

Climate Change Risks and Financial Sector

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Abstract— Worldwide, the number of weather extremes is rising. Natural disasters in developing countries and even the floods in Europe are just examples for this fact. People living in vulnerable areas of developing countries are the most affected by the effects of climate change. To reduce emissions of greenhouse gases (GHG), which are the main causes for climate change, national and international regulation is emerging. Climate change does not only affect communities and societies but also companies and the financial sector. Extreme weather events can ruin companies and destroy economical values. The insurance industry and other institutional investors have begun to take climate and CO2 risks into consideration. This paper presents an overview of the climate change risks and financial sector.

Index Terms— climate change, financial sector, international practices

I. INTRODUCTION

The consequences of climate change are continually stronger felt, and the sum of each single event (the flood of the Elbe river, Storm Lothar, Storm Wiebke,) make it obvious to the national and global economies that global climate change is becoming evermore relevant. Moreover most of the victims of climate change are not in the industrial countries, but rather in the rural areas of developing countries.

Those in the insurance business were the first in the financial sector to feel the consequences. German watch already offered an expert workshop to address this issue on September 16, 2002, at which climate-insurance solutions for the "insurable" in developing countries was a topic, among other things [1].

However, more actors in other areas of the financial sector are making their voices heard, especially those who demand a stronger consideration for the risks that climate change brings. It is about developing appropriate risk management plans for the direct risks, such as flood and storms, as well as for the indirect climate risks, for example the regulation of greenhouse gases.

There are indications that those who make the investment decisions for billions of Euro, like insurers, banks and pension funds, are increasingly realizing that there is a link between our climate, carbon risks and investment policies. Companies in the finance sector are able to manage risks and to contribute actively to the protection of our climate subsequently through their risk awareness and following investment policies and decisions.

This paper presents an overview [1]-[4] of the climate change risks and the financial sector.

II. THE IMPORTANCE OF CLIMATE CHANGE FOR THE FINANCIAL SECTOR

Direct Effects of Climate Change

The financial sector is directly affected by the direct consequences of climate change (flooding, storms, droughts....).

Further risks threaten through the regulative risks of climate change. Other possibilities or even probable consequences are mentioned in the IPCC Third Assessment Report [2]. The next section will present extreme climate-related phenomena and their effects on the insurance industry: observed changes and projected changes during the 21st century.

Legal Liabilities and Risks

Two lines of argumentation run together here. To the first belongs the duty of institutional investors to avert damages for the investors. Ignoring the risks of climate change or even the absence of a management strategy plan for climate risks could lead to loss and eventually lawsuits from investors. This hazard is still too unknown and not thoroughly researched.

Risks for investors threaten over a different path as well: Some of the victims of climate change are currently looking into lawsuit possibilities against some of the bigger greenhouse gas emitters. The time is coming soon for states and corporations, who fall into this category of large greenhouse gas emitters, when they will have to change their damaging behavior. The commitment to compensate damages, which has already been developed (and which, because of the idleness of the climate regime, is still being developed), could also be sued. Several lawsuit options are being discussed on the Internet site [5].

III. CLIMATE EVENTS THAT ARE RELEVANT TO THE INSURANCE AND OTHER FINANCIAL SERVICES SECTORS

Most weather extremes have relevance for the financial sector.

Hot Temperature Extremes

Hot summers are likely to become more common as a result of global warming.

Cold Temperature Extremes

As a result of global warming, cold extremes of winter weather are likely to become rarer. In temperate latitudes, this development generally would be beneficial for business

activities in, for example, the construction and transport sectors, with concomitant reductions in claims for business interruption.

Heavy Rainfall and Flooding

IPCC TAR WGI [3] indicates that "many models" now project that conditions in the tropical Pacific may become more El Niño-like, with associated changes in precipitation patterns.

Low Rainfall—Drought, Land Subsidence, and Wildfire

Drought is important for the financial sector through impacts on commercial agriculture, building foundations, and wildfire occurrence. Fig. 1 shows the cost of subsidence claims to the industry from 1975 to 1997 in England and Wales. There is a clear relationship with rainfall (with some lag effects).

Similar effects are seen in France. Where insurance is used as the mechanism to finance repairs to building foundations, as in the UK and France, costs for domestic properties can be higher than where the damage is not insured, as in Australia.

Adaptive responses such as stronger foundations in new buildings and repairs to older housing capital should reduce the problem.

