



The Effects of Climate Change – an Insurance Perspective

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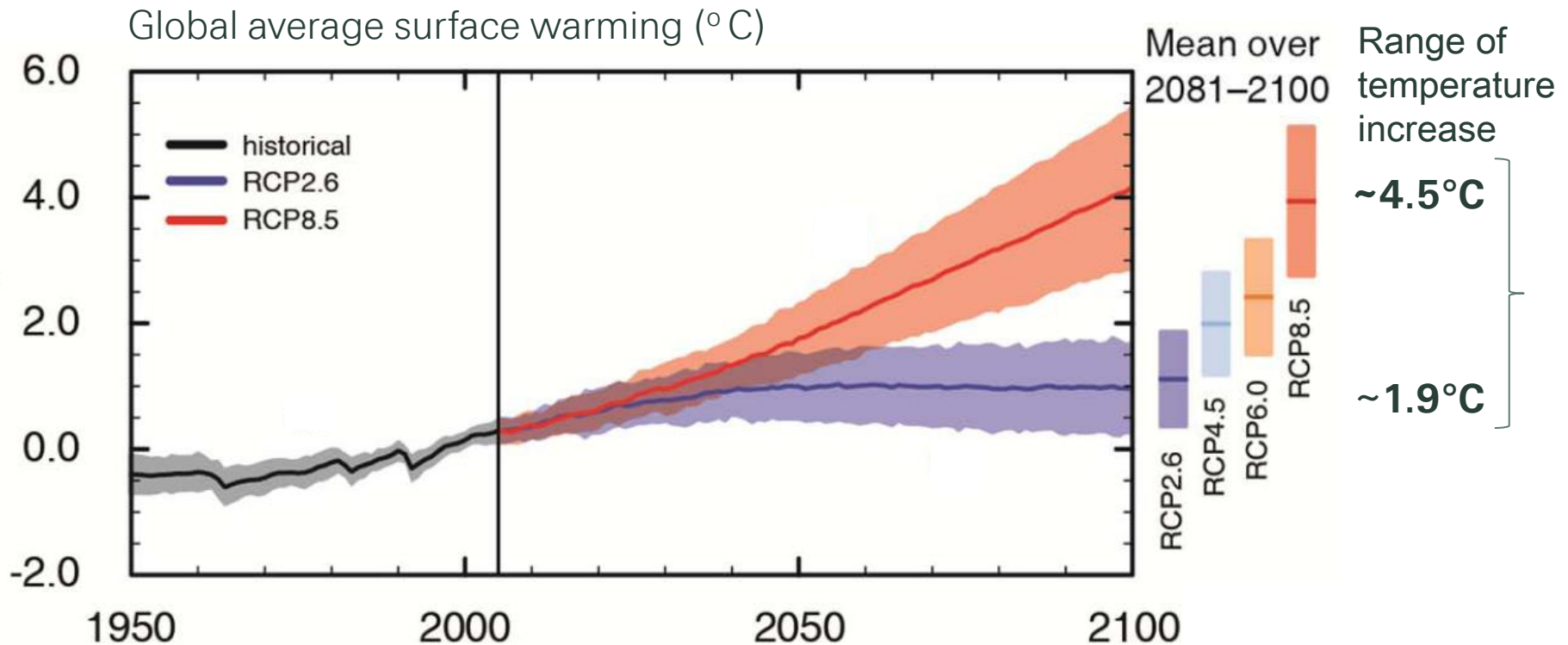
Contents

- The need for climate adaptation
- Swiss Re's climate strategy
- Business Opportunities
- Economics of Climate Adaptation





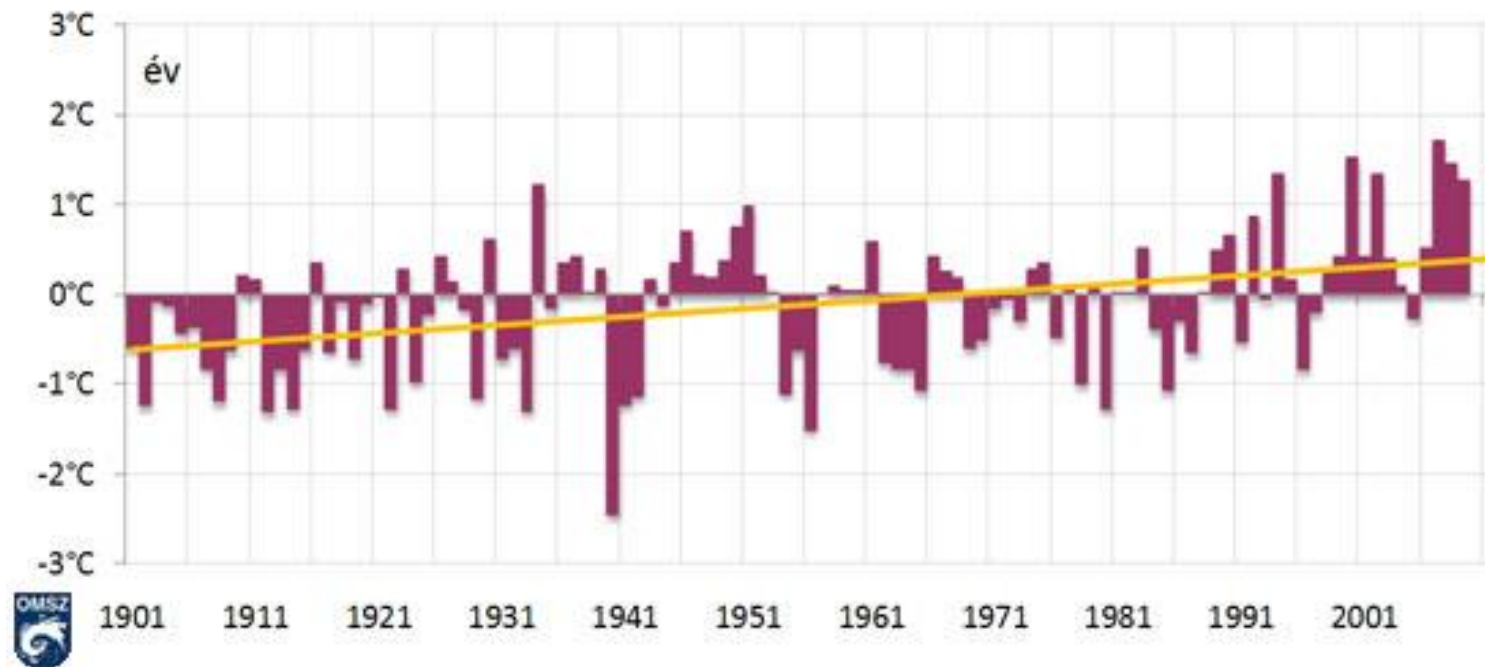
Scientists expect a rise of the global mean temperature between 2 and 4°C



Source: IPCC AR5, Sep 2013

- A 2°C outcome would be desirable, but very unlikely to be achieved
- Even if we stop all emissions today, climate is still going to alter
- We need to adapt to a changing environment

Observed rise of the Hungarian mean temperature between 1901-2009*



Source: Országos Meteorológiai Szolgálat

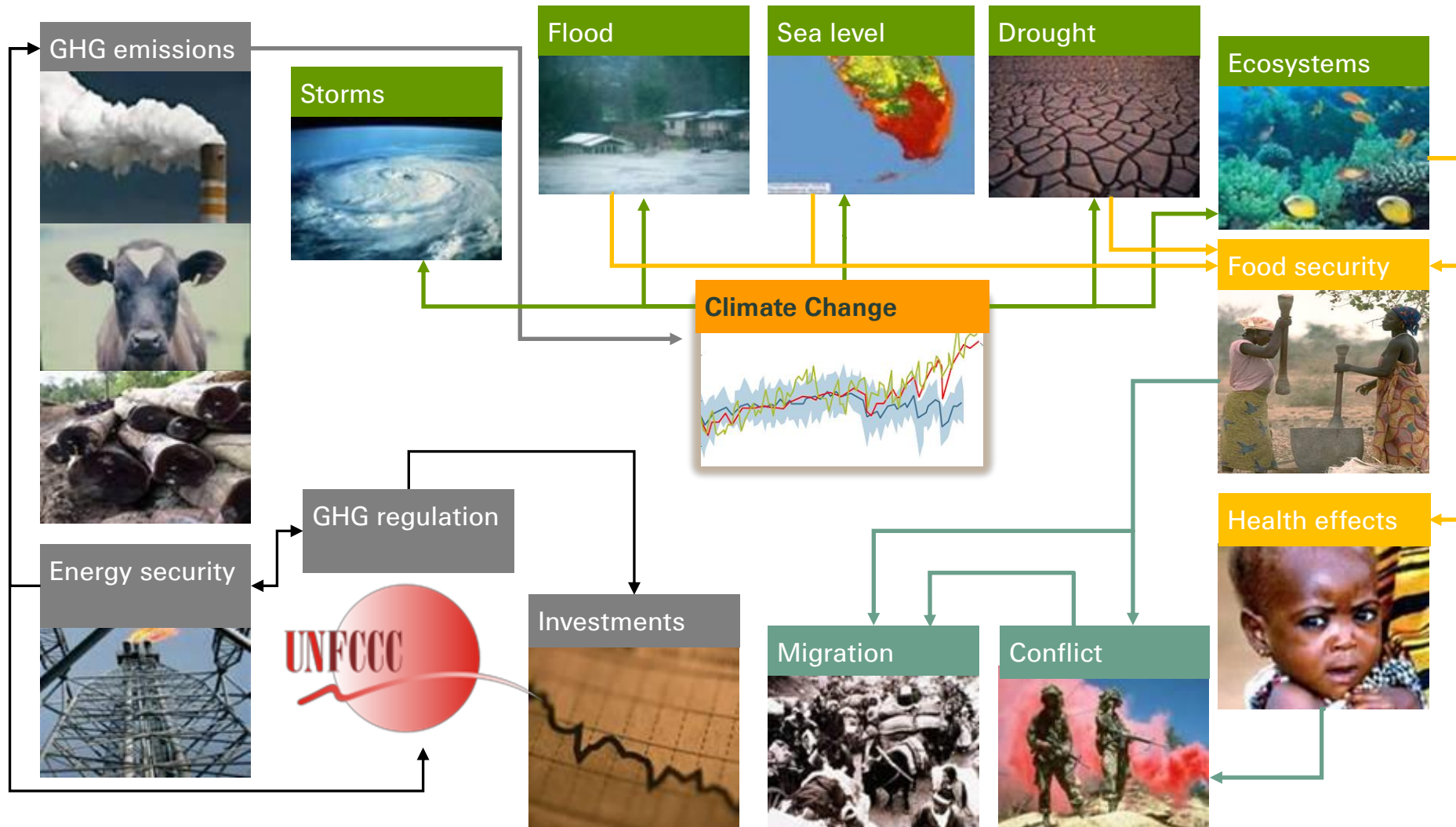
→ Rise in the mean temperature by 1°C between 1901-2009

