

**04/01/2010 05:00 PM****Climate Catastrophe****Part 7: Climate Change's Winners and Losers**

Even though researchers have been refining their climate models for more than 30 years, there is one natural phenomenon that continues to elude them. "Clouds still pose the biggest problem for us," says Marotzke. "The uncertainties are still very big. This remains the most important issue for us."

It all seems simple enough in theory. When temperatures rise, more moisture evaporates. But does that mean that more clouds form as a result? And if so, do they curb or accelerate global warming?

On their upper surfaces, clouds act like mirrors. They reflect sunlight back into space, thereby cooling the atmosphere. But on their lower surfaces they prevent the heat reflected by the Earth from escaping, and temperatures rise.

Which of the two effects predominates depends on the height and type of clouds. "You just have to look up to see how many different types there are," says US cloud expert Björn Stevens, the new director of the MPI-M. "And each cloud type behaves differently."

**'The Jury Is Still Out'**

Until now, no one knew exactly which clouds benefit from a greenhouse climate. But the answer to this question determines whether average global temperatures will end up being one degree higher or lower than predicted by today's models, a factor which creates significant uncertainty. "The jury is still out on which direction the pendulum will take," says Stevens.

Despite the enormous uncertainties, there is agreement on at least one issue: Global warming can no longer be stopped.

But would that be as horrific as has been predicted? Does humanity truly face plagues of biblical proportions? Won't a warmer climate also have its benefits? And won't it lead to higher crop yields and more tourism revenues in many places?

The truth probably lies somewhere in the middle. There will undoubtedly be losers, but there will also be winners. Whether global warming is more likely to be harmful or beneficial depends entirely on the location of the observer.

**Imprecise Simulations**

Unfortunately, the computer simulations that predict the climate of the future are still too imprecise to be able to draw reliable conclusions for each individual country or region. Although it is relatively easy to predict the amount by which average temperatures will probably rise in different parts of the world, the models are still relatively shaky when it comes to precipitation. In fact, the prognoses the different models make are sometimes very contradictory.

Nevertheless, a clear trend is emerging in most simulations. "In places where it already rains a lot today, it will rain even more," says Erich Roeckner, a veteran climatologist who has spent years simulating changes in precipitation in a warmer climate. "And where it's dry today, it'll be even drier in the future."

The common myth that developing countries, the poorest of the poor, will suffer the most as a result of climate change is wrong -- at least according to current climate models.

In central Africa, for example, the models predict that hardly anything will change, and precipitation will likely remain constant. And according to most simulations, precipitation could even increase in the drought- and famine-plagued Sahel. "If this turns out to be true," says Roeckner, "it will of course be a surprisingly positive side effect."

### **Clear Winners of Climate Change**

The clear winners are principally the northern regions of the world where it has up until now been too cold and inhospitable. Countries like Canada and Russia can look forward to better harvests and blossoming tourism. The countries bordering the Arctic also hope that the melting of sea ice will enable them to reach previously inaccessible natural resources. For Scandinavians, for example, the only drawback will be a possible guilty conscience over the fact that they are benefiting from climate change.

It will become more arid, however, in many subtropical regions. Industrialized nations, which bear the greatest culpability for global warming, will be most heavily affected. The new drought zones will probably lie in the southern United States and Australia, as well as in South Africa. In Europe, Mediterranean countries like Spain, Italy and Greece will struggle with even drier climates than they already have today.

A drastic shift could take place in the European tourism business, as climate change heralds bad times for the large tourist developments in southern Spain and good times for hotels along the North Sea and Baltic Sea coasts. "If I had a vacation house on Mallorca," Max Planck scientist Jochem Marotzke jokes, "I would sell it and look for one on (the Baltic Sea island of) Usedom."

### **A Mediterranean Climate in Germany?**

Germany could be among the beneficiaries of climate change. A Mediterranean climate could prevail there by the end of the century, which would mean that summer temperatures in Hamburg, in the north, would be as warm as they are in the southwestern city of Freiburg today, while Freiburg's summers would come to resemble those of Marseilles today. Perhaps palm trees would even grow on the North Sea island of Helgoland.

But there are also downsides. While it will be drier in the summer, rainfall will increase significantly in the fall and winter. Northern Germany, in particular, could see more flooding. To avoid flooding, it will be necessary to improve drainage on fields and pastures and reestablish old flood plains.

In particularly dry regions, on the other hand, such as the eastern state of Brandenburg, the risk of forest fires will increase even more than it has already as a result of the global warming that has

already occurred. Paradoxically, the amount of land affected by fire has declined considerably since 1970, even though there are more fires today. This is because optical smoke detectors have now been installed to monitor forests, so that fires are extinguished more quickly. As global warming continues, it could also become necessary to replace pine forests with mixed forests.

For Germans today, who have just experienced an unusually harsh winter, these scenarios are still a long way off. What, some are likely to wonder, do simulations about the world in 100 years have to do with the reality of life today?

### **Looking into the Near Future**

To illustrate the consequences of global warming more vividly, scientists at the MPI-M are currently developing a medium-term scenario: the world in 20 years' time.

"For the first time, we want to try to look into the near future," says MPI-M Director Jochem Marotzke. "This is more difficult, because the fluctuations are bigger than in the long term."

While the supercomputers are still computing away, scientists already estimate that average temperatures will rise by another half a degree Celsius by 2030, or about the same temperature increase since the 1970s. "This will be clearly felt here," says Marotzke.

Germany will see many more tepid summer nights, and spring will begin earlier and earlier. And in only 20 years, snow could become a thing of the past in Germany.

All of this can no longer be averted.

### **Delayed Reaction**

Even if humanity were to stop burning coal, oil and natural gas immediately, there would still be a moderate temperature increase in the next two to three decades. This is because the planetary weather system reacts with a certain delay to the greenhouse gases that have already been emitted into the atmosphere.

One of the biggest unanswered questions is whether it will be possible to keep the temperature increase at less than two degrees Celsius, as world leaders agreed at the climate summit in Copenhagen.

Critics pose a completely different question: How slavishly must humanity stick to this target? Will it truly be the end of the world if this threshold is exceeded?