THE RISKS OF CLIMATE CHANGE – INNOVATIVE PROJECTS OF MUNICH RE

Prof. Dr. Peter Hoeppe
Head of Geo Risks Research/Corporate Climate Centre

Lunchtime Colloquium, Rachel Carson Center, Munich, April 12, 2012

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Munich Re

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- Founded 1880
- The leading reinsurance company
- Annual premium € 27bn in reinsurance
- Leading role in covering risks of natural hazards

Munich Re the first alerter to global warming

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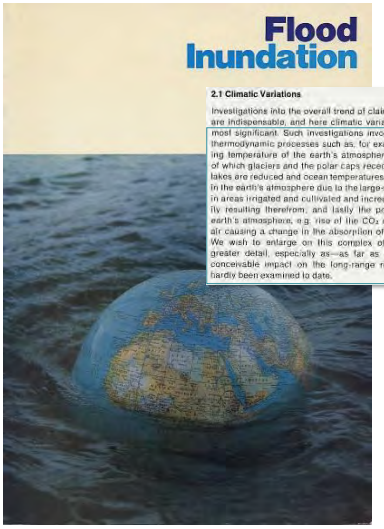

a study of thermodynamic processes such as, for example, the rising temperature of the earth's atmosphere (as a result of which glaciers and the polar caps recede, surfaces of lakes are reduced and ocean temperatures rise)

rise of the CO_2 content of the air causing a change in the absorption of solar energy.

especially as—as far as we know—its conceivable impact on the long-range risk trend has hardly been examined to date.

Munich Re Publication,1973

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World Economic Forum – Global Risks 2011

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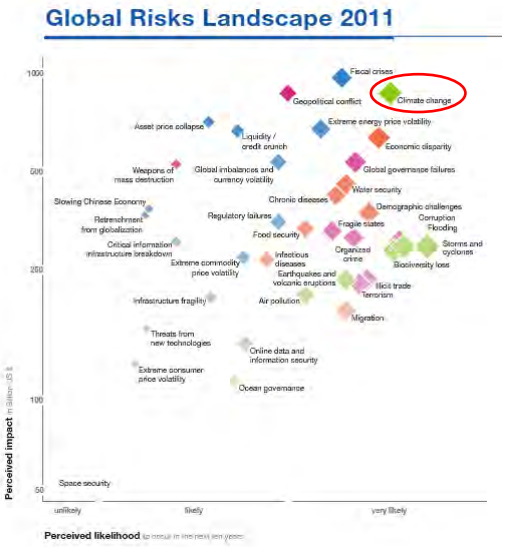

Economic risks
Geopolitical risks
Environmental risks
Societal risks
Technological risks

- Survey of 580 leaders and decision makers across the globe
- Supported by 18 workshops
- Assessment of 37 global risks for the next 10 year period

Climate Change is Real and Ongoing

Adjusted (ENSO, solar activity, vulcano eruptions) temperature data

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Source : Rahmstorf Dez. 2011 (http://www.scilogs.de/wblogs/blog/klimalounge/klimadaten/2011-12-08/globale-temperatur-reloaded)

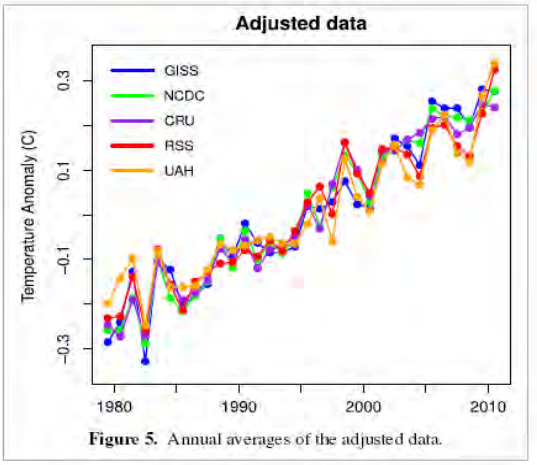

Figure 5. Annual averages of the adjusted data.