→ Significant rise between 1980-2009 by 1.5°C

*Compared to the average of the period 1971-2000

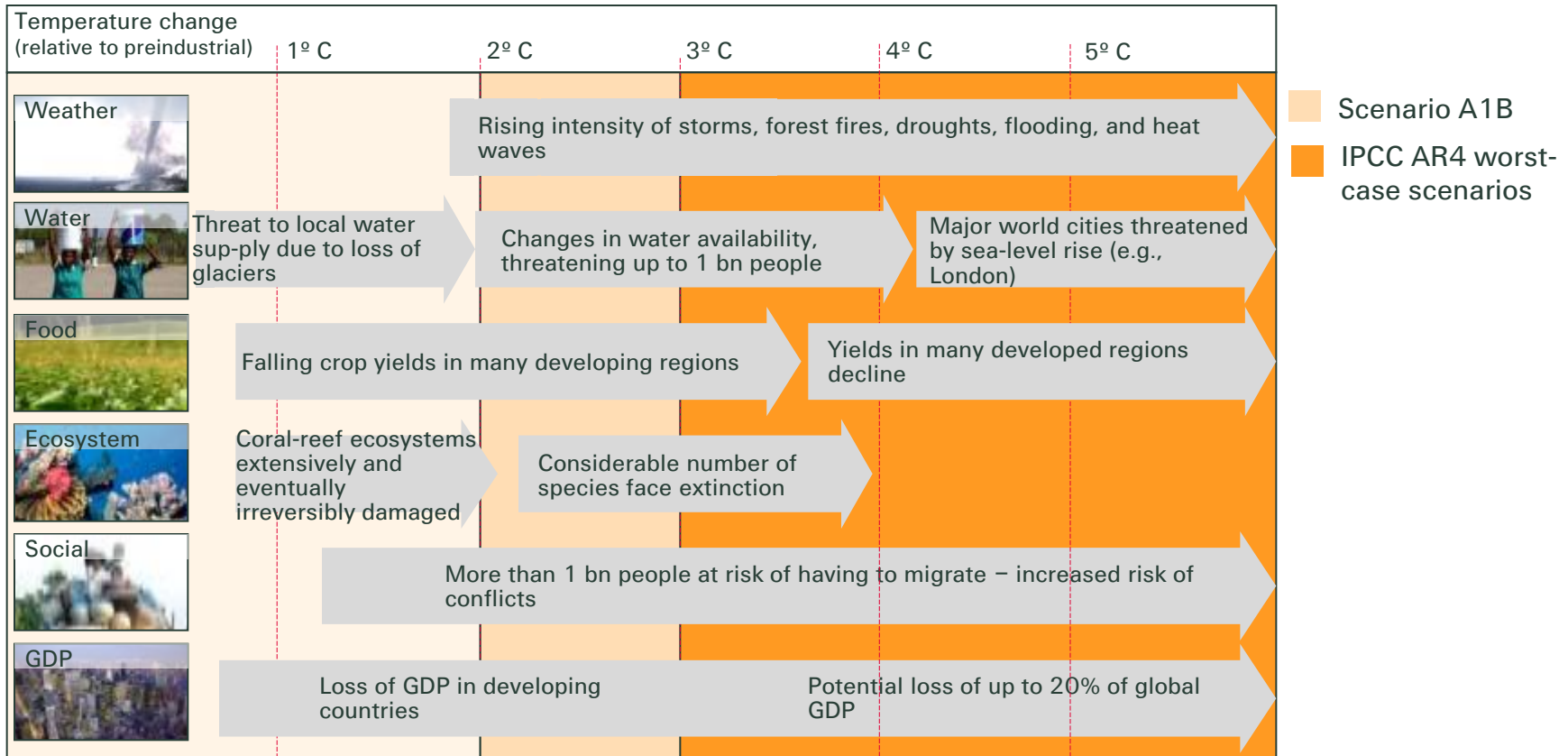


Climate risks are highly inter-connected





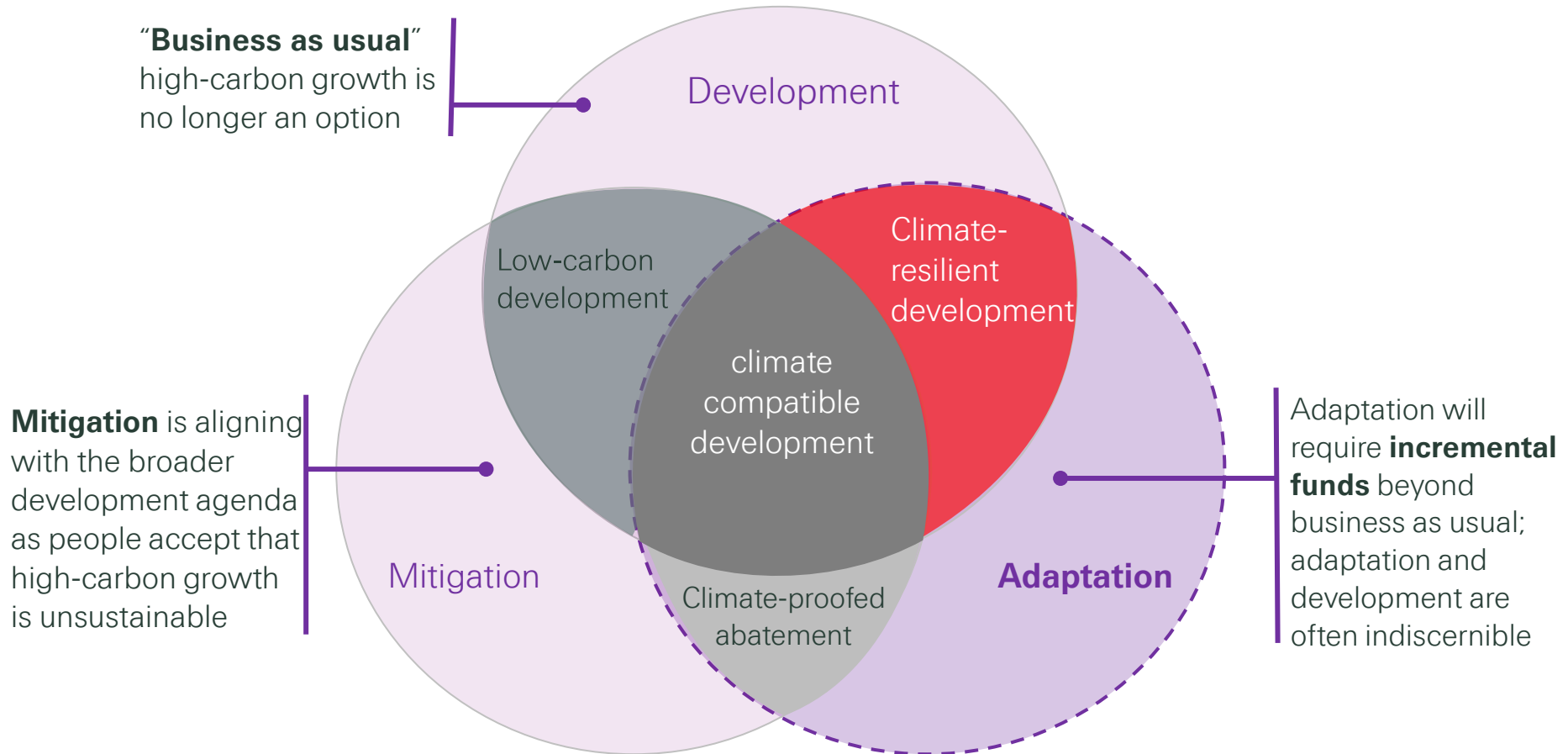
As global warming accelerates scientists expect increasingly drastic impacts



Source: Stern Review; IPCC



The need for climate-resilient development



The main levers for combating climate change

- **Mitigation:** Reduction of greenhouse gas emissions, or increase greenhouse gas sinks
 - Energy efficiency, renewables, clean tech/low-carbon growth

- **Adaptation:** Increase the ability to adjust to a changing environment
 - Risk prevention
 - Physical infrastructure
 - Process/technology optimization
 - Risk transfer and financing
 - Incentivize prevention

→ In general the more mitigation there is, the less will be the impacts to which we will have to adjust, and the less the risks for which we will have to try and prepare.



