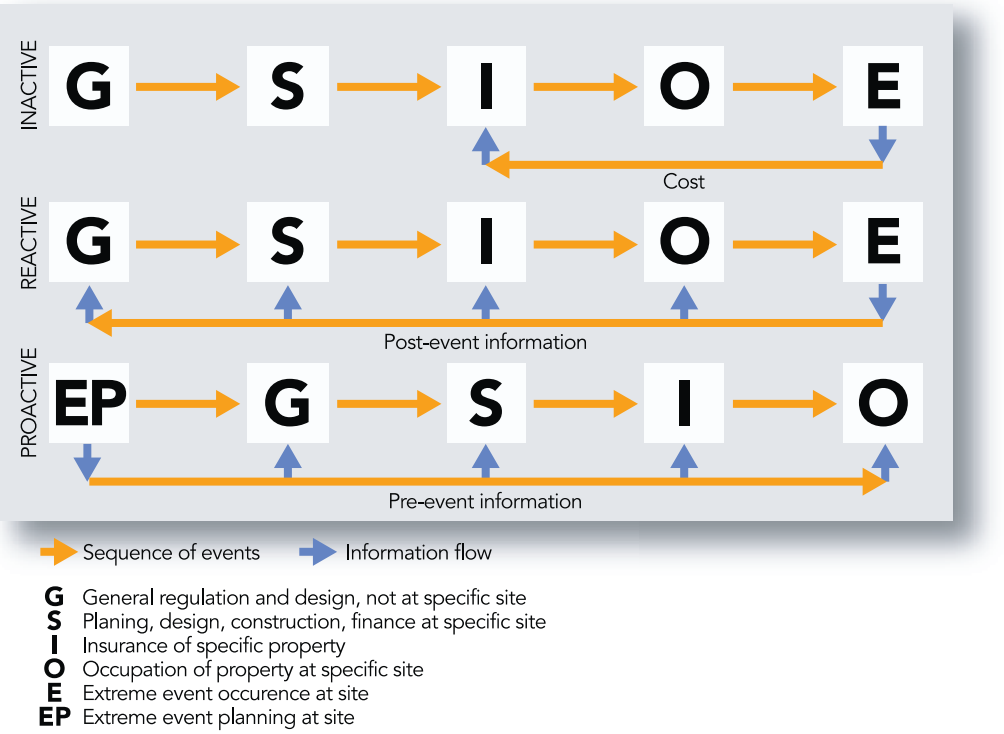

Figure 13:

An integrated property damage system

Conventionally, insurance is provided once property developments have taken place, in the inactive mode. If damage becomes more frequent, insurers begin to share information about their losses to raise awareness and justify their actions e.g. exclusions (the reactive mode). Climate change requires a third stage, into proactive mode, where insurers become partners in the process of infrastructure planning.

Source: Chartered Insurance Institute, 2001

Innovative approaches are already being developed, refined and scaled up, including micro-finance and -insurance, cat bonds, weather derivatives and pools or funds of micro-projects set up by ethical investors. The case studies in Part II cover the financial sector in action in four problematic situations: disaster recovery in developing countries, disaster recovery in a developed country, crop insurance, and flood insurance.

Part II
THE ROLE OF FINANCIAL INSTITUTIONS IN PRACTICE

Case study A:
Funding disaster recovery more effectively in developing countries

Experts in the disaster management field have become frustrated at the way things work. Presently for every nine dollars spent on disaster relief, just one goes on disaster prevention. Recovery is slow to start, and often the impacted population remains in a dependent status, rather than developing on a sustainable path. The examples that follow show that establishing a financial safety-net before disasters strike is a more viable route.

(i) The use of weather derivatives to provide disaster relief in Ethiopia

The World Food Programme (WFP) signed a contract in March 2006 with Axa Re for an indexed payout of 7 million USD in the event of a severe drought in the subsequent year, as measured by 23 weather stations in the region. Insurers were prepared to take on the risks because advances in technology meant it was easier to predict factors like rainfall. The premium for one year is 930,000 USD and has been met by a small group of donors, including the US, together with the Ethiopian government. The scheme has several benefits:

- Fast payout for Ethiopian farmers. The WFP says the scheme will enable it to get aid to those in need at the first signs of problems without having to wait for donors to respond to appeals. Money and food at the very beginning of a crisis is critical. The same amount of money available on day one can feed 20 to 30 percent more people than that amount of money that comes in the middle of a crisis. Later food prices go up and people's physical health deteriorates, making them less able to work and more vulnerable to disease;
- Avoidance of volatile demands for finance for WFP and donors;
- Minimal disruption of other WFP planned projects in other countries, through diversion of funds from development to disaster relief.