Observed changes in sea surface temperature in tropical ocean basins with TC activity

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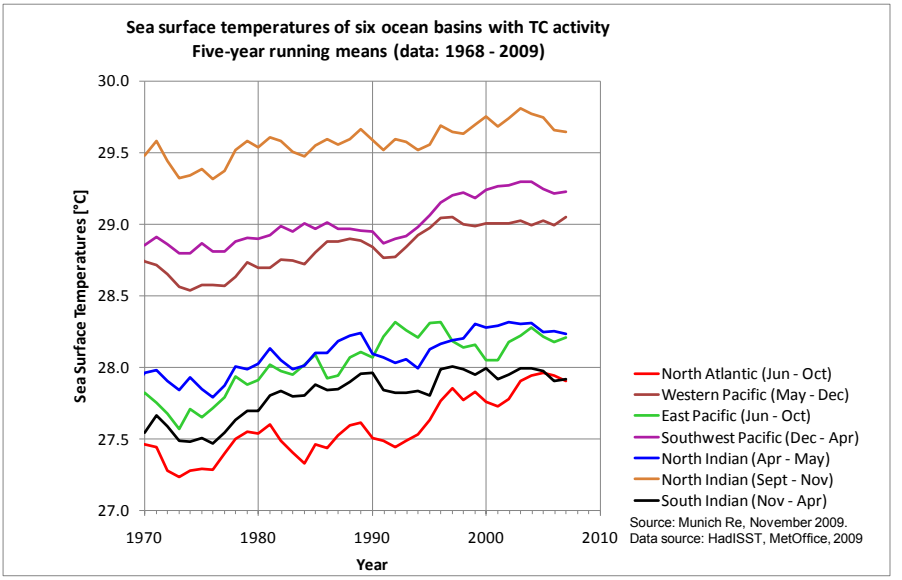
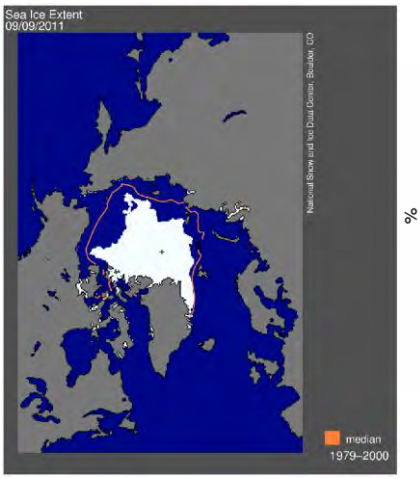
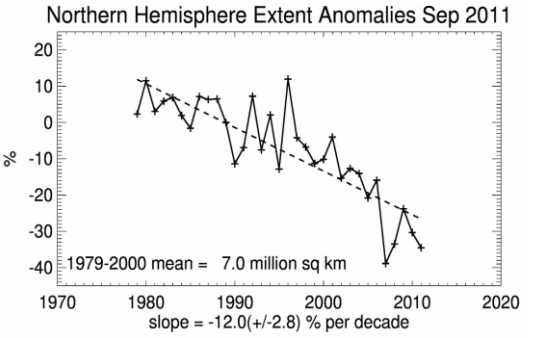


2011 a year with extremely low arctic sea ice extent





Source: The National Snow and Ice Data Center, Boulder CO (2011)

Major weather catastrophes of recent years Examples

August 2002: floods in Saxony with losses amounting to US$ 11.6bn

Summer 2003: the natural catastrophe with the greatest human impact in Europe for hundreds of years, approx. 70,000 heat deaths

July/August 2010: Worst ever documented flood in Pakistan killed 1,760 people

December 2010 to January 2011: Precipitation records in Queensland (Australia) followed to extreme floods. Highest ever measured sea surface temperatures around Australia

February 2011: Cyclone Yasi, one of the strongest and largest cyclones which has ever made landfall in Queensland (Australia)

April 2011: Record number of tornadoes in USA, whole tornado season creates highest ever losses

October to November 2011: Floods in Thailand become most expensive flood loss event on a global level

Munich Re NatCatSERVICE – The most comprehensive database of natural loss events

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Year	Number of data sets
0079 - 999	35
1000 - 1499	200
1500 - 1899	1 000
1900 - 1949	1 200
1950 - 1979	2 900
1980 - 2011	25 000