Swiss Re's climate strategy

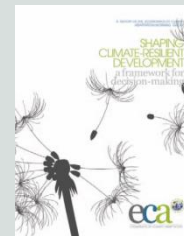
Coping with climate change requires both mitigation and adaptation measures

Assess and manage the risk



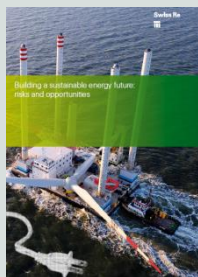
- Advance knowledge
- Address in risk management, underwriting/pricing

Seize business opportunities



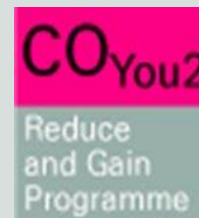
- Solutions for mitigating and adapting to climate change
- Catastrophe insurance
- Weather risk solutions

Influence the business environment



- Dialogue with regulators, investors, clients, and employees
- Support climate policy development

Lead by example



- Greenhouse gas neutral since October 2003
- Reduced emissions per employee by 50.6% by 2010
- COYou2 Programme



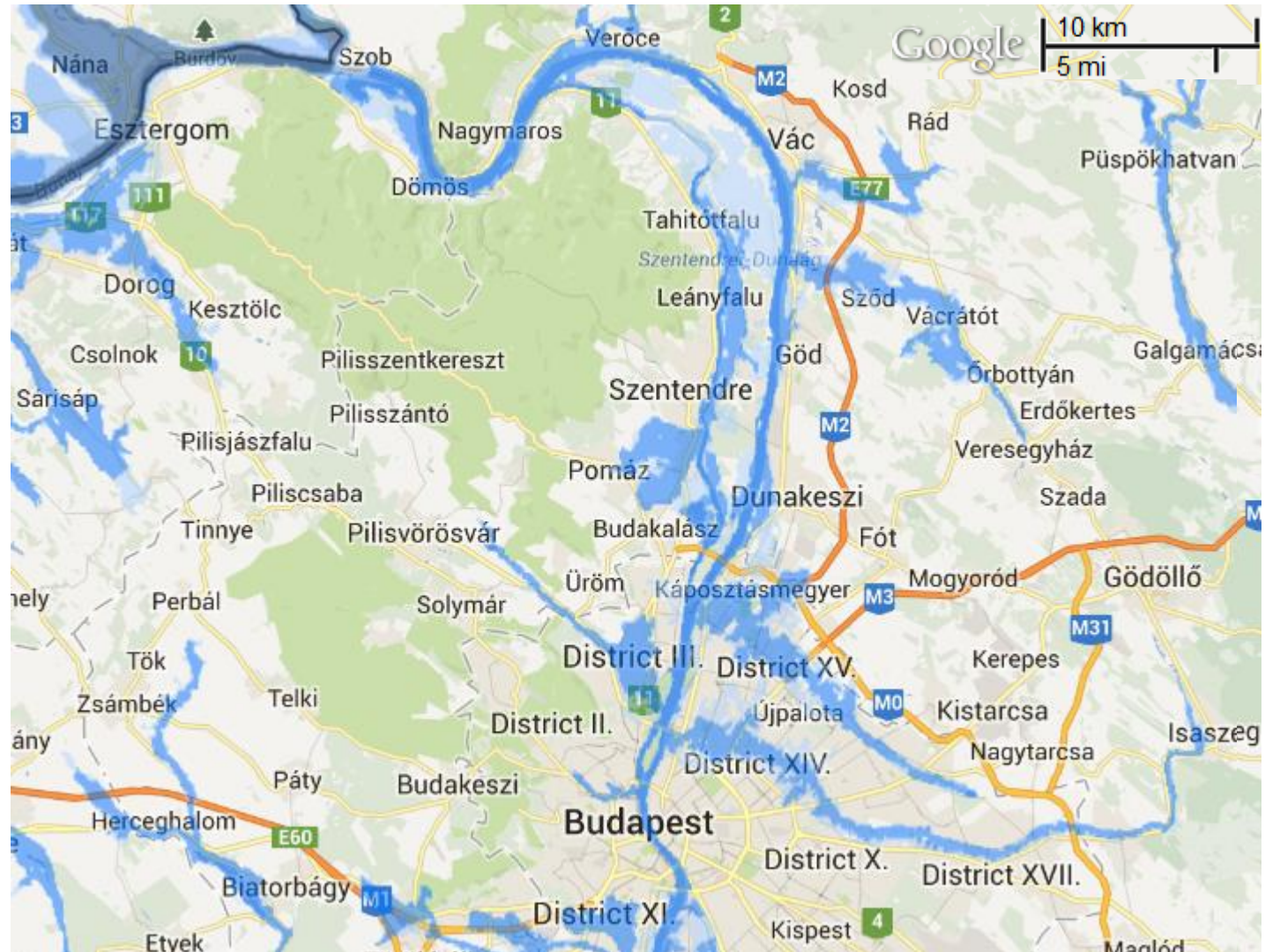
Assess and manage the risk

- We understand natural catastrophe risks and the impact of climate change to assess our own P&C business accurately and to structure sound risk transfer solutions
- We invest in proprietary, state-of-the-art natural catastrophe models and collaborate with universities and scientific institutions, e.g. ETH Zurich and ProClim.
- We stay abreast of the latest knowledge on the economic impact of natural disasters, including the effects of climate change.
- Timescales: climate change impact over the coming decades versus our business on annual transactions.
- Our models (for underwriting and risk management) provide an estimate of today's risk and will gradually reflect trends as they are updated in regular intervals.



