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# "Many people are unaware that our life form depends on the world's ecosystems"

**Climate physicist Thomas Stocker has been conducting research into the relationship between global warming and the concentration of greenhouse gases in the atmosphere since the 1980s. Today he is Co-Chair of Working Group 1 of the Intergovernmental Panel on Climate Change, and campaigns for a proactive climate policy.** ***By Gabriela Neuhaus.***

**One world: As a scientist, how do you see your role in shaping future global climate policy?**
*Thomas Stocker:* As Head of the University of Berne's Department for Climate and Environmental Physics, I am responsible for ensuring that good scientific research is conducted. As Co-Chair of the Science Working Group of the Intergovernmental Panel on Climate Change or IPCC (see inset), it is my job to present the most pertinent scientific findings of climate research so as to provide decision-makers with robust, intelligible statements on climate change.

**The meeting of climate scientists in March this year ahead of the climate negotiations in Copenhagen in December gave the impression that the situation has become more acute since the IPCC Fourth Assessment Report in 2007. Would you agree?**
The IPCC Report reflected the current situation at the time of its publication in 2007. Further observations of the climate system made since then only confirm this picture: for example, the temperature trend. The arctic ice cover has receded much faster than the models predicted. Other studies have shown that the change is at least to some extent within natural fluctuation boundaries. Given the nature of such a complex system, in which it is first necessary to determine the natural fluctuation band, it is extremely difficult to identify effective changes outside the norm: particularly when the available data does not go far enough back, as is the case with the arctic ice cover, for which the only comprehensive measurements start from around 1970: a relatively short time scale.
One thing we didn't expect, however, was that greenhouse gas emissions would increase even further, as has been the case over the past two years. Here we have an increase that exceeds the IPCC's maximum projection. Whether this trend in emissions will continue is entirely in our hands: it is up to the human race to decide whether to resign ourselves to further accelerated growth in emissions or to take action to reduce emissions even below the IPCC Report's lower projection. This is a necessity if we are to achieve the 1994 UN Climate Convention target, which is binding under international law: Article 2 states clearly and unequivocally that greenhouse gas concentrations in the atmosphere must be stabilised "at a level that would prevent dangerous anthropogenic interference with the climate system".

**What, in your view, are the most important findings of the IPCC Fourth Assessment Report published in 2007?**
One key finding which the fourth report on climate change clearly highlighted was that global warming is triggering a series of chain reactions. For some time, I personally have been convinced that the most important, and probably most severe, change is happening in the water cycle. The report provides clear evidence that regions which are already suffering from drought will become even dryer. This is because dry periods will last longer, and in geographical terms drought is becoming more widespread. And regions which already enjoy sufficient water reserves, i.e. at medium and high latitudes, will see more rain in future. So, alongside the challenge of global warming, we have to contend with a change in water supplies. Even now we can see from the example of India that a one-week delay in the monsoon has massive implications for the region's ecosystems and economy.

**The IPPC Fifth Assessment Report on Climate Change is scheduled for publication in 2013. Will it contain anything new?**
Research scientists expect more detailed statements on various themes and further results in various areas. It is essential for many coastal regions to know the extent to which the sea level will rise. To predict this, we must gain a better understanding of the impact of warmer climate conditions on the ice cover in Greenland and the Antarctic. Another topic that is close to the hearts of research scientists is the classification of regional climate changes: Up to now, science has been unable to determine the causal relationships between global warming and local environmental phenomena such as the series of summer droughts in Spain. Only when we have conclusive proof that the fountain in our back garden has dried up due to global climate change will the right policy decisions be made at the local level. People are more willing to take steps to protect the climate if they are directly affected and can identify the concrete causes.
The task is to understand the entire chain and classify the changes according to their causes, so that we can statistically attribute them to the rise in greenhouse gases. This is a complicated scientific problem, but it must be addressed if we want to prove that such changes, including extreme events such as flooding or drought, are connected to global climate change.

**How much do we know about regional climate change, and does the corpus of available data vary depending on the region?**
As far as information on local climates is concerned, there are lots of gaps. This is because of the narrow scientific basis in the countries most strongly affected, where it is extremely difficult to find scientists with the resources and experience to provide the IPCC with key information on the local climate. Yet such information is essential to gain a better understanding of local weather and climate conditions. Right now, even in industrialised countries observation

stations are being neglected or shut down due to the pressure to cut costs - so here, too, we have a fight on our hands to make sure that the data situation does not get any worse.
In addition to our efforts to improve the data situation, we are also endeavouring to refine our global models. Here we are set to achieve further improvements, since the resolution for models is becoming much better and enabling more detailed study. One reason for this is the increasingly fast processing speed of computers. Our forecasts are becoming more and more accurate. But there is still one uncertainty factor over which science has no influence: We don't know how much emissions will rise by over the next few years, so we must continue to work with scenarios.