>30,000 data sets

Global Natural Catastrophe Update

Natural Catastrophes 2011
World map

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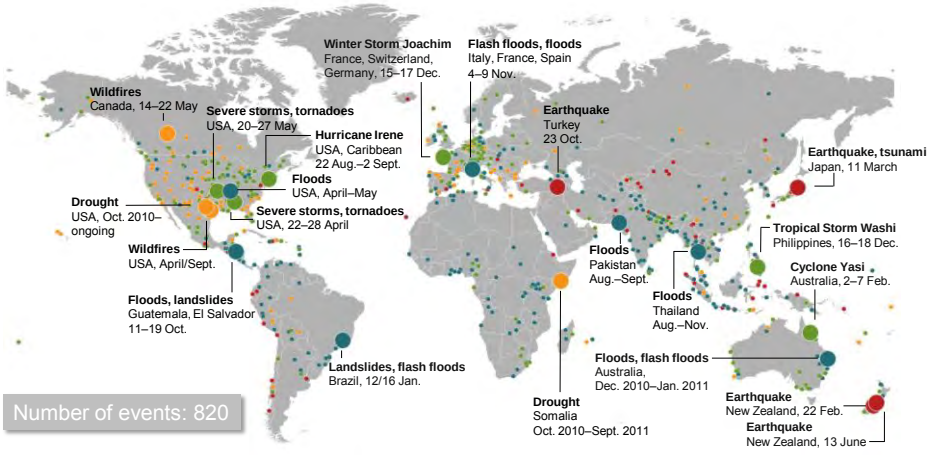
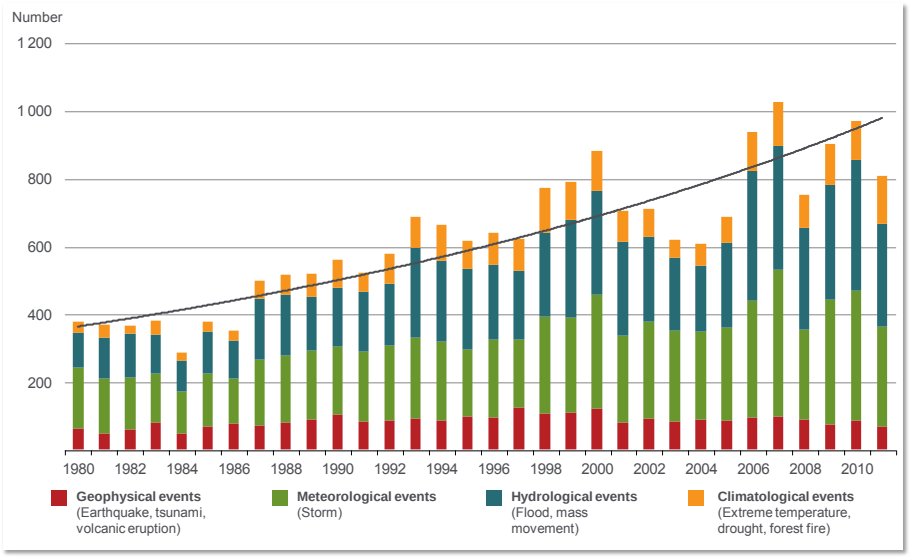


