

# Costs of Climate change

## **Costs of Climate Change**

**Low prices produce the highest costs**

# Costs of Climate change

## **Hurricane Katrina 2005**

The number of people who lost their jobs because of hurricanes Katrina and Rita has now climbed above the half-million mark with further increases expected in coming weeks from Hurricane Wilma.

The Labour Department reported 502,000 hurricane-related Job-losses claims.

# Costs of Climate change

**Dieter Helm:** “The major factor holding back progress on tackling the climate crisis is that politicians have tried to sell the idea that action will be relatively cheap.

If governments told the truth about the level of cost and scale of effort needed, then people would start to take it seriously, he said. "If you tell people the truth rather than lying to them they will eventually come round. Lying about the cost of decarbonising our economy has got us into the mess we are in today where we are going nowhere fast,"

Dieter Helm, professor of energy policy at Oxford University and head of the academic panel of advisers to the United Kingdom's environment department

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Price competition between producers heats up the use of agrarian chemicals and depletion of natural resources and harms the environment.

# Costs of Climate change

Rising sea level will have impact on 136 US cities, affecting lifestyle of one million people. Buildings worth 28 billion US Dollar will be lost. In the Greater New York area damages of one billion USD are caused nowadays by hurricanes level 4. Draught and fires in California and the South of Europe will increase tenfold by 2050.

Water shortage in India will cause losses of 40 billion USD in agricultural sector where 70% of peasants earn their living.

## **River flooding**

Shinjiro Kanae and Yukiko Hirabayashi, using a global-scale river discharge simulation, found that in the case of 3 °C warming above the 1980-1999 temperature average, approximately 300 million people could be at risk, even in years of relatively low flooding. If the temperature increase is greater than 3 °C, the flood-affected population would likely be even larger. The authors stress that the famous '2-degree' tipping point, rather than 3°C, should be accepted as guideline for continental river flooding.

Hirabayashi, Y.; Kanae, S.: First estimate of the future global population at risk of flooding. *Hydrological Research Letters* **3**, 6-9 (2009). Doi:10.3178/hrl.3.6  
<http://dx.doi.org/10.3178/hrl.3.6>

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High temperatures and drought may cause the Amazon rain forest to die back by 70% at the end of the century. Even with the an increase of 2°C the loss of 1.6

Michael Bruch from Allianz Global Corporate and Specialty says that these costs must be considered by insurance companies which suffered high losses with Katrina hurricane.

Tipping points have ecological and economic impact and affect many regions with global interaction warns Regine Günther, of climate and energy politics of the WWF.

<http://www.wir-klimaretter.de/content/view/4394/256/>

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### Sea level rise

**Exposed assets in Port Megacities** - A global sea level rise of 0.5 m by 2050 is estimated to increase the value of assets exposed in all 136 port megacities worldwide by a total of \$US 25,158 billion to \$US28,213 billion in 2050.

**Exposed assets on NE coast of the US** - The impact of an additional 0.15 m of SLR affecting the NE Coast of the US as a result of the localized SLR anomaly means that the following port megacities may experience a total sea level rise of 0.65 m by 2050: Baltimore, Boston, New York, Philadelphia, and Providence. 0.65 m of SLR is estimated to increase asset exposure from a current estimated \$US 1,359 billion to \$US 7,425 billion. The additional asset exposure from the regional anomaly alone (i.e. 0.65 versus 0.5 m) is approximately \$US 298 billion.

**Insurance aspects** - The critical issue is the impact that a hurricane in the New York region would have. Potentially the cost could be 1 trillion dollars at present, rising to over 5 trillion dollars by mid-century. Although much of this would be uninsured, insurers are heavily exposed through hurricane insurance, flood insurance of commercial property, and as investors in real estate and public sector securities.

Lenton, Tim; Footitt, Anthony; Andrew Dlugolecki: Major Tipping Points in the Earth's Climate System and Consequences for the Insurance Sector. November 2009 by WWF - World Wide Fund for Nature and Allianz SE.  
[http://knowledge.allianz.com/nopi\\_downloads/downloads/TP\\_Final\\_report.pdf](http://knowledge.allianz.com/nopi_downloads/downloads/TP_Final_report.pdf)

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### **Indian Summer Monsoon - in hydrological systems in Asia**

In India under a 'tipping' scenario doubling of the drought frequency are expected and effects from the melting of the Himalayan glaciers and reduced river flow will aggravate impacts.