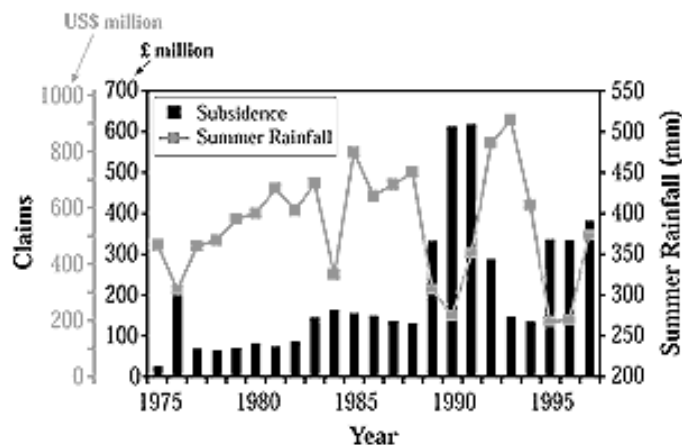


Fig. 1 Summer rainfall and subsidence claims in the UK: 1975-1997. Rainfall data are for England and Wales, April to September (from Climatic Research Unit, University of East Anglia, UK). Subsidence claim costs are in original-year values (from Association of British Insurers).

Lightning Strikes

Model experiments are not able to tell us anything directly about changes in lightning occurrence as a result of global warming.

Tropical and Extra tropical Windstorm

Experiments with climate models to date have not produced a consensus regarding the likely future occurrence of

tropical and extra tropical windstorms. Both have a very large capacity to cause damage.

Sea-Level Rise

Increases in sea level pose a major potential risk to coastal zones, especially if they are associated with an increase in storminess. The mid-range increase in sea level by the year 2100 as a result of anthropogenic climate change is 49 cm, taking into account atmospheric aerosol concentrations, with estimates ranging from 26 to 72 cm.

IV. CLIMATE CHANGE IN AFRICA

Africa is highly vulnerable to the various manifestations of climate change. Six situations that are particularly important are:

- Water resources, especially in international shared basins where there is a potential for conflict and a need for regional coordination in water management
- Food security at risk from declines in agricultural production and uncertain climate
- Natural resources productivity at risk and biodiversity that might be irreversibly lost
- Vector- and water-borne diseases, especially in areas with inadequate health infrastructure
- Coastal zones vulnerable to sea-level rise, particularly roads, bridges, buildings, and other infrastructure that is exposed to flooding and other extreme events
- Exacerbation of desertification by changes in rainfall and intensified land use.

The historical climate record for Africa shows warming of approximately 0.7°C over most of the continent during the 20th century, a decrease in rainfall over large portions of the Shale, and an increase in rainfall in east central Africa. Climate change scenarios for Africa, based on results from several general circulation models using data collated by the Intergovernmental Panel on Climate Change (IPCC) Data Distribution Center (DDC), indicate future warming across Africa ranging from 0.2°C per decade (low scenario) to more than 0.5°C per decade (high scenario). This warming is greatest over the interior of semi-arid margins of the Sahara and central southern Africa.

Projected future changes in mean seasonal rainfall in Africa are less well defined. Under the low-warming scenario, few areas show trends that significantly exceed natural 30-year variability. Under intermediate warming scenarios, most models project that by 2050 north Africa and the interior of southern Africa will experience decreases during the growing season that exceed one standard deviation of natural variability; in parts of equatorial east Africa, rainfall is predicted to increase in December-February and decrease in June-August. With a more rapid global warming scenario, large areas of Africa would experience changes in December-February or June-August rainfall that significantly exceed natural variability.

V. CLIMATE CHANGE IN THE AUSTRALIA AND NEW ZEALAND REGION

This region spans the tropics to mid-latitudes and has varied climates and ecosystems, including deserts, rainforests, coral reefs, and alpine areas. The climate is strongly influenced by the surrounding oceans. The El Niño-Southern Oscillation (ENSO) phenomenon leads to floods and prolonged droughts, especially in eastern Australia and parts of New Zealand. The region therefore is sensitive to the possible changes toward a more El Niño-like mean state suggested by Working Group I. Extreme events are a major source of current climate impacts, and changes in extreme events are expected to dominate impacts of climate change. Return periods for heavy rains, floods, and storm surges of a given magnitude at particular locations would be modified by possible increases in intensity of tropical cyclones, mid-latitude storms, and heavy rain events (medium confidence) and changes in the location-specific frequency of tropical cyclones (low to medium confidence). Scenarios of climate change based on recent coupled atmosphere-ocean climate models suggest that large areas of mainland Australia will experience significant decreases in rainfall during the 21st century (low to medium confidence).