Source: MR NatCat*SERVICE*

NatCatSERVICE

Natural catastrophes worldwide 1980 – 2011

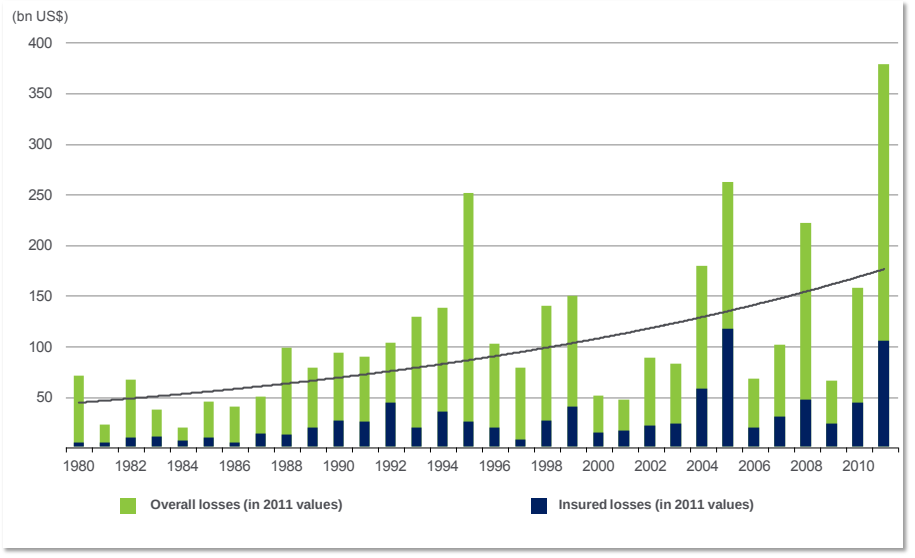
Number of events with trend



NatCatSERVICE

Natural catastrophes worldwide 1980 – 2011

Overall and insured losses with trend



U.S. Thunderstorm Loss Trends

Annual Totals 1980 – 2011

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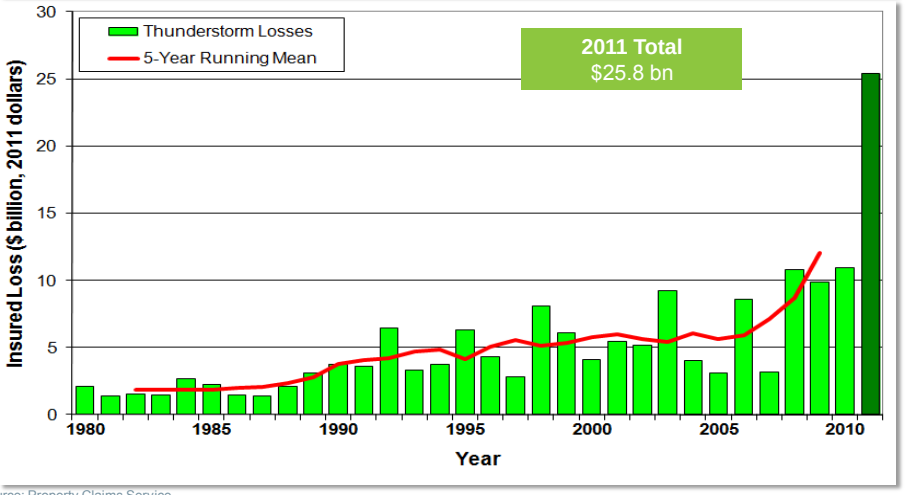
Average thunderstorm losses have increased fivefold since 1980.



Source: Property Claims Service
MR NatCat*SERVICE*

Reasons for Increases in Natural Catastrophe Losses

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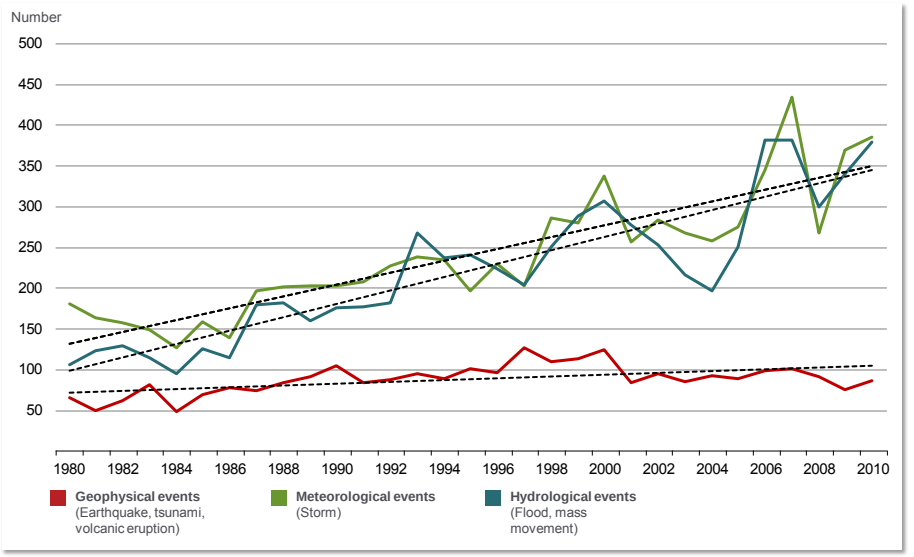
1. Population growth
2. Increasing standard of living (wealth)
3. Settlement and industrialization in highly exposed regions
4. Concentration of population and values in large cities
5. Increasing insurance market (relevant for trend of insured losses)
6. Environmental changes – global warming