Other applications now in hand include a similar scheme for Mali if the Ethiopian project is a success. The World Bank is also exploring a concept called the Global Index Insurance Facility (GIIF), capitalised at 100 million USD initially. It would reinsure government and private sector institutions against specified weather events or commodity market fluctuations.

(ii) 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. 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.

Case study B:
Hurricane Katrina – Problems with disaster management in a developed country

Even developed countries are susceptible to climate disasters. Katrina revealed some weaknesses in the public and private sector approaches, and in their collaboration. By learning from previous experiences, private insurers coped relatively well, but other stakeholders suffered heavily. Many were under- or un-insured, either because they did not appreciate the need for insurance or could not afford it. Banks have survived the first effects, but there may be local issues if recovery falters.

In 2005, New Orleans was a major port of 500,000 people on the Mississippi delta, with 4,000 oil and gas installations in the nearby Gulf of Mexico. As well as being in the hurricane belt, the area is subject to subsidence in excess of 10mm per year. Urban development in low-lying areas had increased the exposure. In August 2005, Hurricane Katrina struck, with a storm surge of up to 8.5 metres. Up to 80 percent of the city was flooded, with 55 percent of the properties over 1.2 metres deep. The total number killed probably exceeded 2,000. Due to pollution from leaking sewage, chemical and oil facilities, the entire city was compulsorily evacuated. It was early December before access to the city was completely restored, but a large number may never return. Just 25,000 children are registered at school now, compared to 65,000 before. Employment is 30 percent down.

The effects were far-reaching. Areas that housed refugees had to provide services, damage to offshore installations drove up global energy prices, construction teams left other areas, and federal funding elsewhere was reduced to cope with the emergency relief. Currently, quality of life is poor for the residents. Recovery was complicated because repairs to hurricane damage in Florida in 2004 were still incomplete, and the record 2005 season included three major storms: Katrina (total economic damage 125 billion USD), Rita (16 billion USD) and Wilma (18 billion USD). Together they bankrupted the federal National Flood Insurance Program (NFIP), and created "demand surge", when recovery costs rocket due to labour and material constraints.

Katrina cost insurers over 40 billion USD, excluding 15 billion USD against the National Flood Insurance Program (NFIP), and 2 billion USD in offshore energy. Some commentators put the total cost at 350 billion USD[71]. Perhaps 35,000 homes were uninsured, because they were outside the government-defined flood zone. Reinsurers bore 45 percent of the private market costs, as opposed to 20 percent in the 2004 hurricane season, because their contracts are intended to respond more when events are very large. Although insurers deployed thousands of adjusters, they were denied access by the emergency. This allowed damage to deteriorate , and complicated the attribution of damage between flood and storm. (In the US, the private market excludes flood cover, which is available through NFIP). The delays increased living costs for consumers, and reduced business profits. Other aggravating factors were public disorder (theft, looting and arson), and fraud.

Important issues were identified by this disaster:

"Worst case" scenario Storm surge risk has been underestimated, with important implications for rebuilding and siting facilities like oil refineries. The zoning maps used by NFIP may need to be updated. Reinsurers raised their charges in 2006 by around 25 percent for hurricane risk, but for some risks e.g. less-sturdy drilling rigs, rates rose by 300 percent. Munich Re has identified eight other possible sites for catastrophic flood[72].

Risk transfer products Great hardship resulted from the absence of flood cover, and compensation is complicated by the existence of several different mechanisms. Only three percent of businesses had contingent business interruption coverage, which allows claims for economic losses, even if a business is not itself affected directly.

Macro-economic risk The financial impacts extended into the wider economy, especially energy markets. Two airlines sought bankruptcy protection.

Case study C:
Simplified insurance products help poor farmers to cope with abnormal rainfall

Traditional crop insurance is not commercially viable anywhere. Farmers understand their risks so well that only high-risk ones insure (anti-selection), and the costs of monitoring crops at field level is high. In India, this is compounded by the slow settlement of claims under the public sector scheme - often a year or more after the loss, which forces the farmer to borrow at high interest rates, default on loans or sell assets. Natural disasters affect whole districts, so that traditional social networks cannot cope. The very poor cannot diversify, and may not be able to manage debt, so weather index insurance is well-suited to their needs.