Before stabilization of greenhouse gas (GHG) concentrations, the north-south temperature gradient in mid-southern latitudes is expected to increase (medium to high confidence), strengthening the westerlies and the associated west-to-east gradient of rainfall across Tasmania and New Zealand. Following stabilization of GHG concentrations, these trends would be reversed (medium confidence).

VI. CLIMATE CHANGE IN EUROPE

The adaptation potential of socioeconomic systems in Europe is relatively high because of economic conditions (high gross national product and stable growth); a stable population (with the capacity to move within the region); and well-developed political, institutional, and technological support systems. However, adaptation potential for natural systems generally is low. [very high confidence]

Present-day weather conditions have effects on natural, social, and economic systems in Europe in ways that reveal sensitivities and vulnerabilities to climate change in these systems. Climate change may aggravate such effects. [very high confidence, well-established evidence]

Vulnerability to climate change in Europe differs substantially between sub regions; it is particularly high in the south and in the European Arctic. This has important equity implications. More marginal and less wealthy areas will be less able to adapt. [very high confidence, established but incomplete evidence]

VII. CLIMATE CHANGE IN LATIN AMERICA

The Latin America region is remarkably heterogeneous in terms of climate, ecosystems, human population distribution, and cultural traditions. Land-use changes have become a major force driving ecosystem changes. Complex climatic patterns, which result in part from interactions of atmospheric

flow with topography, intermingled with land-use and land-cover change, make it difficult to identify common patterns of vulnerability to climate change in the region. Water resources, ecosystems, agriculture and plantation forestry, sea-level rise, and human health may be considered the most important among the various sectors that may be impacted by climate change.

VIII. CLIMATE CHANGE IN NORTH AMERICA

North America has experienced challenges posed by changing climates and changing patterns of regional development and will continue to do so. Varying impacts on ecosystems and human settlements will exacerbate sub regional differences in climate-sensitive resource production and vulnerability to extreme events. Opportunities may arise from a warming climate, and some innovative adaptation strategies are being tested as a response to current challenges (e.g., water banks), but there are few studies on how these strategies could be implemented as regional climates continue to change. Recent experience demonstrates high capability in emergency response to extreme events, but long-term problems remain.

IX. CLIMATE CHANGE - IMPLICATIONS FOR THE INSURANCE INDUSTRY

According to IPCC the balance of evidence suggests a discernible human influence on global climate change. The global mean surface air temperature is expected to increase by 1 to 3.5 °C by the year 2100. Sea levels are expected to rise beyond critical levels in several regions, as a consequence of thermal expansion and melting of ice masses.

According to simulations based on known physical mechanisms, man-made global warming would contribute to an enhanced global mean hydrological cycle and to shifts in atmospheric and oceanic circulation patterns. This may affect regional storm paths and alter the frequency and intensity of extreme weather events and/or their geographical distribution. The exact influence is not yet known due to the limitations of today's understanding of the climate system.

Even small shifts in regional climate zones and/or storm patterns carry the risk of a large increase in property damage, exacerbated by inadequate planning and construction, in certain areas. Because of the non-linearity of the relationship between the intensity of a meteorological event and the property damage incurred, damage can increase rapidly (e.g. increasing the wind gust speed of a 200 km/h storm by 10 % leads to a damage increase of about 150%). Especially when a critical value for the intensity is surpassed and protective measures fail, property damage increases sharply.

A change in weather patterns is likely to affect the property insurance industry, since it underwrites risks related to natural events such as storms and heavy rainfall. Already, computer simulations show that in several areas of the U.S.A. a single storm could result in economic damage of US\$ 100 billion, of which 50% can be expected to be insured. Other lines of insurance are also likely to be affected. For example, changes in human health (e.g. due to spreading of diseases) may affect the life assurance and pension industries. Shifts in agricultural

production due to climate change may affect crop insurance, adding to the inherent difficulties of loss control and evaluation in this field.

There are also likely to be implications for investment activities as society plans for, and adapts to, the new climate regime. The economic situation of selected regions, such as coastal zones and islands, or of whole industries could be affected. As much as one third of investments in global stock markets (with a total capitalization of more than US\$ 15 trillion) are presently managed by the insurance industry and pension funds. It is therefore in the interests of the industry to understand better the investment opportunities and challenges which will arise from measures to reduce greenhouse gas emissions and to reduce the vulnerability of society.