**Drought costs** - Extrapolating from the 2002 drought using a simple calculation would suggest that the future costs (in today's prices) might be expected to double from around \$US 21 billion to \$US 42 billion per decade in the first half of the century.

### **Aggravating factors:**

- decreasing probability of consecutive 'non-drought' years from which to accumulate surpluses (the probability of two consecutive 'non-drought' years is halved from 64% to 36% and for three consecutive years reduced from 51% to 22%);
- the pressures of increasing population on food and food surpluses (identified as equal to an increase in production by >40% by 2020 and continuing thereafter); and
- impacts of climate change on irrigation (with up to a 60% reduction in dry season river flows). This has implications not only for India but for economies regionally and worldwide.

**Insurance aspects** - The potential scale of drought losses could abort the initiatives to extend insurance more widely into the rural sector. The wider repercussions of drought through an economic slow-down and deterioration in public finances would impact insurers strongly, through the liquidation of private savings and the impairment of investments in public sector securities.

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[http://knowledge.allianz.com/nopi\\_downloads/downloads/TP\\_Final\\_report.pdf](http://knowledge.allianz.com/nopi_downloads/downloads/TP_Final_report.pdf)

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**Amazon drought** - In 2005, large sections of the western Amazon basin experienced severe drought. Recent studies () suggest that droughts similar to that of 2005 will increase in frequency from 1-in-20yr to 1-in-2yr and above by between 2025 and 2050 if stabilization at 450 to 550 ppmv CO<sub>2</sub>e is achieved (with a higher probability if not). The drought of 2005 resulted in a range of impacts including increases in wildfire (with knock-on effects including human health and closure of airports, schools and businesses), interference with navigation (and therefore trade), reductions in agricultural productivity (with knock-on effects to industries servicing agribusinesses and food shortages) and impacts on hydroelectric power generation (which supplies 85% of Brazil's electricity). These impacts reduced contribution to Brazilian GDP in affected regions including Mato Grosso do Sul, Santa Catarina, Paraná and Rio Grande do Sul.

**Insurance aspects** - Insurers would be directly affected by the economic effects of drought in the region i.e. an economic slow-down, and deterioration in public finances. The impacts on natural forests would be less material, since markets in natural carbon and biodiversity are unlikely to be significant for some time, and the drought risk will become evident during that period. In a broader sense, drought could incentivize investment into other forms of energy, e.g. solar power.

Lenton, Tim; Footitt, Anthony; Andrew Dlugolecki: Major Tipping Points in the Earth's Climate System and Consequences for the Insurance Sector. November 2009 by WWF - World Wide Fund for Nature and Allianz SE.  
[http://knowledge.allianz.com/nopi\\_downloads/downloads/TP\\_Final\\_report.pdf](http://knowledge.allianz.com/nopi_downloads/downloads/TP_Final_report.pdf)

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### **Shift in aridity in Southwest North America (SWNA) - a significant shift to a very arid climatology in Southwest North America (SWNA)**

Overview - Aridity in Southwest North America is predicted to intensify and persist in the future and a transition is probably already underway and will become well established in the coming years to decades, akin to permanent drought conditions (). Levels of aridity seen in the 1950s multiyear drought or the 1930s Dust Bowl are robustly predicted to become the new climatology by mid-century, resulting in perpetual drought. In California alone this will result in a number of impacts including on water resources, agriculture, and wildfire.

**Wider impacts** - Besides South-western North America, other land regions to be hit hard by subtropical drying include southern Europe, North Africa and the Middle East as well as parts of South America. If the model projections are correct, Mexico in particular faces a future of declining water resources that will have serious consequences for public water supply, agriculture and economic development and this will (and already has) affected the region as a whole, including the United States.

**Insurance aspects** - Insurers are now alert to wildfire risk in the region. The most serious aspects of the tipping point for insurers would therefore be the indirect ones, i.e. economic and labour market disruption and a deterioration of public finances. On the positive side, investment in water management and alternative energy could provide opportunities for fund managers.