NatCatSERVICE

Natural catastrophes worldwide, 1980 – 2010

Number of events by peril with trend



Climate change and extreme weather events (IPCC, 2007)

Phenomenon[a] and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend[b]	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	*Very likely*[c]	*Likely*[d]	*Virtually certain*[d]
Warmer and more frequent hot days and nights over most land areas	*Very likely*[e]	*Likely (nights)*[d]	*Virtually certain*[d]
Warm spells/heat waves. Frequency increases over most land areas	*Likely*	*More likely than not*[f]	*Very likely*
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	*Likely*	*More likely than not*[f]	*Very likely*
Area affected by droughts increases	*Likely* in many regions since 1970s	*More likely than not*	*Likely*
Intense tropical cyclone activity increases	*Likely* in some regions since 1970	*More likely than not*[f]	*Likely*
Increased incidence of extreme high sea level (excludes tsunamis)[g]	*Likely*	*More likely than not*[f,h]	*Likely*[i]

very likely > 90% likely >66% more likely than not > 50%

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Climate change is a strategic topic for Munich Re
The three pillars of Munich Re's climate change strategy

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Risk assessment	Business opportunities	Asset management
▪ Research of natural hazards and climate change impacts ▪ Climate liability issues ▪ Prospective risk management (considering weather oscillations such as El Niño)	▪ Growing demand for risk transfer solutions such as renewable energy covers ▪ Performance covers for solar modules	▪ Integration of sustainability criteria into investment strategies ▪ Significant expansion of renewable energy investments where frameworks are appropriate

Becoming carbon neutral (Munich: since 2009, reinsurance worldwide: 2012)

Supporting several climate initiatives

Investments in Renewable Energies of € 2.5 bn. over the next years

Initiating flagship projects such as the Dii GmbH and MCII

Reinsurance property-casualty – Strategy

Munich Re sets the standard for renewable energy insurance solutions

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Wind energy
Innovative solution for major losses in the form of guarantees – manufacturers profit from the capital relief this provides

Photovoltaic energy
New type of insurance to cover performance guarantees – benefits customers and manufacturers; high demand around the world

Geothermal energy
The exploration risk is frequently a stumbling block for projects – there is rising demand for Munich Re's special covers

Picture © Geothermie Unterhaching GmbH & Co KG

Munich Re's strategy

Growth market: Renewable energies

Investments in renewable energies are rising fast:

- In 2011 US$ 260 bn[1]
- Further major growth expected

- Thanks to risk-transfer solutions, investors receive the security they need
- Special covers for renewable energies offer significant potential for business

[1] Source: Bloomberg New Energy Finance

Climate Change Vulnerability Index 2012
(taken from KPMG publication „Expect the Unexpected“, 2012)

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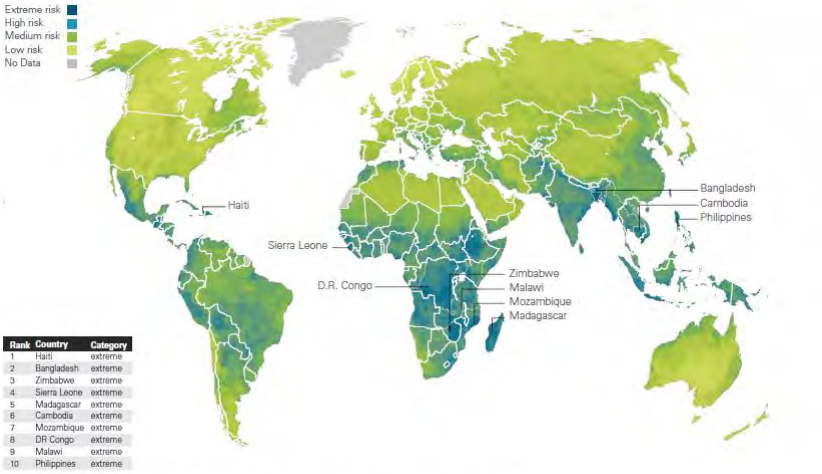