X. INVESTORS DEMAND DISCLOSURE ON CLIMATE CHANGE RISKS

A group of leading US institutional investors who represent more than €841 billion has launched an “Investor Network on Climate Risks” at the United Nations this month. The group has called upon the US Securities and Exchange Commission to enforce corporate disclosure rules to analyze how climate change risks could affect companies. UN Secretary General Kofi Annan and former US vice-president Al Gore supported the move.

The issue of climate risks is also the focus of two new investor reports: asset management company SAM (Sustainable Asset Management) has published a new study to help investors make better-informed decisions regarding automotive company stocks in light of emerging “carbon constraints”, while financial analysts Innovest and WWF (World Wide Fund for Nature) have just released new research that analyses the financial climate risks and opportunities faced by 14 major international electric utilities companies.

XI. HARD NUMBERS ON THE COSTS OF CLIMATE CHANGE CREATE MOOD OF URGENCY

The global expansion of the Carbon Disclosure Project (CDP) is firmly under way. Signatories, from Africa, Asia, Europe and North America, now represent over \$10 trillion in assets – more than double last year’s total. Responses from the FT500 Global Index companies are also up sharply, from 47% to 59%. Moreover, survey data are more diversified by industry, and more sophisticated in content, than previously. The total emissions from operations reported to CDP across all sectors equaled 2,886,033,085 tones of CO2 equivalent (CO2e), or roughly 13% of all emissions from fossil fuel combustion worldwide.

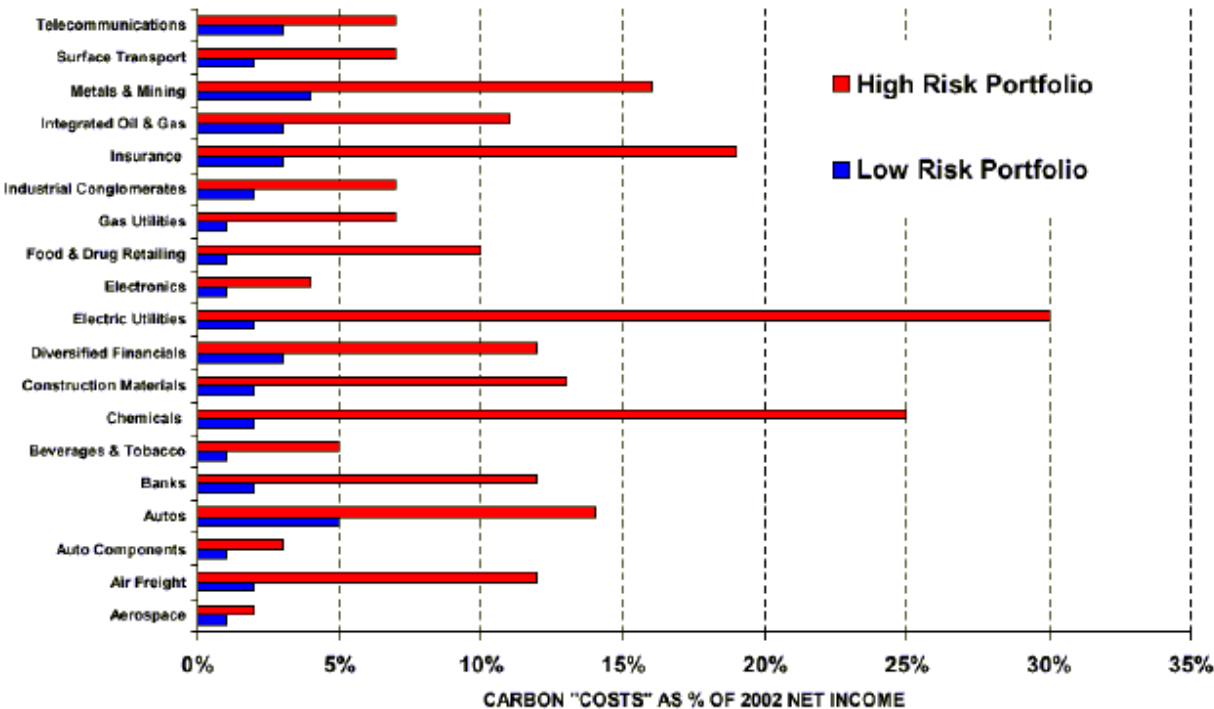


Fig. 2 Financial impacts of climate changes

XII. CHANCES CLIMATE CHANGE OFFERS THE ECONOMY

The production sector has not yet realized the changes and possibilities that will come with climate change. The financial sector should be challenged to approach the hindrances in the financing of, for example, greenhouse gas-friendly

technology. (Or if necessary, demanding action from the politicians.) With all pressure: climate-friendly attitude shall pay off. There are more and more cases where it already has positive impacts on corporations' budgets and in any case it will mean a reputation gain for individual corporations. Protecting the climate can be added to the marketing scheme. A difference between those corporations with high carbon risk and those with small carbon risk will be evident, Fig. 2.