Rainfall insurance was launched in India in 2003. Since then, there have been major improvements in the product design and delivery. A key development was the partnership between BASIX, an Indian micro-finance institution based in Hyderabad, The World Bank's Commodity Risk Management Group, and private insurers.

Gestation started in 2000 when the private sector was legislated into being. In 2003, the weather insurance pilot was very small and the products and systems rather simple, with payouts based on the entire seasonal rainfall recorded locally. In 2004, 10 rainfall products were trialled, but still on a small scale. A major expansion took place in 2005. The product was no longer crop-specific, but focused on district as the risk factor. Administration was streamlined, and the product was marketed in six Indian states in several languages. Over 7,000 policies were sold, and other insurance companies and agents followed suit. The outlook for 2006 is further strong expansion, but growth may be limited by the availability of weather data. As customers gain confidence with insurance products, BASIX believes there is scope to package it with other livelihood enhancement products, thereby monsoon-proofing loans. This would provide protection for BASIX as well as its clients. Insurance for non-farming activities could also take off.

The premium rates are not low, at between five and 12 percent of sum insured, but experience shows that insurers will not participate unless the scheme is viable, and clients are willing to pay if the claim settlement process is fast and fair. In fact the underwriter, ICICI Lombard, now sells weather insurance via BASIX, other intermediaries, and retail (direct), for crops, and also salt and brick manufacture. The insurer identified three barriers. Better weather data will reduce basis risk[II] for clients and encourage improved reinsurance rates. Automatic reinsurance is needed to permit greater flexibility in writing new contracts and portfolios. Third, the government should revise its subsidy policy for yield-insurance products, which undermines the weather insurance market.

This initiative has succeeded due to strong collaboration between all the partners, with doorstep delivery, and quick claim settlements – even before harvesting is over, compared with customary delays of twelve months in public schemes. It featured iterative and collective product development and innovation.

All the stakeholders gain: government by reduced relief payments and social problems, and easier budgeting; the insurer by more business; the microfinance institution BASIX complements its client services; the poor farmers receive reliable protection for their income and assets; and overseas development agencies avoid disruption from emergency relief calls, and can claim speedier assistance for clients. Wider schemes would benefit intermediaries, by generating more revenue; and banks by protecting their credit risk.

The World Bank intends to replicate this success in other developing countries e.g. Thailand and Mali. One question that remains to be explored is, what difference will this make long-term to the farmers – how will they exploit their new resilience to climatic variability as they gain confidence?

II Basis risk refers to the possibility that the actual losses suffered may differ from the contractual pay-out under the derivative.

Case study D:
UK flood insurance - How public/private sector co-operation can make risks insurable

Normally, insurers are reluctant to provide cover for flood insurance, because of the risk of anti-selection. Only those at high risk will buy the product, so the premium fund will be small, set-up and administration costs will be uneconomic, and the risk of an extreme event and bankruptcy will be high. In fact, with climate change, small-scale floods are also multiplying in frequency. The UK shows that a public – private approach may enable cost-effective flood insurance, if the tendency to develop in risky areas is controlled.

Universal private-market flood insurance was introduced to the UK in 1961 due to government pressure. Cover was at a uniform rate everywhere, and was "bundled" with other risks like fire and theft in one product. On its side, government undertook to maintain flood defences. This arrangement has now broken down. Developers, local authorities and lenders ignore flood risk because insurance is available. New insurers discriminate between areas of different flood risk. And flood claims have mounted, culminating in huge claims in 1998 and 2000.

Insurers saw this as confirmation that climate change had arrived. Through their collective body, The Association of British Insurers (ABI), they had commissioned papers from 1994 onwards into flooding e.g. coastal flood risk, landuse planning, inland flood risk, risk mitigation, sewer infrastructure (In 2004, ABI even made funding of flood defences an electoral issue in the national elections). Most of the 2.2 million properties in flood risk areas are already protected to a minimum standard of one in 75 year-flooding, but ABI set out its policy for the future in the Statement of Principles on the Provision of Flood Insurance, effective from 1 January 2003:

1. In low and medium risk areas (i.e. less than one in 75 year flood risk), ABI members will provide flood cover as a standard feature, with differentiated premiums to reflect different degrees of risk.
2. In areas scheduled to become low-medium risk within five years, cover will continue for existing clients. Policy conditions will reflect the risk. Transfers of ownership will be considered sympathetically.
3. In other high-risk areas, insurers will work with existing clients and the authorities to continue to provide cover. This might include the use of flood resilient materials and temporary defences to defend the property.
4. No commitments are given for new clients in high-risk areas.