Lenton, Tim; Footitt, Anthony; Andrew Dlugolecki: Major Tipping Points in the Earth's Climate System and Consequences for the Insurance Sector. November 2009 by WWF - World Wide Fund for Nature and Allianz SE.  
[http://knowledge.allianz.com/nopi\\_downloads/downloads/TP\\_Final\\_report.pdf](http://knowledge.allianz.com/nopi_downloads/downloads/TP_Final_report.pdf)

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### **A Message to take home**

Historical GHG emissions have already ‘committed’ us to at least 0.6 °C of further warming. The lack of determined action to reduce GHG emissions means that a warming almost certainly in excess of 2 °C and probably in excess of 3 °C sometime in the latter half of the 21<sup>st</sup> century is likely unless extremely radical and determined efforts towards deep cuts in emissions are put in place in the short term (by 2015).

Alarmingly, this means that, conceivably, there could be tipping elements that have not been triggered yet but which we are already committed to being triggered and/or have already been triggered, but we have yet to fully realize it because of a lag in the response of the relevant system.

Although having the potential to affect very significant numbers of people and assets, such elements are virtually absent from policy and decision contexts concerning what changes in temperature or other variables constitute ‘dangerous climate change’. Work to provide early warning of such tipping elements could provide information to facilitate adaptation or mitigation but, at the same time, getting to the point where action is taken on the basis of such early warnings is, arguably, the greater challenge.

Lenton, Tim; Footitt, Anthony; Andrew Dlugolecki: Major Tipping Points in the Earth’s Climate System and Consequences for the Insurance Sector. November 2009 by WWF - World Wide Fund for Nature and Allianz SE.  
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### **The Stern Review**

The Stern Review of the Economics of Climate Change [1] is a report to the Prime Minister and the Chancellor of the Exchequer of the United Kingdom.

It argues that “the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP1 each year, now and forever.” These are “risks of major disruption to economic and social activity, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century”.

Secondly, the Stern Review argues that “the benefits of strong early action outweigh the costs”. This action would keep concentrations of greenhouse gases below 550 ppm CO2 equivalent.

Critics say that the Stern Review is out of step with the economic literature on climate change. Stern assumes that society will never get used to higher temperatures, changed rainfall patterns, or higher sea levels. This is a rather dim view of human ingenuity. It contradicts what we know about technological progress, adaptation, and evolution, Tol says [2].

[1] Stern, N: The Economics of Climate Change: The Stern Review. (Cambridge University Press, Cambridge, 2006).

[2] Tol, Richard S.J.: THE STERN REVIEW OF THE ECONOMICS OF CLIMATE CHANGE: A COMMENT  
[http://ff.org/centers/csspp/pdf/20061031\\_tol.pdf](http://ff.org/centers/csspp/pdf/20061031_tol.pdf)

# Costs of Climate change

## **The Social Cost of Carbon (SCC)**

**SCC is usually estimated as the net present value of climate change impacts over the next 100 years (or longer) of one additional tonne of carbon emitted to the atmosphere today. It is the marginal global damage costs of carbon emissions.**

**1996 - EU sets the 2 degrees (pre-industrial target)**

**2002 - UK sets the Social Cost of Carbon SCC for Gov. appraisal (£70/tC = £19/tCO<sub>2</sub> for yr 2000 emission and prices)**

**2006 - Stern Review - recommended target 450-550ppm estimates SCC of \$85/tCO<sub>2</sub> yr 2000 BAU and \$30/tCO<sub>2</sub> on 550 [£19/tCO<sub>2</sub>])**

**2007-8 - UK revises SCC in line with Stern 550 (£26/tCO<sub>2</sub> yr 2007)**

**2008 - UK introduces Climate Change Act - 80% reduction by 2050**

**2008 - EC 2020 target (20% GHG / 20% Renew) by 2020 rising to 30% GHG with global deal**

**2009 – UK legally binding 5yr interim budgets (2022) and replace SCC**

[1] Paul Watkiss, David Anthoff, Tom Downing, Cameron Hepburn, Chris Hope, Alistair Hunt, and Richard Tol: **The Social Costs of Carbon (SCC) Review – Methodological Approaches for Using SCC Estimates in Policy Assessment. Final Report** 2005 Research on behalf of Defra

[http://socialcostofcarbon.aeat.com/files/Final%20Report\\_7.doc](http://socialcostofcarbon.aeat.com/files/Final%20Report_7.doc)

# Costs of Climate change

## The Climate Change Act

The principal aim of the Climate and Energy package is to reduce emissions in the EU in a cost effective manner, while fairly distributing the costs between Member States. In order to do this the Commission have devised a burden sharing methodology for the effort each Member State must undertake to reach the GHG and renewable energy targets.