Global flood zones provide detail flood hazard information worldwide

Return Period
■ 100 years
■ 500 years

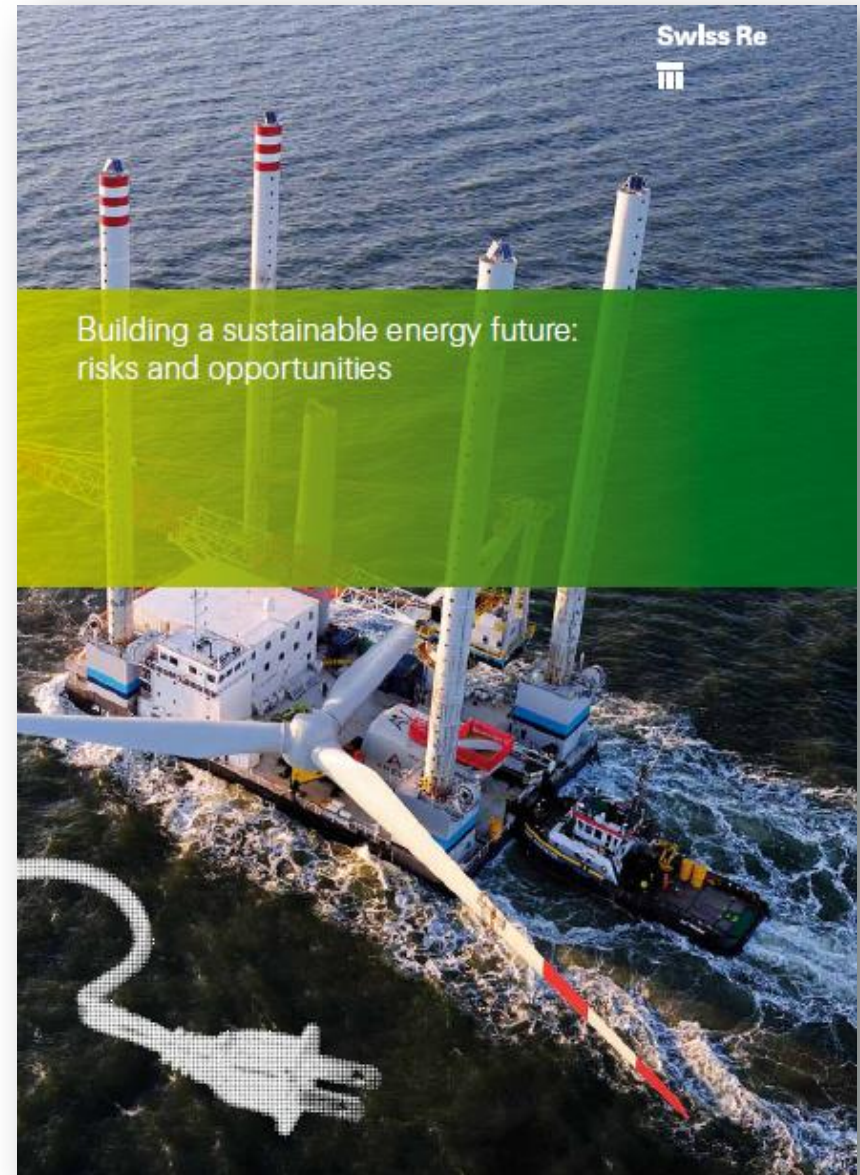


Swiss Re Global
Flood Zones™
swissre.com/catnet

Swiss Re



Seize business opportunities: Building a Sustainable Energy Future

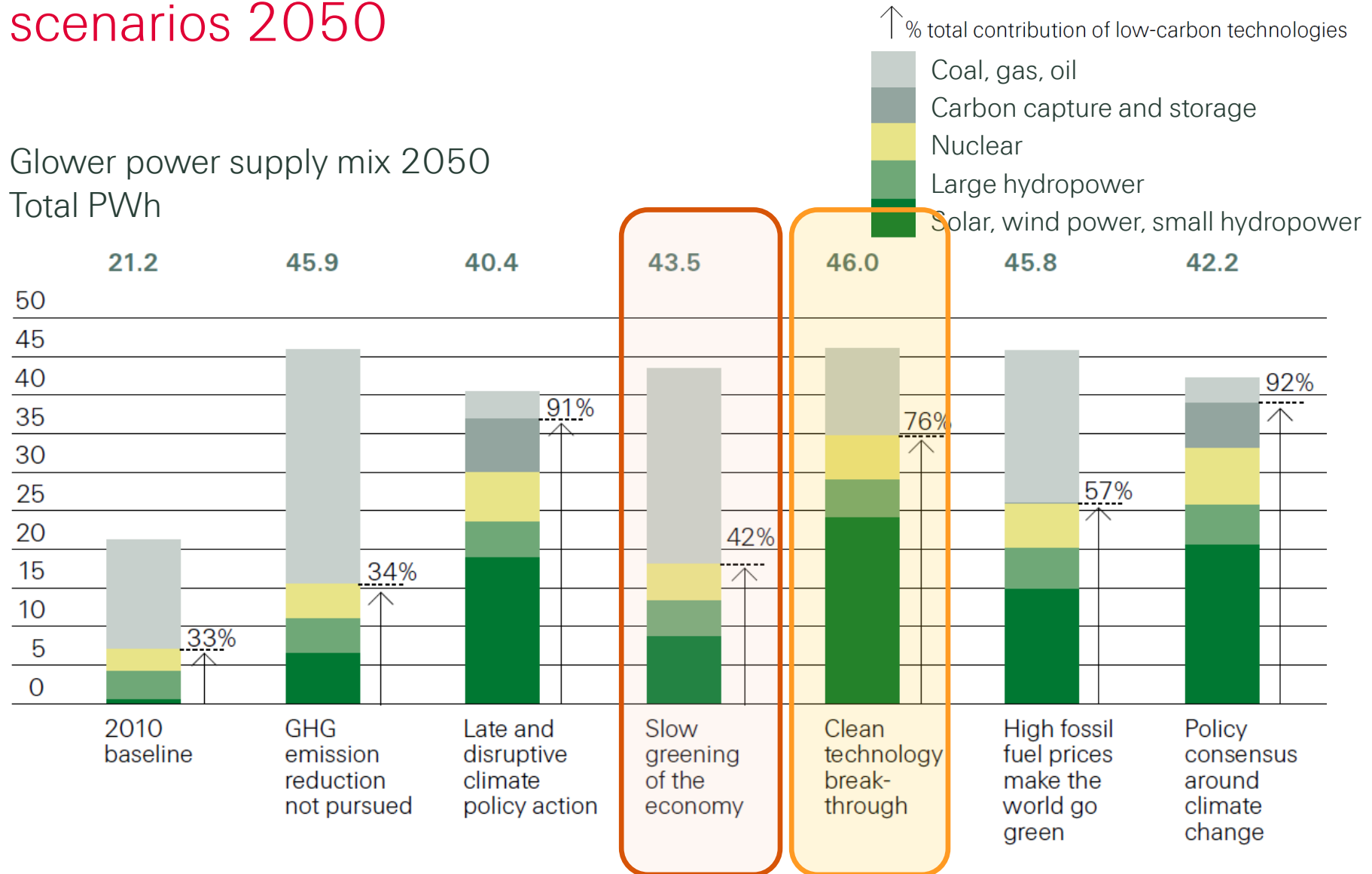


Download from Swiss Re library

http://media.swissre.com/documents/Scenarios_for_Climate_Change.pdf

Power mix depending on global energy and climate scenarios 2050

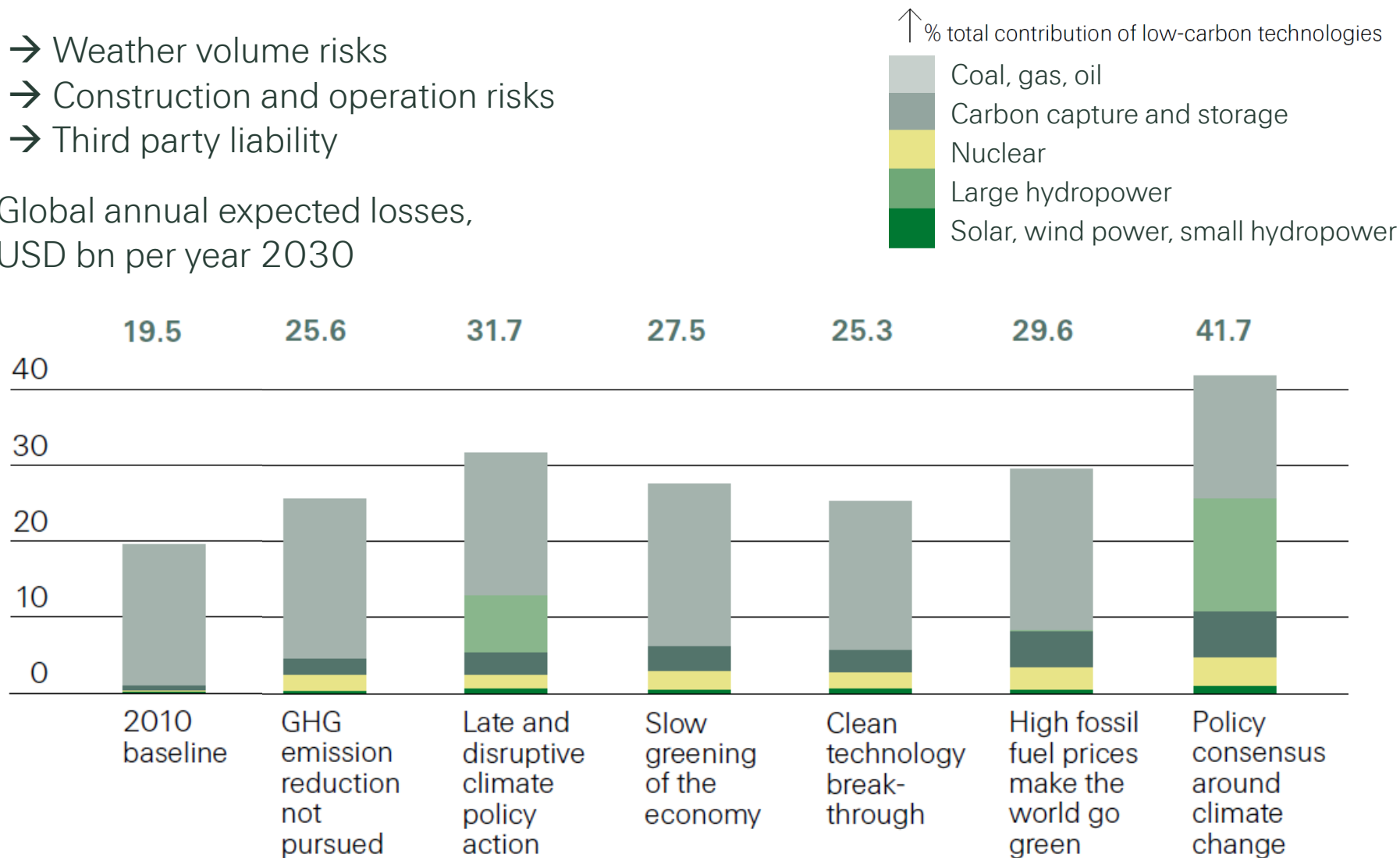
Glower power supply mix 2050
Total PWh



Green scenarios ask for new risk transfer options for renewables

- Weather volume risks
- Construction and operation risks
- Third party liability

Global annual expected losses, USD bn per year 2030





Crop Insurance Products

■ Indemnity Based Crop Insurance

→ insurance payouts based on the actual loss at the insured unit level (plot, farm, cooperative etc.)

■ Index Based Crop Insurance

→ insurance payouts based on an index measurement

– **Area-Yield Index** (indemnity based on area-yield loss)

– **Crop Weather Index** (indemnity based on weather index payout scale)

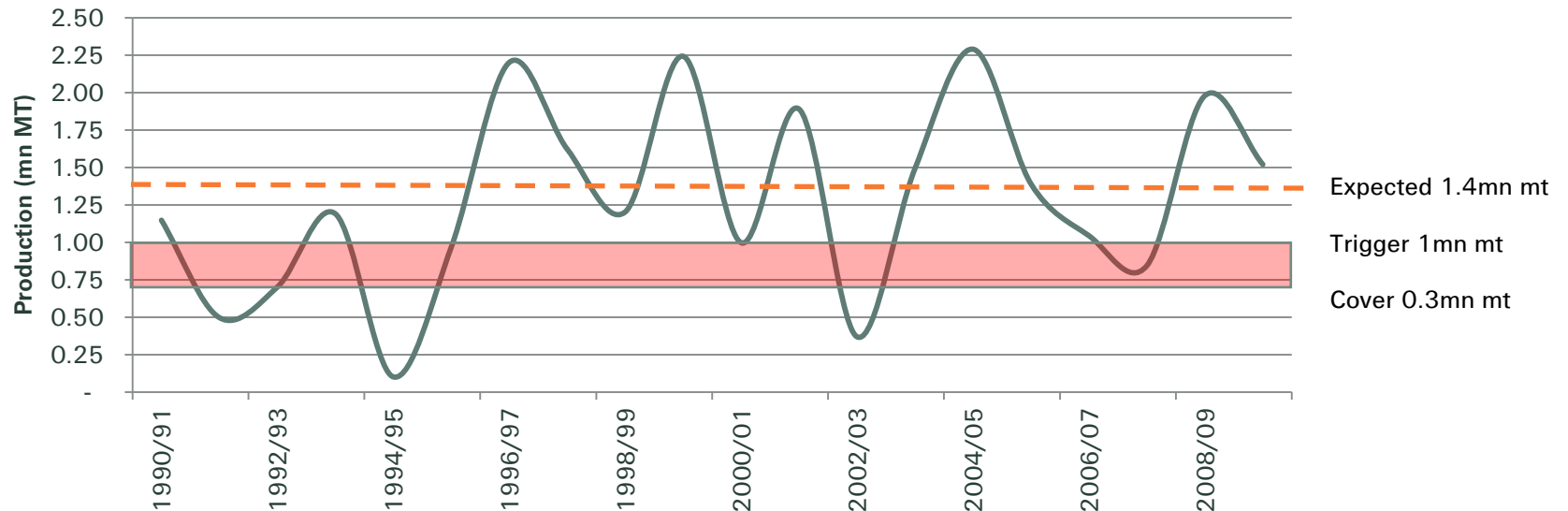
– **NDVI** (indemnity based on Normalized Difference Vegetation Index payout scale)

■ Crop Revenue Insurance

→ insurance payouts based on yield measurements and crop prices



Yield Index Cover - Example



- Expected production is based on clients market share and government statistics.
- Trigger: in % of expected production for clients market share
- Payout: actual production below trigger (e.g. 25% of production) by a pre-defined monetary amount per ton of shortfall.