In return, ABI expects government action on five key areas: protection for most of the high-risk houses that remain; maintenance of investment in flood management in real terms, taking account of climate change; reform of the land-use planning system to ensure sustainable developments; effective communication to the public about flood risk; and improvements to urban drainage to alleviate the risks of sewer flooding and flash-flooding.

Inappropriate development in flood risk areas is key. One government department is pressing for huge growth in such areas, and currently local authorities are able to ignore precautionary advice from environmental agencies.

Individual companies are making great use of geographical information systems to underwrite individual properties. Aviva, a founder insurance member of UNEP FI, undertook its own aerial survey to create more accurate topographical maps and identified 650,000 homes within official flood risk areas which were actually low-risk, so insurable. The company now sells the raw data to other insurers and agencies. Other insurers have found that by using social-housing landlords to distribute "insurance-with-rent" products they can overcome the problem of financial exclusion, which affects half of the poorest households,

without incurring an undue degree of anti-selection in flood- or crime-prone areas.

Key aspects of the private UK flood insurance system are that it admits all floods, not only disasters, and that it discriminates risk, but also treats existing clients sympathetically. Administration cost is reduced by the “all-risk” cover. Finally, insurers act collectively on policy, but not as a cartel on competitive matters.

Part III
THE WAY FORWARD: BARRIERS TO INTEGRATED ADAPTATION

There are six types of obstacles that prevent us coping with the impacts of climate change. Often they interact to reinforce each other and create a situation of low adaptive capacity.

Financial In many cases the immediate cost of adaptive solutions is beyond budget. The UNFCCC process has been slow to generate funds for developing countries to research impact problems, build capacity and implement adaptation projects. Progressively, the magnitude of impact damage will remove options as insurability ceases. For the financial sector, adaptation projects need to have a profit margin, at least in the scaled-up stage. For other stakeholders, the cost of conventional financial products is a barrier. In the case of natural systems and public goods like forests, wild creatures, and clean water and air, often no value is attached to them, but they are at risk from climate change. This impedes the use of financial instruments and markets to preserve them.

Cognitive Often there is a view that climate is too variable to plan for, or that climate change is a remote issue. Also, basic data may be unavailable, or too imprecise for practical decisions. Specifically, accurate and timely weather data are essential for designing and using weather derivatives, but often the quality is poor and access is expensive and bureaucratic. In its reviews, IPCC notes there is a dearth of studies that quantify the effects of climate change or even past climatic variability.

Social/cultural Adaptation can be stymied by unwillingness to accept radical solutions like relocation, or attitudes to risk. Political correctness may avoid examining worst-case scenarios if they contravene other objectives like the MDGs. In general, shorter-term issues get much more attention. Disadvantaged sections are unable to participate due to lack of skills and knowledge.

Institutional. Agencies are not well co-ordinated between different levels of government, or across departments and economic sectors. In the triad of disaster management, environment and economic development, the first two are clearly subordinate, especially in the budgetary process. Three non-communicating circles of experts have sprung up to service these different goals. Funding is guarded jealously, and allocated without thinking of “triple dividends”. Donors to developing countries like Pacific Islands are more inclined to fund massive infrastructure than less costly “integrated adaptation” solutions like public health. In New Zealand, central government policy states that coastal development must allow for SLR, but there is no guidance or support for capacity-building at local level. Meanwhile home owners and commercial interests challenge local government policy that restricts development. Consultation is often sketchy, and excludes the most vulnerable sections.

Engaging the OECD financial sector in developing countries is difficult due to trade barriers and low standards of governance and fiscal prudence. The private financial sector in developing countries is very weak. Financial regulation often hampers innovation or risk transfer. In the EU, weather derivatives and cat bonds are not "insurance", so insurers cannot provide them. The "true and fair" accounting focus on actual events in corporate performance cuts against “smoothing" the cost of disasters. This undermines the appetite for such risks. In some jurisdictions, insurers are not free to charge what they believe is the risk-justified premium, which also restricts the market. Unlike other industries, the financial sector does not represent itself at climate negotiations in a high-profile way, which weakens its influence.

Technological Some solutions may be judged too risky, like very high sea-walls, or impractical as in the quantities of water needed for conventional irrigation.

Physical/ecological The entire disappearance of critical subsystems like glaciers or species will remove choice, although it may not happen for some decades.