The secondary objective of the package is to enhance the chances of a securing an international agreement to reduce emissions, through the EU showing leadership.

## The Explanatory Memorandum to the Climate Change Act Predictions:

**A total cost            EUR 20.6 Billion**

**A total Benefit        EUR 9.2 to 242.1 Billion**

[1] EXPLANATORY MEMORANDUM TO THE CLIMATE CHANGE ACT 2008 (2020 TARGET, CREDIT LIMIT AND DEFINITIONS) ORDER 2009 No. 1258. THE CARBON BUDGETS ORDER 2009 No. 1259

[http://www.opsi.gov.uk/si/si2009/em/uksiem\\_20091259\\_en.pdf](http://www.opsi.gov.uk/si/si2009/em/uksiem_20091259_en.pdf)

Summary: Analysis & Evidence			
<b>Policy Option: A</b>		<b>Description: Set UK carbon budgets to enable the UK to meet commitments made to reach the goals of the EU Climate and Energy Package.</b>	
<b>COSTS</b>	<b>ANNUAL COSTS</b>		Description and scale of key monetised costs by 'main affected groups' Cost to installations covered by EU Emissions Trading Scheme (£1.9bn). Cost of Renewable Energy Strategy = (19.9bn). Cost savings (through negative cost abatement opportunities) of meeting remaining GHG reductions in the non-traded sector (-£1.2bn).
	One-off	Yrs	
	£ 0	0	
	Average Annual Cost (excluding one-off)		
£ 3.0 billion		Total Cost (PV)	£ 20.6 billion
Other key non-monetised costs by 'main affected groups' Possible local air quality costs from some renewable sources not included. Policy costs in non-traded sector. Possible hidden costs in non-traded sector such as hassle and time costs associated with energy efficiency measures.			
<b>BENEFITS</b>	<b>ANNUAL BENEFITS</b>		Description and scale of key monetised benefits by 'main affected groups' Benefits of GHG emissions reductions to meet UK commitments to a 20% reduction in GHG emissions. Benefits will depend on other's actions and the emissions concentration trajectory the world is on. High end of range reflects world where EU action is pivotal in achieving a global deal.
	One-off	Yrs	
	£ 0	0	
	Average Annual Benefit (excluding one-off)		
£ 1.3to 35.2 billion		Total Benefit (PV)	£ 9.2 to 242.1 billion
Other key non-monetised benefits by 'main affected groups'. Innovation benefits from the Renewable Energy Strategy to bring down future mitigation costs. Possible air quality benefits in the non traded sector.			
Key Assumptions/Sensitivities/Risks There are significant uncertainties over the avoided damage costs associated with reduced greenhouse gas emissions; benefits depend on the emissions trajectory assumed to measure the social costs of carbon. Costs of the policies are sensitive to the fossil fuel prices assumed. Estimation, by the DECC Energy Model, of the effort required to meet the non-traded target is subject to large confidence intervals.			
Price Base Year	Time Period	Net Benefit Range (NPV)	NET BENEFIT (NPV Best estimate)
2008	Years 8	£ -11.4 to + 221.5 billion	£ 221.5 billion
What is the geographic coverage of the policy/option?			UK
On what date will the policy be implemented?			January 2013

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### **Food:**

Stern says that climate change would hamper agricultural productivity in some parts of the world, particularly Africa. This would be a problem in today's world. However, the Stern Review says that African economies would grow rapidly. This is inconsistent with famine. Middle-income countries would import food (global food production is not threatened by climate change) rather than starve.