Example: RAINFALL INDEX for the benefit of farmers in India

Features of the solution:

- First deal in 2004 with Basix (microfinance) for castor and groundnut crop in Mehbubnagar, Andhra Pradesh against poor monsoon rainfalls covering 1'500 farmers
- Today > 1'500'000 farmers have taken weather insurance policies, estimated annual premium volume of USD 100mn

Involved parties together with Swiss Re:

- Basix (microfinance)
- AIC Agricultural Insurance Company (run by government, provides insurance scheme)
- ICICI Lombard, Iffco Tokio (private insurers)
- Worldbank (technical assistance)

Further information:

- Rainfall index is the weighted sum of rainfall during each growing phase
- Most policies cover precipitation, temperature, or a combination of both
- Weather Insurance is a complementary tool for effective risk management



Example: satellite-based drought index product to compensate government of Mexico

Features of the solution:

- Small cattle ranchers mainly rely on natural pasture
- Droughts reduce biomass
- Solution provides economic relief for supplemental purchases of feed
- Available biomass measured by a vegetation index calculated by using infrared and red spectral data from daily satellite images

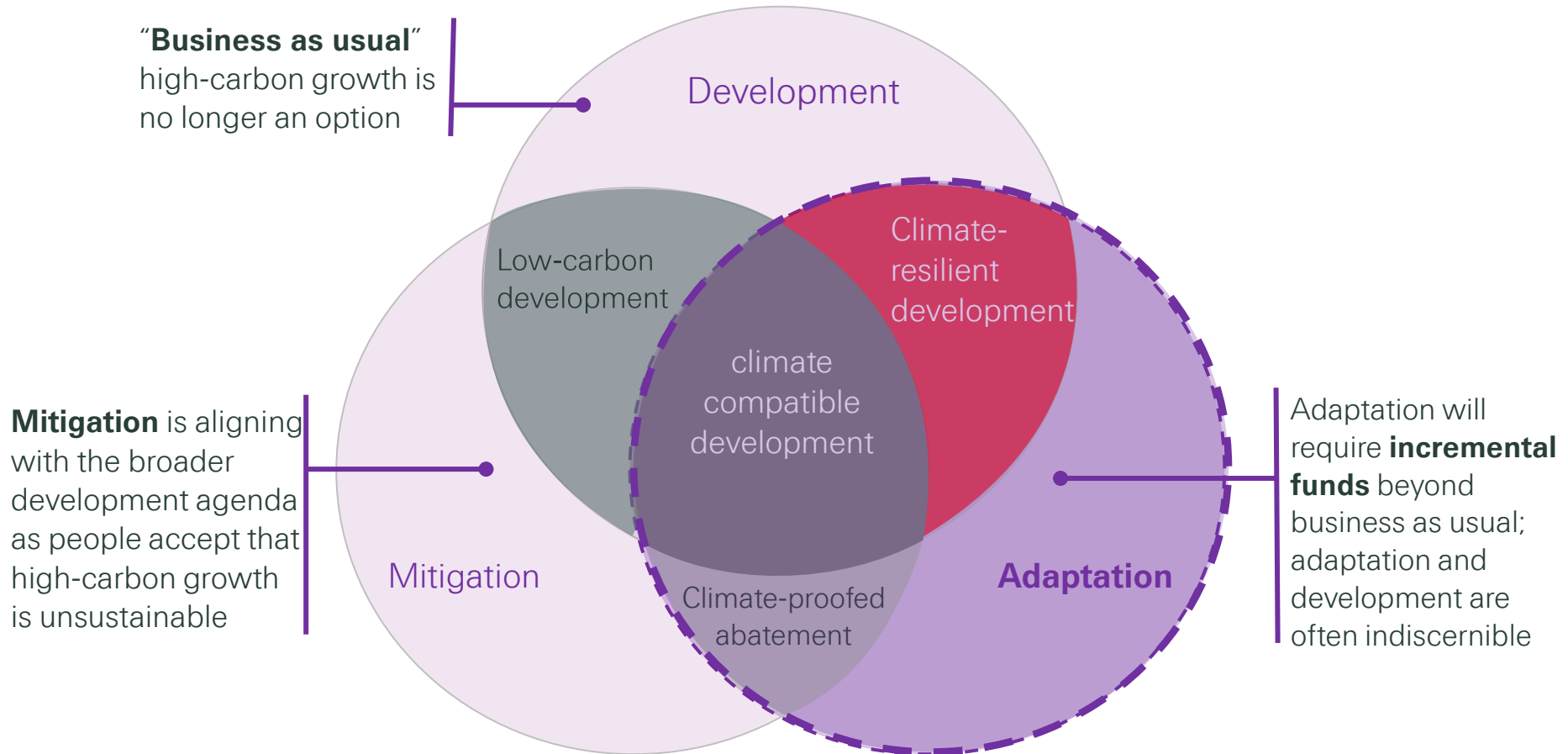
Involved parties together with Swiss Re:

- Secretariat of Agriculture (SAGARPA), insured
- Agroasemex, Mexican state-owned local reinsurer

Further information:

- Satellite images reflect pasture conditions, basis for objective claims settlement
- Vegetation Index data is available globally, administered by the National Oceanic Aerospace Agency
- Detailed monitoring (high resolution) is done on selected sample plots – no country-wide monitoring.

The need for climate-resilient development

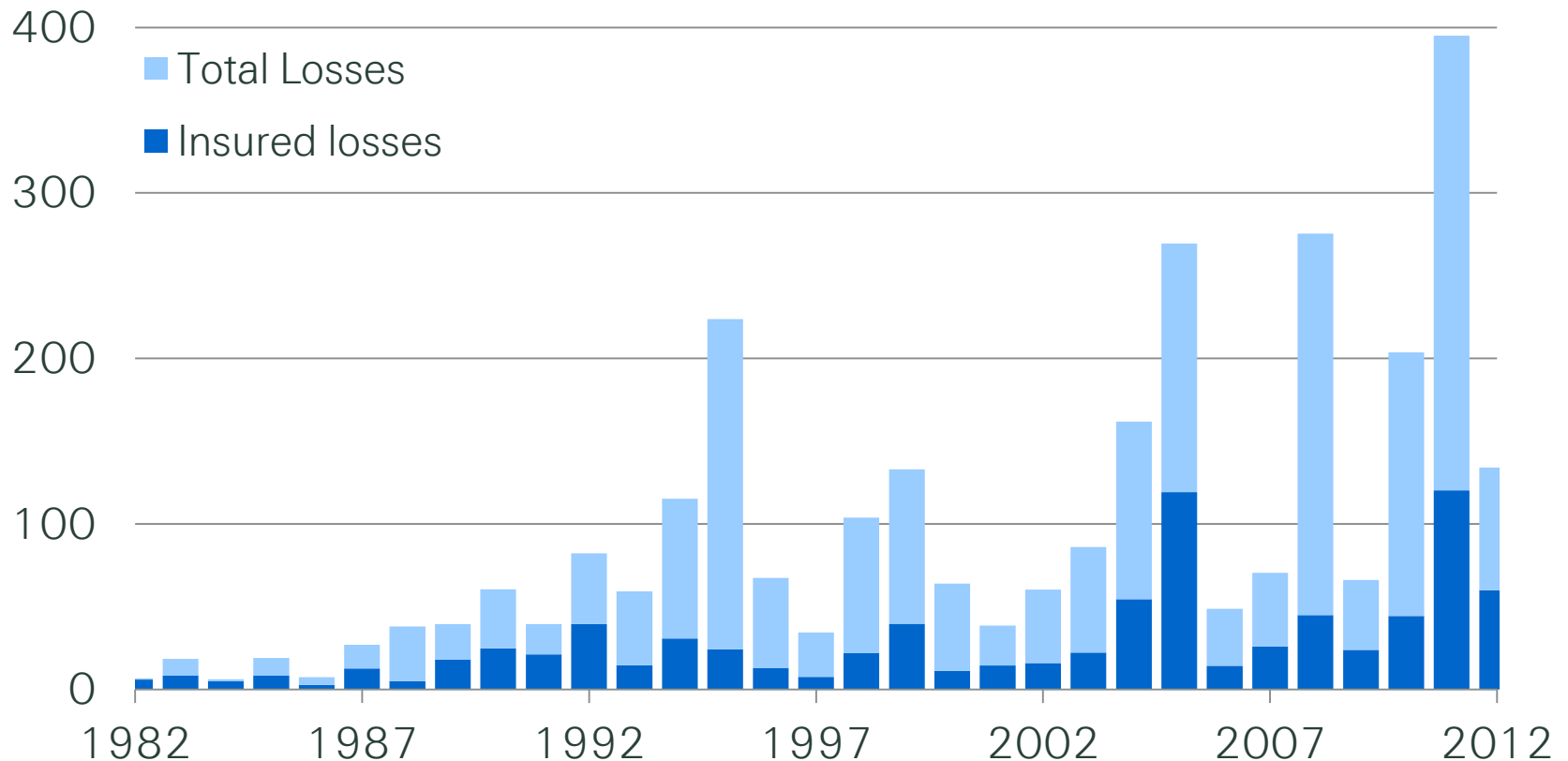




Natural catastrophe losses are on the rise

Natural catastrophe losses 1982-2012, in USD billion (2012 prices)