The carbon-producing market is a self-preserving one. "Business as usual" is heard almost everywhere. Carbon certificates play only a very small role in trading, and stay at a very low level in reference to volume and trading. One cannot expect that carbon certificates will be worth 30-50 US\$ per ton in the near future. Considering the current weakness of emission targets, the price level will probably be about 10 US\$ per ton, compared to today's 3-5 US\$.

XIII. THE NEED FOR INTERNATIONAL COOPERATION, RESEARCH AND PREVENTATIVE ACTION

Based on the current status of climate research and on their experience as insurers and reinsurers, the member companies of the Insurance Industry Initiative for the Environment in Association with UNEP (UNEP Insurance Industry Initiative) are convinced that global climate change entails significant environmental, economic, social, and geopolitical risks. A precautionary approach should be taken in dealing with the issue by international cooperation, research and preventative action.

International Cooperation, Research

The risks of climate change can only be counteracted by the joint efforts of governments, political and social institutions, industrial and commercial enterprise (including the insurance industry), and of all individuals. This requires mechanisms, which allow input from a wider range of stakeholders, including the private sector.

Developed countries need to take the lead in redirecting their economies to a path of reduced per capita greenhouse gas emissions. The developing countries are encouraged to identify the areas where they need assistance in terms of information, technology, capacity building etc. In particular, developing countries should take note of the environmental problems already being experienced in the developed areas of Europe, America and Asia. They need to raise public awareness of the need to follow a sustainable development path or future generations will have to face a heavy bill. Ultimately, only if all nations contribute to a preventative climate policy, can the overall goal of stabilization of atmospheric greenhouse gases be achieved.

To achieve climatic objectives at a minimum cost flexible, market-based policies should be favored. These include international technology transfer, joint implementation and international emissions trading schemes. Counterproductive subsidies should be eliminated and a fiscal framework for energy consumption established which is truly sustainable.

Additional research concerning climate issues is needed to reduce uncertainty but cannot eliminate it entirely. We urge the parties to the United Nations Framework Convention on Climate Change (UNFCCC) to support scientific research to establish what concentration level and rate of increase of greenhouse gases are likely to be dangerous for society and to find an agreement on a safe path in managing climate risks.

Preventative Action

In accordance with a precautionary approach, considering the risks associated with different emission scenarios, and taking into account the inertia of the climate and of the socio-economic systems, we urge the Parties to the UNFCCC to agree on measures, which will decouple the emission pathway from a business-as-usual scenario.

Policy-makers have a leadership role in establishing and enforcing long-term priorities and values in the management of natural hazards. This encompasses short and long-term planning of land-use, infrastructure projects and building quality regulation, education, and implementation of incentives (or disincentives) to promote sound risk management by all sectors of society.

Cost-efficient technological options are available to achieve considerable greenhouse gas reductions and other societal goals. Structural barriers that prevent the introduction of such options should be removed. Efficient energy conversion technologies (e.g. cogeneration, fuel cells, high-efficiency gas turbines), renewable energy technologies, demand-side energy management and carbon-free energy sources should be promoted.

XIV. COCLUSIONS

Throughout the paper it became clear that the risks for capital investments are increasing. Climate experts impressively elucidated the predictions of the IPCC Third Assessment Report, where the increase in various strong weather events is viewed as probable or very probable. It would be helpful to quantify these scenarios for further predictions and damage prognoses.

Many paths were revealed for which further success-promising work could be done: report formats, transparency, and further examination of action courses for share and stakeholders, etc.

An important short - middle term goal is bringing the sustainability ratings of corporations into a form with which the language of analysts and fund managers is compatible and which can be a helpful tool in the investment-making process.

Already action is being taken in the area of climate risks and investment decisions, suggestions that came from this workshop. One of these is the work of the Carbon Disclosure Project and another is a German watch project, "Institutional investors and climate protection.

XV. REFERENCES

- [1] <http://www.germanwatch.org/klak/ws02vers.htm>
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XVI. BIOGRAPHY

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