Furthermore, it is hard to imagine rapid economic growth without substantial improvements in agriculture productivity; at present, African agriculture is particularly inefficient. [1]

[1] Tol, Richard S.J.: THE STERN REVIEW OF THE ECONOMICS OF CLIMATE CHANGE: A COMMENT  
[http://ff.org/centers/csspp/pdf/20061031\\_tol.pdf](http://ff.org/centers/csspp/pdf/20061031_tol.pdf)

# Costs of Climate change

Rice is labour intensive. It is well integrated in the environment and uses land which could not be used with machines.

Climate change hits these peasants. Some say rice increases emission of methane from their fields and suggest to leave them dry to avoid organic material to decompose to methane.

Reiner Wassmann, a biologist specialising in climate change at the International Rice Research Institute says that 1/5 of all greenhouse gas emissions are methane which is at least 20 times more effective at trapping heat in the earth's atmosphere than CO<sub>2</sub>.

About 10 percent of the methane comes from rice farming, while other sources include the flatulence of cows and decomposing landfill garbage dumps.

Wassmann said it was essential that rice farmers in Asia and the rest of the world did their bit to tackle climate change, but lumping them in with more obvious, fossil-burning culprits of climate change was wrong.

[1] Rice an unlikely global warming culprit  
<http://www.google.com/hostednews/afp/article/ALeqM5hJrGUqG321PcUObDiZTSbxrtGx0g>

# Costs of Climate change

William Ruddiman, Professor Emeritus in environmental sciences at the University of Virginia, has presented a widely published theory according to which humanity started to affect the climate thousands of years ago, not just since the start of the industrial revolution. According to the theory, rice cultivation, commenced in East Asia already over 5,000 years ago, caused the declining methane amounts to again increase, which contributed to preventing the next ice age.

The timeframe of the spread of peatlands matches the increase in methane levels

## **Rice plantations not responsible for huge methane emission [1]**

Professor Atte Korhola, however, explains the emergence of the peatlands in the northern hemisphere, and their development history.

According to Korhola the expansion of northern peatlands significantly accelerated about 5,000 years ago. At the same time, the methane content in the atmosphere started to increase.

the early increase in methane levels was mainly caused by natural reasons, and human operations are not necessarily required to explain it.

The expansion of peatlands was triggered by the climate turning moister and cooler, which caused the groundwater levels to rise, while accelerating peat build-up and growth. A similar methane peak may also emerge in the future if precipitation in the Arctic areas increases as forecasted.

[1] Korhola et al. The importance of northern peatland expansion to the late-Holocene rise of atmospheric methane. *Quaternary Science Reviews*, 2010; DOI: 10.1016/j.quascirev.2009.12.010  
<http://dx.doi.org/10.1016/j.quascirev.2009.12.010>

# Costs of Climate change

On 26 September 2009 Typhoon Ketsana submerged rice fields at Luzon Island in the Philippines. The whole harvest was lost.

The peasants carry the costs of climate caused by the industrialised society.

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### **Methane:**

Rice farmers are accused of methane emission from their wet rice fields

### **Important sources of methane are:**

- Melting permafrost of the Siberian tundra.
- Gases from cattle breeding and litter.

# Costs of Climate change

Rising temperatures will open the north pasage.

This will benefit the fishing industry but undermine the living grounds of Inuits.

Permafrost melting erodes the coastline of Alasca.

The ice holds the sandy ground together. When the ice melts the sand is washed away by the waves, says a study by Robert Anderson. Habitat for birds and other wildlife will be lost, together with freshwater reservoirs which will drain into the sea.

Stabilization measures using sandbags have been undertaken at the Alaskan town of Kaktovik on the Beaufort Sea in an attempt to slow the problem. [1].

[1] Portions of Arctic Coastline Eroding, No End in Sight, Says New CU-Boulder Study. University of Colorado at Boulder. December 14.2009  
<http://www.colorado.edu/news/r/fff17f8947aba3f5e502f0ed30adb9ee.html>

# Costs of Climate change

## **Arctic may become a source of carbon dioxide [1]**

David McGuire of the U.S. Geological Survey and the University of Alaska at Fairbanks and his colleagues show that the Arctic has been a carbon sink since the end of the last Ice Age, which over time has accounted for between zero and 25 percent, or up to about 800 million metric tons, of the global carbon sink. On average, says McGuire, the Arctic accounts for 10-15 percent of the Earth's carbon sink. But the rapid rate of climate change in the Arctic – about twice that of lower latitudes – could eliminate the sink and possibly make the Arctic a source of carbon dioxide.