* 2012 Loss numbers are a preliminary estimate

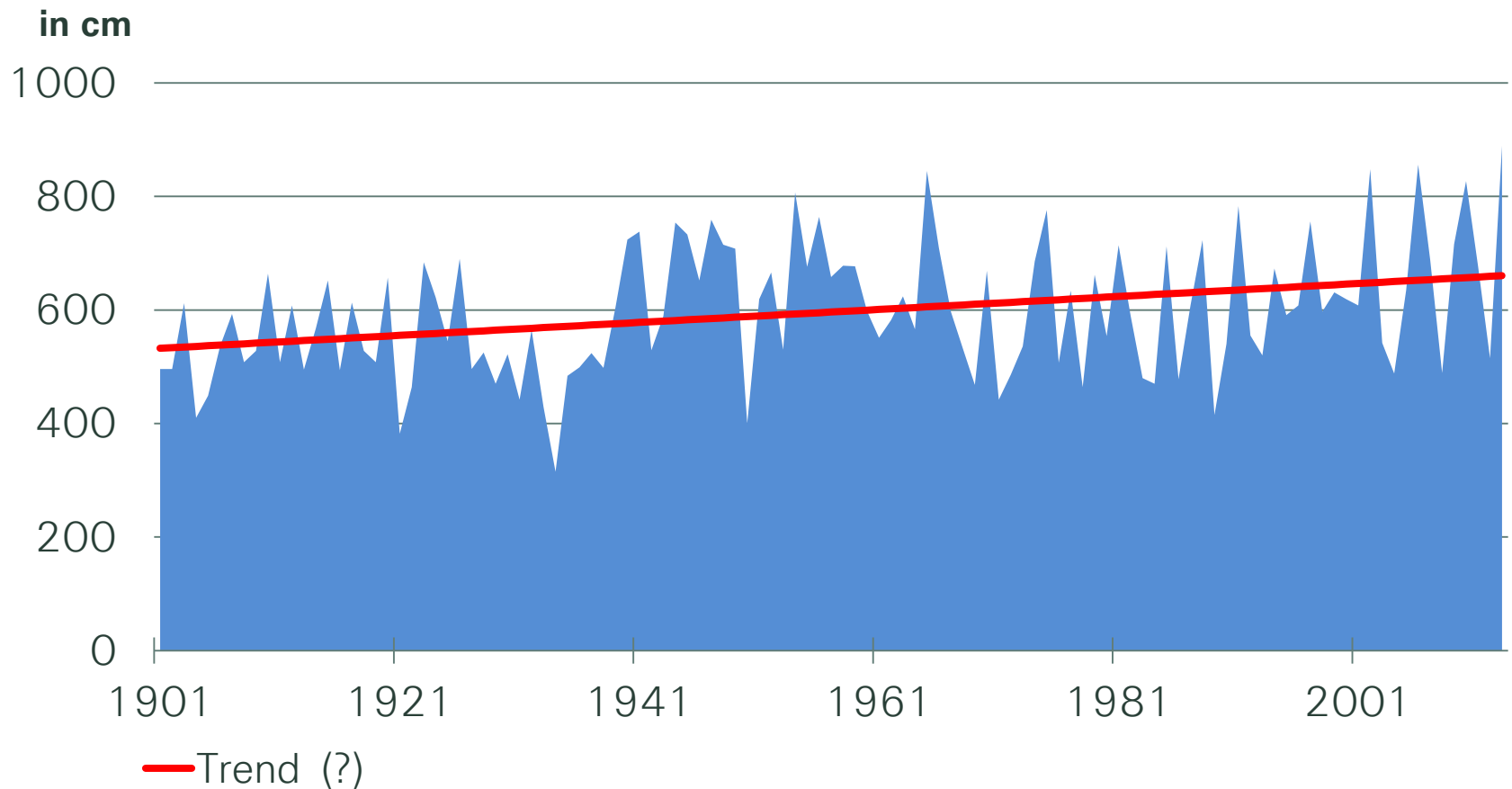


Note: Insured losses: property and business interruption, excluding liability and life insurance losses

Source: Swiss Re sigma

Potential for more severe flood losses?

Highest annual water levels of the Danube at Budapest



Source: Országos Vízelző Szolgálat (www.hydroinfo.hu)

Main drivers of increasing natural catastrophe losses

- **Accumulation** of assets in exposed areas

Ocean Drive, FL, 1926



Ocean Drive, FL, 2000



- **Climate change** results in rising intensity of storms, forest fires, droughts, flooding and heat waves in many regions. If unmitigated, climate change could cost the world economy around 20% of global GDP by the end of this century.

Climate adaptation is an urgent priority

■ **Decision makers** of national and local economies ask

– What is the potential **climate-related loss** to the economies and societies over the coming decades

– How much of that loss can we avert, with what **measures?**

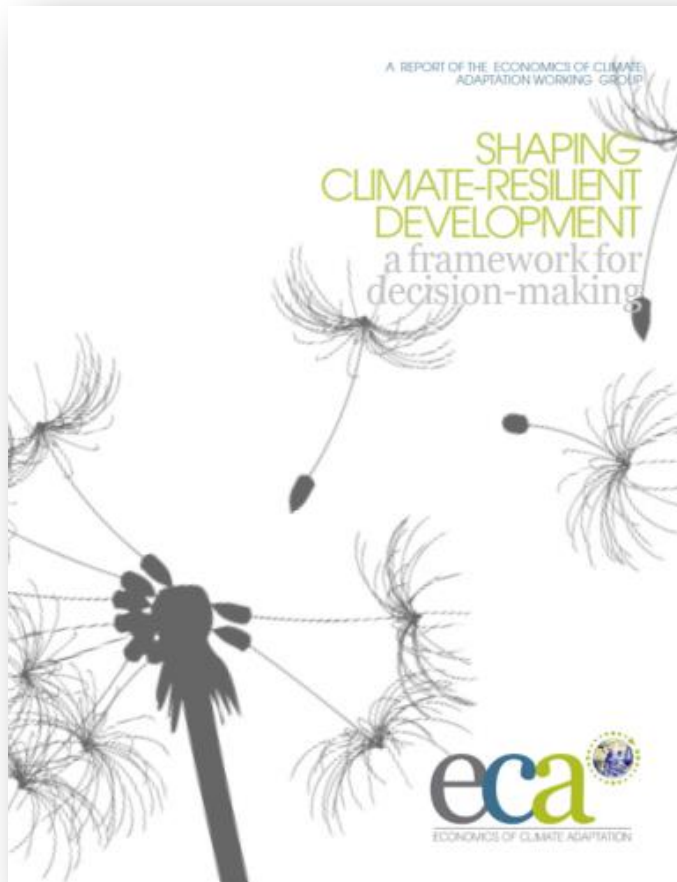


– What investments will be required to fund those measures and will the **benefits** of that investment outweigh the **costs?**



Economics of Climate Adaptation - Shaping Climate-Resilient Development

The full report, 8 case studies, 164 pages



[http://media.swissre.com/documents/
rethinking_shaping_climate_resilient_development_en.pdf](http://media.swissre.com/documents/rethinking_shaping_climate_resilient_development_en.pdf)

The working group studied 18 regions with diverse climate hazards



www.swissre.com/climatechange

Economics of Climate Adaptation (ECA) Working Group, a partnership between the Global Environment Facility, McKinsey & Company, Swiss Re, the Rockefeller Foundation, ClimateWorks Foundation, the European Commission, and Standard Chartered Bank.

Climate-resilient development needs to **assess** and **address** total climate risk

Objectives

- Provide decision makers with the **facts and methods** necessary to design and execute a climate adaptation strategy
- Supply insurers, financial institutions, and potential funders with the **information** required to unlock risk prevention funding and deepen global risk transfer markets

Methodology

- 1) Follow a rigorous risk management approach to **assess local total climate risk**, the sum of
 - today's climate risk,
 - the economic development paths that might put greater population and value at risk
 - the additional risks presented by climate change
- 2) Propose and prioritize a basket of adaptation measures to **address** total climate risk on an economic basis



TEST CASE ON
HULL, UK – FOCUS ON
RISK FROM MULTIPLE
HAZARDS



City of Hull, north east coast of UK

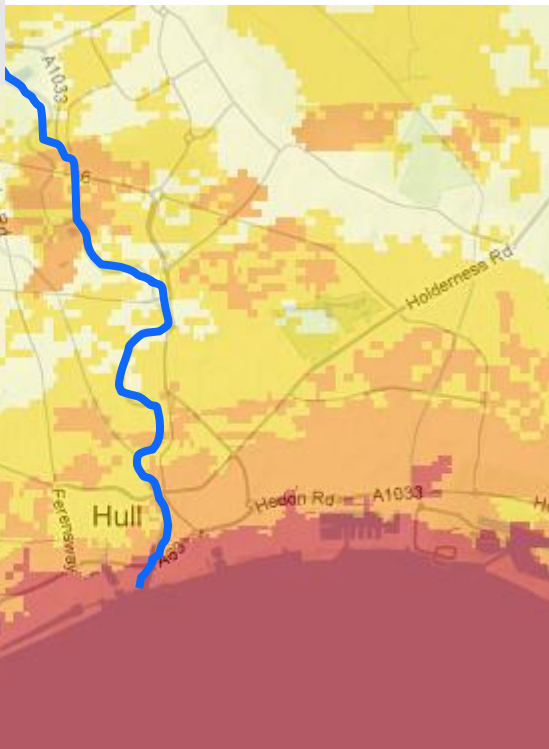
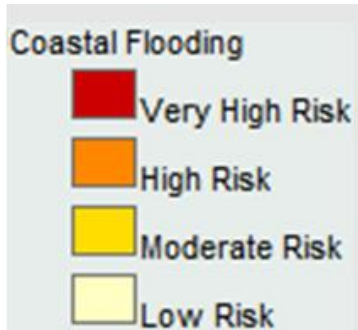
- 2 to 4 m above sea level
- Multiple climate hazards
 - Storm surge **coastal flood** and sea level rise
 - **Fresh water flood** (river and surface water): confluence of two rivers Hull and Humber
 - **Wind storm**