Private sector partnerships in the "triple dividend" workspace

MCII (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:

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 organisations. Identify success stories and disseminate information on success factors.
4. Promote loss reduction measures for climate related risks.

Currently it is engaging other stakeholders in the UNFCCC arena to identify the most fruitful starting-point.

ProVention was established by the World Bank in 2000 to address the increasing frequency and severity of natural disasters and their impacts on developing countries. The initiative comprises a range of stakeholders, but only three corporates, including Munich Re and Swiss Re, from the private sector. Its methodology is:

- Forging linkages and partnerships among key actors and sectors involved in disaster risk management;
- Advocating greater policy commitment to disaster risk management by leaders and decision makers;
- Developing and promoting innovative approaches and applications for reducing risk;
- Sharing knowledge and information from ProVention partners and projects about good practices, tools and resources for disaster risk management.

All ProVention activities are intended to contribute to these four overarching and interconnected objectives and to the Hyogo Framework for Action, and reports and projects are often relevant to adaptation.

RECOMMENDATIONS

Dangerous climate change is approaching fast. Within 35 years the cost of climate damage could rise to 1 trillion USD in a single year. Adaptation can avoid that scenario, with many other benefits. The bulk funding will need to come from the public sector, but the private sector can play a vital role in the process.

Financial Sector

Mainstream climate change

- Factor climate change explicitly now into risk assessments like insurance pricing, the Equator Principles for project finance, equity portfolio management. Screen individual client transactions for climate change risk automatically in all processes, including lending and insurance. Where appropriate hedge weather risks to protect investments. Incentivise climate resilience in financial product design and marketing.

Supply new products and services for adaptation

- Work with other stakeholders to make climate insurance workable, e.g. by applying risk modelling techniques. Where it is not, provide services for public schemes;
- Establish centres of expertise for financial service businesses at the micro-level in developing countries;
- Investors should consider new opportunities in cat bonds and developing world-adaptation funds. Ensure that climate change is treated as a priority in all asset management;
- Be proactive in providing services for adaptive technologies.

Have good contingency plans

- Prepare for worse disasters in terms of local size, duration, and contingent macroeconomic impacts.

Work with policymakers

- Take a stronger role in climate policy to ensure that integrated adaptation happens;
- Support the public sector in its capacity building and adaptation plans for public and ecological goods.

Policymakers

Mainstream climate change

- Ensure that all sectors and levels of government embody climate change as a priority in their policymaking, by including projected impacts in their planning.

Adopt integrated adaptation to achieve a “triple dividend”

- Integrate climate change issues into development policy and disaster management;
- Introduce regulations to promote climate-resilience in development and infrastructure, and enforce them;
- For vulnerable sectors change the agenda from disaster relief to development by capacity building, pilot adaptation scheme funding, and the introduction of private sector resources like microfinance. Build on weather hedging to establish sustainable growth;
- Build capacity through economic diversification, infrastructure and technical training. Sponsor pilot schemes that introduce the private financial sector into the equation, using market systems whenever possible.

Improve information about climate risk

- Prioritise the identification of major climatic hazards, and make basic data and research accessible. Specifically, ensure that accurate and timely data are available at reasonable prices to support the growth in weather derivatives and other risk transfer products, especially in developing countries;
- Carry out awareness-raising and consultation programmes to engage all stakeholders in adaptation;
- Prepare for disasters on the basis that they will be greater than any seen to date in terms of local size, duration, and contingent macroeconomic impacts.

Encourage the development of new financial markets for ecological services

- Actively examine whether the monetisation of ecological goods and services that are vulnerable to climate change could help to preserve them, and where appropriate develop new financial markets for them.

Work with the private finance sector

- Consult the financial sector on adaptation. Because it provides services to a wide range of end-users, it is not so self-serving on climate change as some other sectors;
- Specifically, sponsor regulation that supports catastrophe insurance, with appropriate public sector commitments e.g. an insurance guarantee fund, subsidies for insurance premiums for poorer at-risk segments, or “soft” capital for catastrophe funds. As a general principle, premiums should be matched with the underlying risk. Allow companies to smooth the cost of extreme events. Promote a risk transfer system providing a seamless solution for victims, not disjointed recovery problems.

In developed nations

- Support the use of integrated adaptation policies to make developing nations more resilient.

In developing nations

- Strengthen institutions to ensure good governance and encourage the private sector to invest resources;
- Manage public finances prudently to ensure economic stability;
- Reduce trade barriers against financial services to encourage the influx of new resources and best practices.

Endnotes

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