Carbon generally enters the oceans and land masses of the Arctic from the atmosphere and largely accumulates in permafrost, the frozen layer of soil underneath the land's surface. Unlike active soils, permafrost does not decompose its carbon; thus, the carbon becomes trapped in the frozen soil.

But recent warming trends could change this balance. Warmer temperatures can accelerate the rate of surface decomposition, releasing more carbon into the atmosphere. More concerning, says McGuire, is that the permafrost has begun to thaw, exposing previously frozen soil to decomposition and erosion. These changes could reverse the historical role of the Arctic as a sink for carbon.

[1] Ecological Society of America (2009, October 15). Arctic Has Potential To Alter Earth's Climate: Arctic Land And Seas Account For Up To 25 Percent Of World's Carbon Sink. ScienceDaily. Retrieved January 17, 2010, from <http://www.sciencedaily.com/releases/2009/10/091014144729.htm>

# Costs of Climate change

**Storms, droughts, sea levels, crop yields, fires**

**Greece, California and Australia lost lives, forests and assets with fires.**

Jacques Marcovitch, of the University of São Paulo, Sérgio Margulis, of the World Bank, and Carolina Dubeux, of Coppe/Federal University of Rio de Janeiro predict that in 2050 every Brazilian citizen will lose USD 300 to 910 of his annual income due to climate changes. The gross national product will drop by 0.5% to 2.3% equals losing one year of growth.

Losses will mount up to 2 trillion USD in the next 40 years.

Agriculture will be intensively affected by the climate change. A drop of yields of 30% to 34% are expected for soy, 12 to 17 % for corn and 15 % of loss of coffee crops will take place.

The Study says that yearly investments of 215 million USD in research and genetic modification of soy grain may bring this investment 8 times back. Corn needs 200 million USD investment in research and 170 million USD in irrigation infrastructure.

Brasil pode perder até R\$ 3,65 trilhões em 40 anos para conter efeito das mudanças climáticas  
<http://www.gabeira.com.br/noticias/temas/meio-ambiente/1492-aquecimento-custara-1-ano-de-crescimento-ao-brasil>

# Costs of Climate change

## **Brazil**

**Amazon Region:** Will lose 40% of its forest. Temperature rising by up to 8°C  
Reduction of 30% of the river output.

**Northeast Region:** Reduction of rain fall by 2 to 2,5 mm/day.  
Lack of water reduces cattle farming by 25%. São Francisco river reduces its output by 70% between 2071 and 2100.

**Brazilian Coast:** Rise of sea level will cause 207,5 billion Reais.

**Southeast region:** The river Paraná will suffer a reduction of 30% of the river output.

**The South of Brazil:** will suffer less from frost. Agriculture of the region will profit from rising temperatures.

**Socio-economic costs:** According to John Kerry, US Senator, the Sudan crisis is a result of drought and expansion of the desert.

# Costs of Climate change

## Costs of natural disasters

	Billions USD
Hurricane Katrina	125
Earthquake Kobe	100
Earthquake Sichuan 2008	35
Earthquake Noirthbridge USA 1994	44
Hurricane Ike USA/Caribic 2008	35
Floods in China 2008	30,7
Earthquake Nilgato 2004	28
Hurricane Andrew 1992	26,5
Floods in China 1996	24
Hurricane Ivan USA/Caribic 2004	<u>23</u>
<b>Total Costs Hurricanes and Floods</b>	<b>264,2 Billions USD</b>
<b>Total Costs Earthquakes</b>	<b>207 Billions USD</b>

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## **Population Protests Against Coal Power**

Heavy reaction of the population of Dörpen, Germany, postpones the official authorisation of the construction of a coal power plant.

Germany developed a nuclear exit strategy with complete stop of nuclear reactors in 2020.

Coal fired plants will be necessary unless more support will be granted for alternative energies.