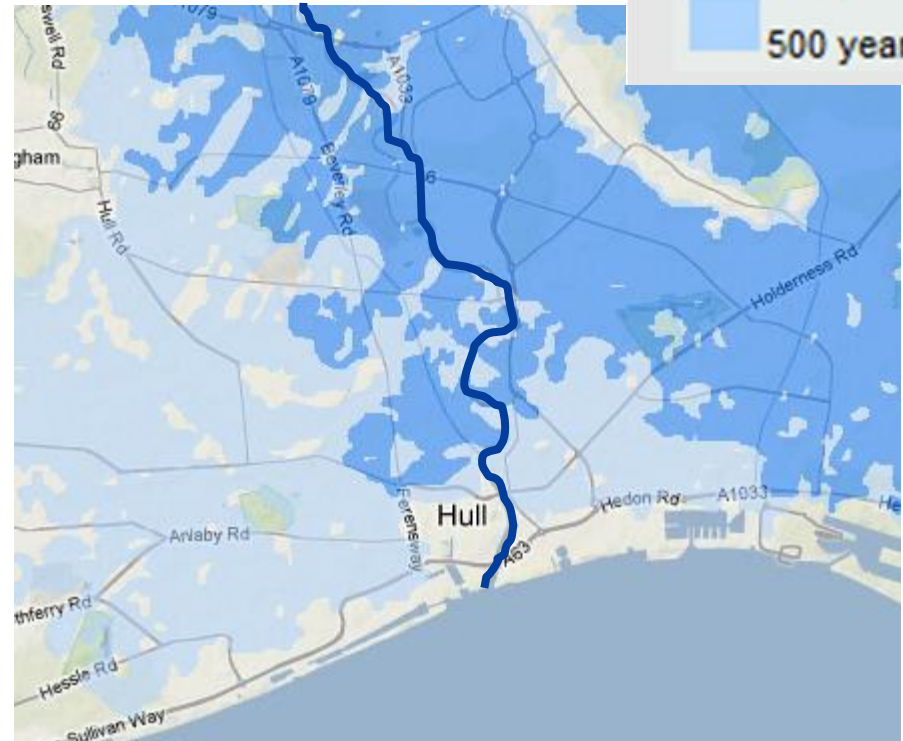
Source: Google Maps



City of Hull, coastal flooding and river flooding



Source: Swiss Re Geoportal, Google Maps



Source: Swiss Re Geoportal, Google Maps

Assess the total local climate risk



<http://150.swissre.com/events/150/zurich.html>

3 Climate change scenarios for Hull

Uncertainty results in highly variable predictions and outcomes

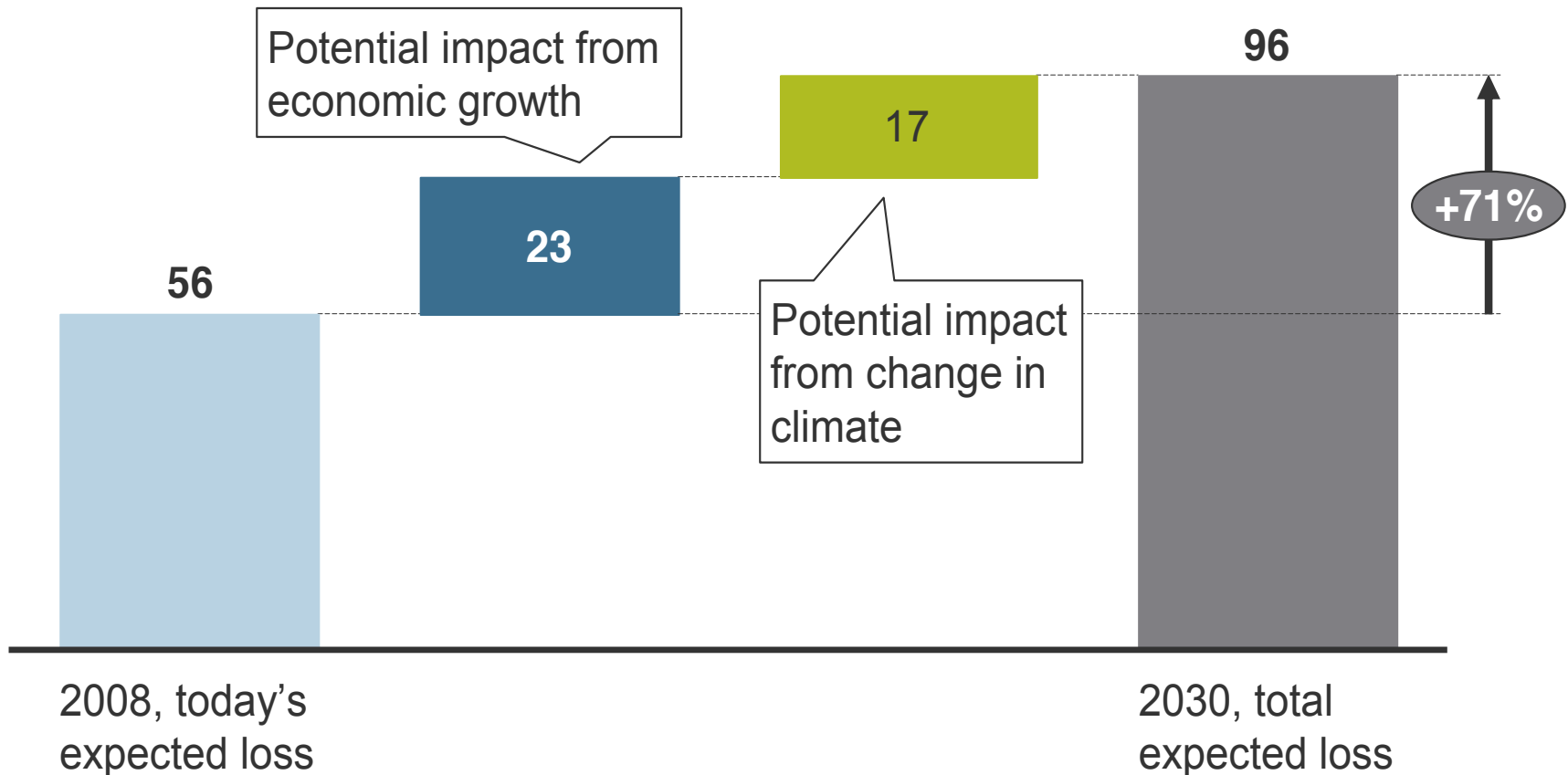
- future development of emissions
- local impact of climate change on weather variables

2030 scenarios	Description
1 Today's risk	<ul style="list-style-type: none"> • No change in climate, historical events used as baseline
2 “Moderate” change	<ul style="list-style-type: none"> • A2 scenario as underlining global emission scenario • Varying parameters for each return period, (storm surge height increase 16-26 cm; increase in extreme precipitation up to 3.3%)
3 “High” change	<ul style="list-style-type: none"> • Worst case assumptions within the hazard modeling used (storm surge height increase of 31-42 cm; increase of 8.3% in extreme precipitation)

Economic growth is the key driver of losses until 2030 in Hull

Expected loss from exposure to climate

Extreme climate scenario, USD millions

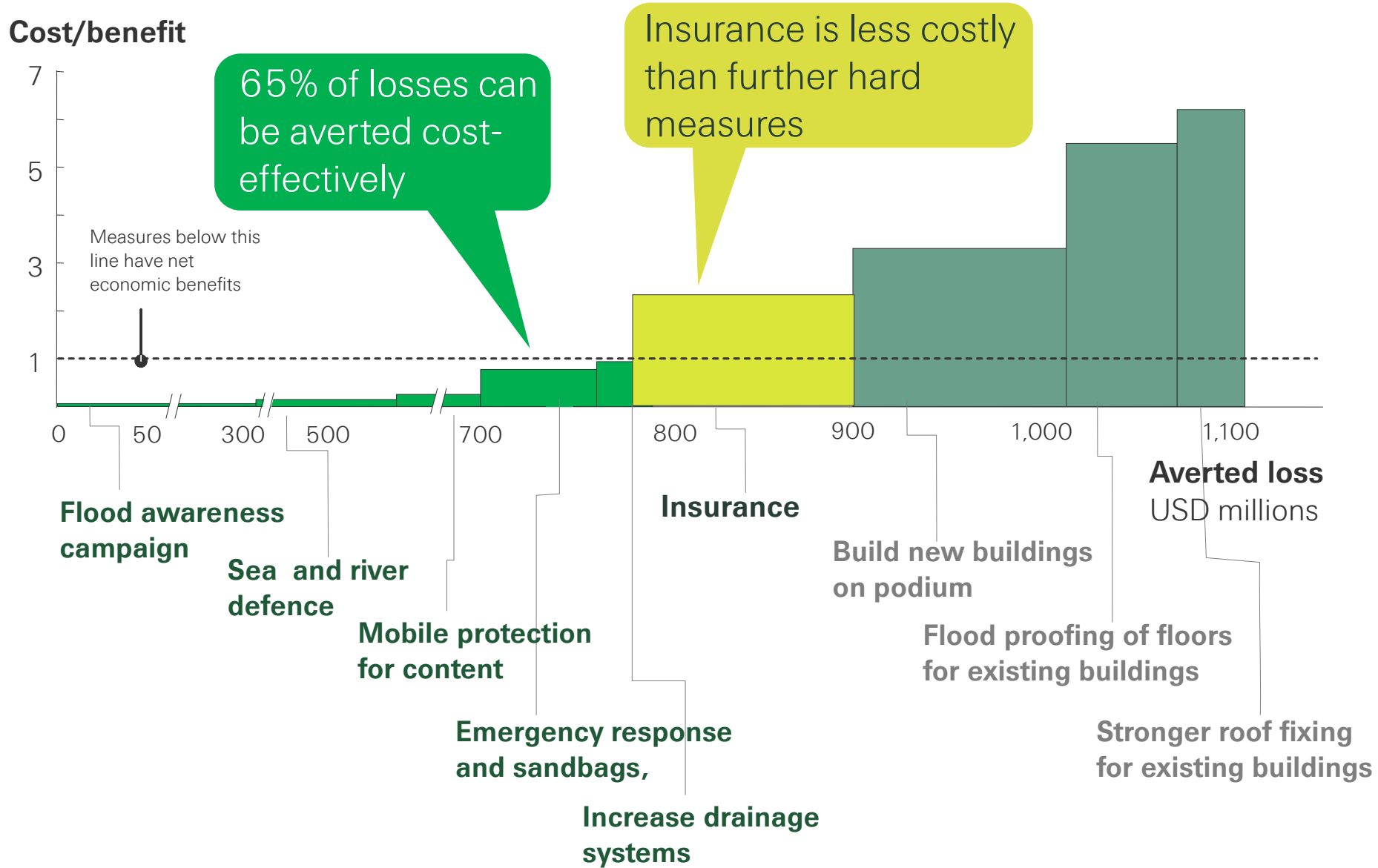


http://media.swissre.com/documents/Economics_of_Climate_Adaption_UK_Factsheet.pdf



<http://150.swissre.com/events/150/zurich.html>

Adaptation cost curve, city of Hull, UK





Conclusions

- ECA methodology provides decision-maker
 - with a **fact base**
 - enables to **understand the impact** of climate change on their economies
 - enables to **identify actions** to minimize the impact at the lowest cost to society
 - allows to **integrate adaptation** with economic development and sustainable growth
- Natural catastrophe modeling is the essence
- Climate is a strategic issue



Economics of Climate Adaptation - Shaping Climate-Resilient Development

Floods in UK

Swiss Re

Economics of Climate Adaptation (ECA) – Shaping climate-resilient development
A framework for decision-making

Adaptation measures are available to make cities more resilient to the impacts of climate change. But decision-makers need the facts to identify the most cost-effective investments.