Rank	Country	Category
1	Haiti	extreme
2	Bangladesh	extreme
3	Zimbabwe	extreme
4	Sierra Leone	extreme
5	Madagascar	extreme
6	Cambodia	extreme
7	Mozambique	extreme
8	DR Congo	extreme
9	Malawi	extreme
10	Philippines	extreme

Source: Maplecroft, (2012). The Climate Change and Environmental Risk Atlas. Available at http://maplecroft.com

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The insured and non-insured world
Property insurance premium per capita – Overview

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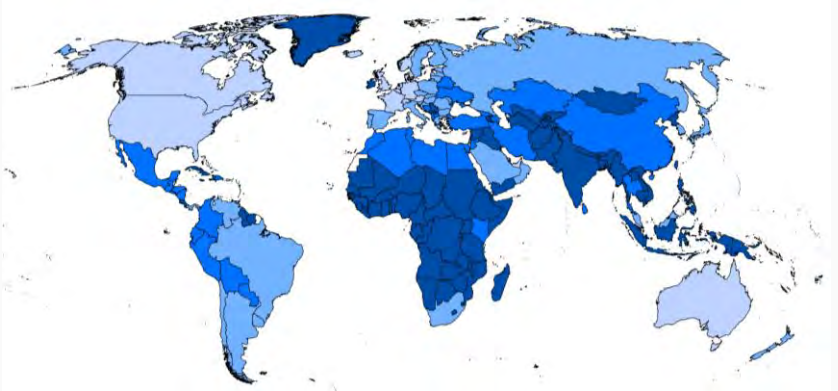

No data

Insurance Groups:

Highly insured countries	Well insured countries	Basically insured countries	Inadequately insured countries
(>1,000 US$)	(101 - 1,000 US$)	(11- 100 US$)	(< 10 US$)

Source: Munich Re, Property insurance premium (non-life including health), per capita in 2008

Munich Climate Insurance Initiative (MCII)

MCII

Objectives of MCII:

Development of risk transfer solutions to support adaptation mechanisms to global warming in developing countries within the framework of the UNFCCC process.

MCII was founded in 2005 on initiative by Munich Re together with Germanwatch, International Institute for Applied Systems Analysis (IIASA), Munich Re Foundation, Potsdam Institute for Climate Impact Research (PIK), Tyndall Centre, World Bank and independent experts.

- Essentials of MCII proposal have made it into the UNFCCC negotiation texts
- Agreement in Cancun on two year programme on “Loss and Damage” including insurance solutions.
- MCII partnering with UNFCCC in organisation of this programme, at COP18 (2012) binding decisions on results expected
- MCII has received funding from German Environmental Ministry (€ 2m) for pilot projects in the Caribbean (project partners CCRIF, MicroEnsure).
  Project has started in June 2011: Development of Livelihood Protection and Lender Portfolio Protection covers in Jamaica, Grenada and St. Lucia

CO_2 – the Most Important Greenhouse Gas

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- CO_2 contributes more than 60% to anthropogenic global warming
- CO_2 on average stays in the atmosphere more than 100 years
- The largest part of CO_2 emissions stems from burning of fossil fuels

=> Key to climate protection and sustainable energy supply are renewable energies

Munich Re has initiated the foundation of the Desertec industrial initiative (Dii GmbH)

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Origin and vision

"Within six hours, deserts receive more energy from the sun than humankind consumes within a year."

- Developed by the Club of Rome's TREC Initiative (Trans-mediterranean Renewable Energy Cooperation)
- Vision: Providing Europe (EU), the Middle East and North Africa (MENA) with a sustainable supply of renewable energy by the year 2050

Today 56 companies support the Dii GmbH

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21 Dii Shareholder (Stand: Dezember 2011)

35 Dii Associated Partners (Stand: Dezember 2011)

Dii GmbH objectives

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Overview of the main modules

Regulatory / legislative environment	▪ analyse and develop a technical, economic, political and regulatory framework for feasible investments into renewable energy and interconnected grids
Roll-out Plan / financing	▪ develop a detailed roll-out plan until 2020 ▪ develop a long-term roll-out plan for the period up to 2050, providing investment and financing guidance
Additional studies	▪ originate some early reference projects to prove the feasibility of the concept ▪ conduct in-depth studies on specific subjects