# Costs of Climate change

## Example of costs of cheap solutions

### No alternatives, they are too expensive [1]

Takeoff weight of flight Air France AF 447 Rio-Paris was 232,757 Tons, only 243 Kilogramm down of the maximum allowed weight of aircraft A330. The 70 Tons of kerosene are sufficient to reach Paris without any detours.

### Crossing thunderclouds in icy top altitude

Flying higher than 11,000 metres, and crossing thunderclouds was necessary to spare fuel. Under these conditions the speed indicator system Thales became clogged due to ice formation and deranged the whole flight system of the aircraft crashing after three hours flight.

### Failing to act

Airbus and the European Air Transport Safety Council discussed nine failures of the pitot tube of the Thales system between May and October 2008, but could not issue a ban on the system. This speed indicator became the cause of the terrible loss of flight AF 447 two month later. [2]

### Safety update to expensive even after the crash of flight AF 447

Airbus provides a safety update "Bus" which provides the pilot flight informations in case of failure of the speed indicator. Air France does not take the update because of the price of 300 000 EURO/aircraft.

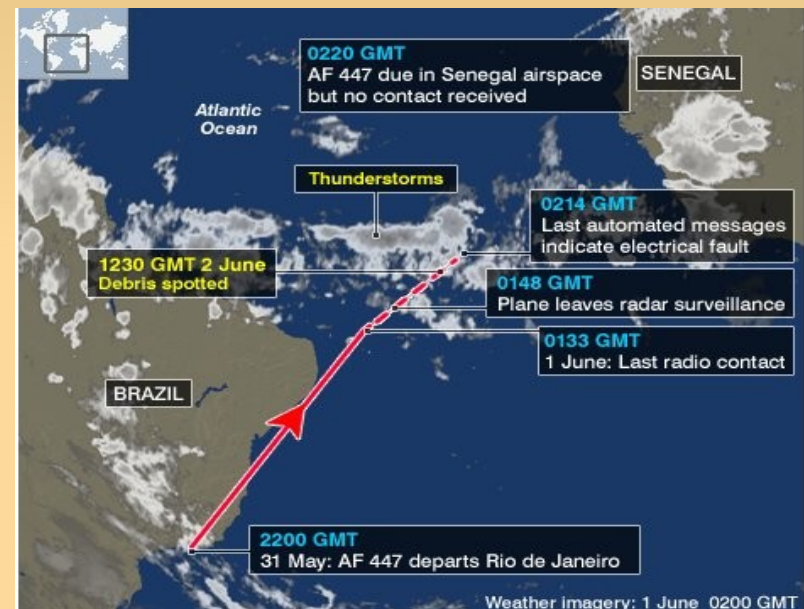
## Looking for lowest prices

**Only the best solution should be chosen to protect environment and keep the world safe .  
The cheapest solutions may cost disasters.**

[1] Spiegel Online: 23.02.2010: Gehirnschlag im Cockpit  
<http://www.spiegel.de/spiegel/0,1518,druck-679238,00.html>

[2] Wikipedia: Air Data Inertial Reference Unit  
[http://en.wikipedia.org/wiki/Air\\_Data\\_Inertial\\_Reference\\_Unit#Air\\_Data\\_Reference](http://en.wikipedia.org/wiki/Air_Data_Inertial_Reference_Unit#Air_Data_Reference)

26 [3] Death in the Atlantic: The Last Four Minutes of Air France Flight 447  
<http://www.spiegel.de/international/world/0,1518,679980,00.html>



# Costs of Climate change

In practically all countries, with the exemption of cities where slums exist, it is forbidden to throw household waste on the street. People put their waste into containers and they pay for the local waste management.



But, interestingly enough, it is not forbidden for conventional, polluting energy to throw waste into the atmosphere. What has become a self-evident point in our culture of living with waste should be the same for overcoming polluting energy supplies and consumption.

[1] Scheer, Hermann: In praise of creative destruction. *Ode Magazine (Special Copenhagen Edition)*, December 12, 2009  
[http://www.eurosolar.de/en/index.php?option=com\\_content&task=view&id=388&Itemid=112](http://www.eurosolar.de/en/index.php?option=com_content&task=view&id=388&Itemid=112)

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## **EPA plans to lower the amount of dioxins levels [1]**

According to the U.S. Environment Protection Agency (EPA), dioxins, such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), the most toxic of dioxins, may cause a large number of different health effects, like cancer and reproductive effects. Dioxins are of concern because they are the result of combustion, and are absorbed from the air into the food chain where they can stay for many years.