Background

Climate adaptation is an urgent priority for the custodians of national and local economies, such as finance ministers and mayors. Such decision-makers ask: What is the potential climate-related loss to our economies and societies over the coming decades? How much of that loss can we avert, with what measures? What investments will be required to fund those measures – and will the benefits of that investment outweigh the costs?

The ECA methodology¹ provides decision-makers with a fact base to answer these questions in a systematic way. It enables them to understand the impact of climate change on their economies – and identify actions to minimize that impact at the lowest cost to society. It therefore allows decision-makers to integrate adaptation with economic development and sustainable growth. In essence, we provide a methodology to pro-actively manage total climate risk, which means:

- Assess today's climate risk
- Chart out the economic development paths that put greater population and assets at risk
- Consider the additional risks presented by climate change


1 The methodology is based on the findings of a study by the Economics of Climate Adaptation Working Group, a partnership between the Caribbean Catastrophe Risk Insurance Facility, Munich Re Company, Swiss Re, the Rockefeller Foundation, Climate Risk Foundation, the European Commission, and Standard Chartered Bank. See www.eoca.net

Drought in India

Swiss Re

Economics of Climate Adaptation (ECA) – Shaping climate-resilient development
A framework for decision-making

Making rural communities more resilient to the impact of climate change requires a comprehensive portfolio of adaptation measures. But decision-makers need the facts to identify the most cost-effective investments.



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Floods in Guayana

Swiss Re

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Multihazard in the Caribbean

CCRIFF
The Caribbean Catastrophe Risk Insurance Facility



Enhancing the climate risk and adaptation fact base for the Caribbean... preliminary results of the ECA

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CCRIFF's Economics of Climate Adaptation (ECA) Initiative

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UK: <http://media.swissre.com/documents/Economics of Climate Adaptation India Factsheet.pdf>

India: <http://media.swissre.com/documents/Economics of Climate Adaption UK Factsheet.pdf>

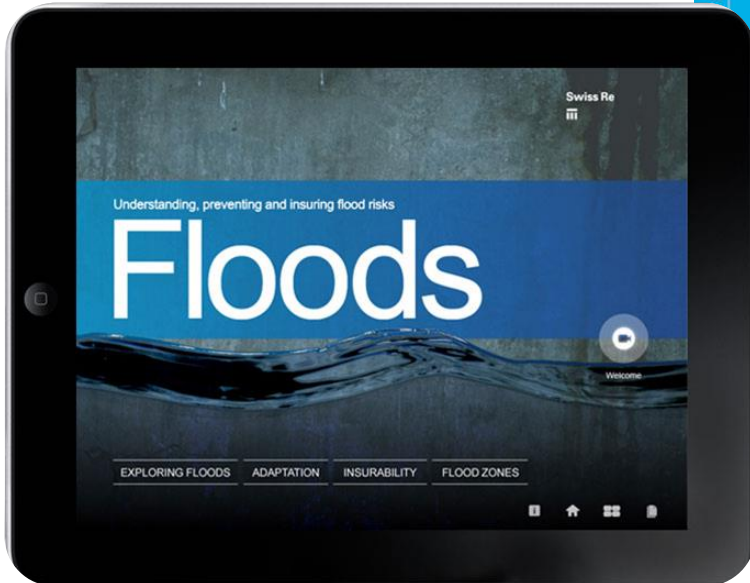
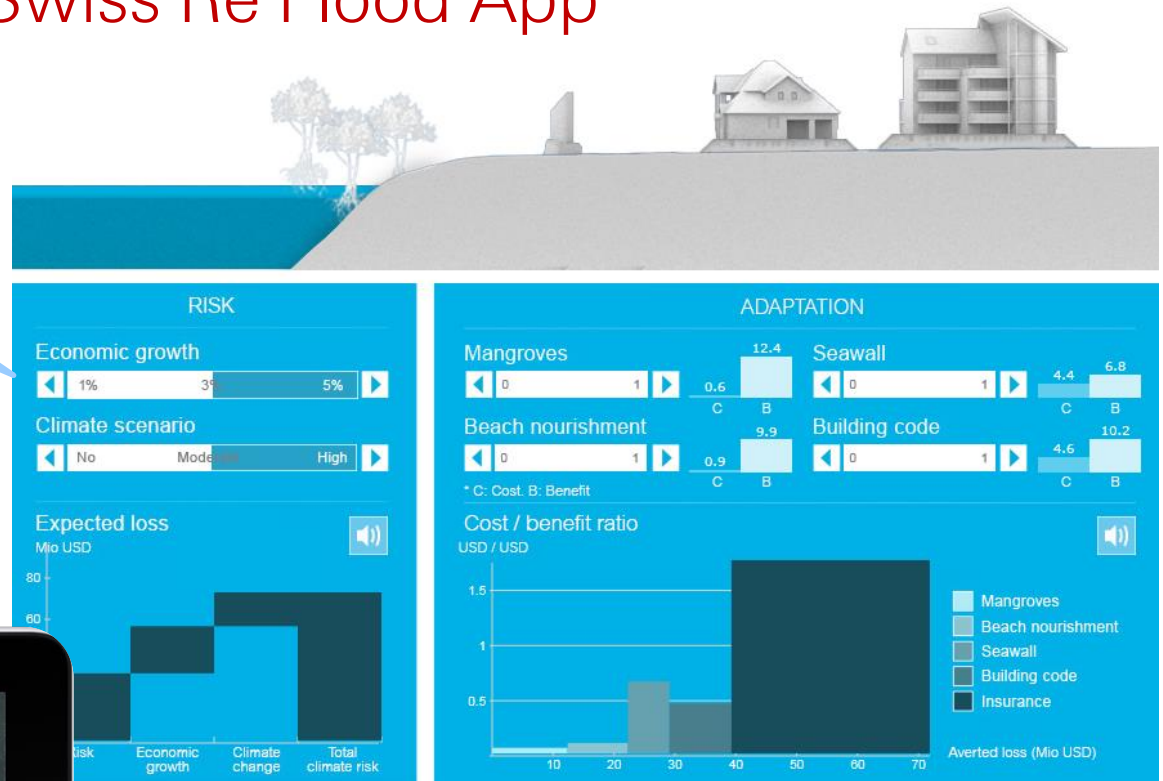
Guyana: <http://media.swissre.com/documents/Economics of Climate Adaption Guyana Factsheet en.pdf>

Caribbean: <http://media.swissre.com/documents/ECA+Brochure-Final.pdf>



Conduct your own Economics of Adaptation in the Swiss Re Flood App

1) **Analyze** the total climate risk

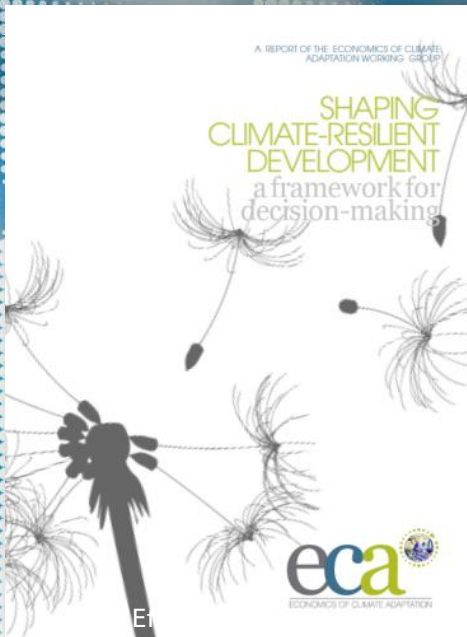


2) **Adapt** cost-efficiently to the risk

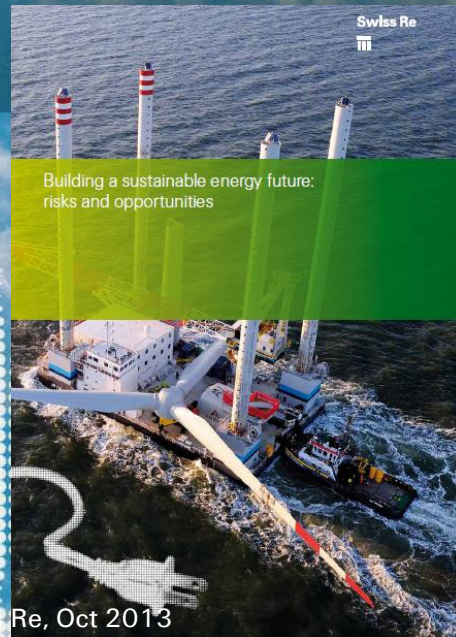


Thank you.

Questions and Answers



Swiss Re, Oct 2013





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