Dii GmbH: open for all field-proved technologies

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CSP Concentrating Solar Power	Wind power	PV Photovoltaic Power	HVDC High Voltage Direct Current
			
▪ Concentration of sunlight by mirrors/lenses, transformation into heat ▪ Power generation by steam turbines ▪ Heat storage enables base load capability	▪ Conversion of wind to electricity by wind turbines ▪ Onshore/offshore wind farms ▪ Limited space requirements, but higher power volatility	▪ Direct conversion of sunlight to electric energy (photoelectric effect) ▪ Large fields with trackers aligned to sunlight ▪ No storage solutions yet	▪ Power transmission over large distances ▪ Selected reinforcement of existing transmission grids ▪ Design for EUMENA super grid

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The Desertec concept is not limited to EUMENA*, also other regions have high potential for solar electricity generation

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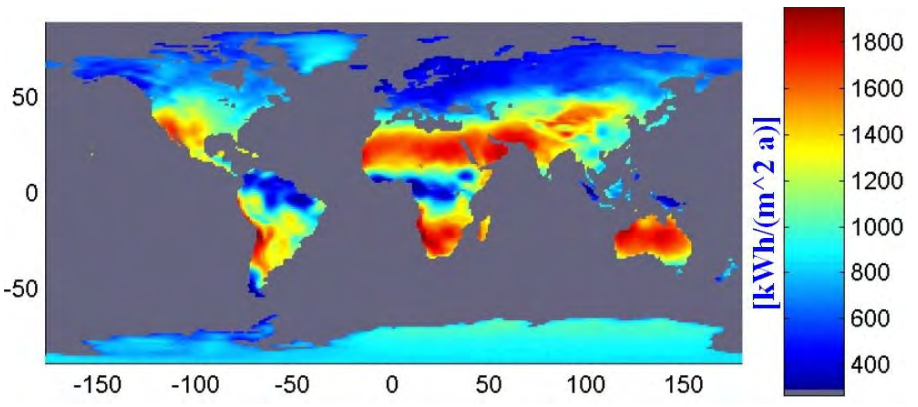
Global distribution of direct normal radiation (needed for CSP technology)**



Source: G. Czisch, ISET, 2000

* EUMENA: Europe, Middle East, North Africa
**Concentrated Solar Power

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Munich Re's goals as the initiator of the Desertec Industries

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CLIMATE PROTECTION	▪ Climate change is a tremendous challenge for humankind ▪ Takeover of social responsibility
INSURANCE SOLUTIONS FOR RENEWABLE ENERGIES	▪ Leading role in developing new risk transfer solutions for renewable energies / new technologies
INVESTMENT	▪ New (direct) investment options ▪ Part of Munich Re strategy to boost investments in renewable energies

Munich Re Publication on „Energy Situation, Problems with Commodities and Insurance" dated 1978

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Das Titelbild zeigt eine Sonnen- oder Solarfarm, wie sie für Afrika und die südlichen Gegenden Europas konzipiert wird. Mehrere zusammengeschaltete Parabolspiegel sorgen für Wassererhitzung im Paraboloidbrennpunkt. Der Wasserdampf wird zu einer Dampfturbine geleitet, die einen Stromgenerator antreibt. Vor dem Rücklauf zu den Spiegeln durchläuft das Wasser noch einen Kühlturm (neben dem Generator-Container sichtbar). Die hier gezeigte Anlage, deren kleinste Einheit auf 50 kW ausgelegt ist, wurde vom Luft- und Raumfahrtkonzern Messerschmitt-Bölkow-Blohm entwickelt.

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Königinstraße 107, D-8000 München 40,
Bundesrepublik Deutschland.

Druck: Carl Gerber Grafische Betriebe GmbH,
Muthmannstraße 4, D-8000 München 45

Munich Re´s Role in Climate Change Management

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1. The first Alerter - Creating Awareness: NatCatSERVICE Database
2. Providing Solutions for Mitigation: Insurance, Desertec
3. Providing Solutions for Adaptation: Insurance, MCII
4. Investor into Climate Change Mitigation Processes: RENT Project
5. Leader in Carbon Neutral Business Operation