## **Preliminary remediation goals (PRGs) for cleanup of dioxins in soil**

Currently, EPA's recommended dioxin preliminary remediation goals (PRGs) for cleanup of dioxins in soil are 1,000 part per trillion (ppt) for dioxin in residential soil and a level within the range of 5,000-20,000 ppt in commercial/industrial soil. The draft interim PRGs proposed are 72 ppt for residential land uses and 950 ppt for commercial/industrial land uses. This draft interim PRGs include consideration of the potential absorption of dioxin through skin exposure.

[1] EPA Seeks Public Input on Interim Guidance for Dioxins in Soil Cleanup Goals

<http://yosemite.epa.gov/opa/admpress.nsf/652d9edd5cf71a2585257359003f5343/6526d9a72fbc7f388525769d004fc223!OpenDocument>

# Costs of Climate change

## **The perpetrator, not the tax payer must pay for environmental cleanup** [1]

The U.S. Environmental Protection Agency reduces the need for federal taxpayers to fund the cleanup of environmental releases. The agency has identified three additional industry sectors for which it will begin the regulatory development process for any necessary financial assurance requirements: the chemical manufacturing industry; the petroleum and coal products manufacturing industry, which primarily includes refineries and not coal mines; and the electric power generation, transmission, and distribution industry. Already included in this program is the hard-rock mining industry.

Financial assurance requirements help ensure that owners and operators of facilities are able to pay for cleanup of environmental releases and help reduce the number of sites that need to be cleaned up by federal taxpayers through the Superfund program, following Section 108(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Additional classes of facilities that require further regulations: waste management and remediation services, wood product manufacturing, fabricated metal product manufacturing, electronics and electrical equipment manufacturing, and facilities engaged in the recycling of materials containing CERCLA hazardous substances.

[1] EPA Identifies Three Industries for Financial Obligations in Cleanup of Environmental Releases Action is a first step to ensure owners of these facilities, not taxpayers, foot bill for the cleanup of environmental releases. December 30, 2010

<http://yosemite.epa.gov/opa/admpress.nsf/652d9edd5cf71a2585257359003f5343/a8c0942a295468338525769c00689c70!OpenDocument>.

# Costs of Climate change

## **How to install the clean energy economy [1]**

Germany is today the country with the most installed solar panels and windmills, whereas Germany is clearly not the country with the most sunshine and the best wind conditions. The success of the introduction of renewable energy is a result of the 20TK Renewable Energy Act.

This act was not a derivative of the Kyoto Protocol. The key point of this act is that all new renewable energies have absolute priority at a guaranteed price in the electric power market. Whatever renewable energy is produced must be taken by the grid and must be taken by the whole electric power service. The conventional energy companies have no possibility to block it. This simple act has created a lot of new investment and has already inspired more than 40 countries, including China and India, to develop a renewable energy technology market.

Governments can also support the necessary dynamism through tax policies. Renewables should be given tax exemptions.

[1] Scheer, Hermann: In praise of creative destruction. *Ode Magazine (Special Copenhagen Edition)*, December 12, 2009  
[http://www.eurosolar.de/en/index.php?option=com\\_content&task=view&id=388&Itemid=112](http://www.eurosolar.de/en/index.php?option=com_content&task=view&id=388&Itemid=112)

# Costs of Climate change

The European Union proposes to give 10 billion Euro for the building of dikes in the developing countries.

Germany: In 2007 it was decided to increase the level of the dikes by 50 cm. The UN climate report 2007 predicts a sea level rise between 18 and 59 centimetres. Other studies cite 9 to 88 centimetres and may even turn out to be higher than that, depending on the increasing emission of greenhouse gasses.

**Correct the causes and not the effects.**

Building dikes is like a doctor which lowers the fever of his patients suffer from a life threatening infection. Penicillin must control invasive bacteria and decarbonising fuel may avoid further climate change.

**The End**