**It is now a scientific fact that climate change is human-induced. Has this made your work simpler?**
No - quite the opposite. The clearer our statements are, the clearer it becomes that measures must be taken if we want to keep climate change under control, along with its effects and – above all – the resultant costs. The result is that certain groups who oppose change are bringing out the big guns, stepping up their efforts and propaganda. This is what's happening right now. (points to the SVP position paper on climate change on the desk in front of him). Indeed, in February 2009 some parties in all seriousness demanded the abolition of the CO2 law and proposed that Switzerland opt out of the follow-up to the Kyoto Protocol unless all large emitters of CO2 pledged to limit their emissions. Naturally these groups also oppose national regulations that impose stricter requirements than international commitments. They want to distance themselves from this change which is affecting not only the climate but also the entire global economy. Anyone with this mindset is clearly saying: We don't want anything to do with this way of thinking or development and innovation process. This is a dreadful attitude. It's as if hundreds of years ago we had said to ourselves: We'll carry on building wooden wheels, making harnesses for horses and shovelling up their dung."
But advances in technology made all this redundant. And it will be the same in future; anyone aiming to retain jobs and create employment must embrace innovation. Those who don't get left behind.
There are lots of SMEs in Switzerland that have been practising this philosophy for some time in their particular field. They may not have much lobbying power, but they perform enormously valuable work, source their materials very carefully, run staff training courses etc. I know of one example where the workforce was doubled yet energy consumption rose by only five percent. That's quite an achievement.

**Industrialised countries are now regarded as the main culprits behind climate change. Will that also be the case in future?**
The fact is that industrialised countries are responsible for past and future climate change: If today I emit one tonne of CO2, the effects will last for the next few centuries. But newly industrialised countries enjoying rapid growth now bear a similar responsibility. Not for the past, but for the future. Innovative technologies must be used in these countries to prevent them going down the path of inefficient products, as we have done. If the majority of the population insist on driving a car, countries like India and China should start from the outset with a two-litre car. Even then, it quickly becomes apparent that cities are unable to cope with such volume of traffic; so aggressive growth in public transport is unavoidable.

**CO2 emissions are rising dramatically, particularly in some newly industrialised and developing countries. Is this justified?**
These countries have much lower emissions per capita than we do: most are well below the 2000-Watt consumption level, while we in Switzerland are having to reduce greenhouse gas emissions to two tonnes per head of population – in other words, by two thirds. I don't say that's impossible, but in our present status we cannot sit back and do nothing. Because there's no denying that emissions will continue to rise in countries which are currently less industrialised.

**What types of measures need to be taken to mitigate the effects of climate change?**
We need new technologies and much more careful management of resources. And we need to redefine the term "quality of life" by opting as far as possible for closed material and energy cycles.
For example, in our society high quality of life means living as close as possible to one's place of work. Or, if you decide to live in the country, being able to use public transport or a bicycle to get from A to B. But if you transpose this to a village in Africa or India, other factors come into play: How can I provide for my family, how can I find access to uncontaminated water, clean air, a clean environment? Enhancing the quality of life in these countries necessitates a degree of regulation: Just as there are no voluntary agreements in human rights, nor are there any when it comes to speed limits. This is why a voluntary agreement on reducing emissions does not work. That goes for us, too!

**So 2009 – when the Climate Summit convenes in Copenhagen in December – will be a decisive year in climate history?**
The task is to formulate a protocol with some bite. It must clearly set down the reductions expected from industrialised countries, and at the same time define sanctions if these reduction targets are not met. The other task is to bring large emitters on board. It is clear that India and China must sign up to this agreement, with generally valid but differentiated responsibilities. Everyone bears responsibility, but to differing degrees – even developing countries must be included. And then we need a clear plan for the way in which emissions allowances are traded. Because recent years have shown that, with unrestricted trading freedom, these allowances have become speculative objects.

**How much time do we have to implement climate protection measures?**
Ecosystems are disappearing as a result of global warming. Many people are unaware that our life form depends on these ecosystems, which we take for granted day after day. Whether we take measures to limit this destruction, and what form these will take, makes no difference to Planet Earth. Even as far back as 30 years ago, science had all the necessary information and communicated it so that decisions on climate protection could be made. At the time it would have been relatively easy to restrict warming to 2 degrees above the pre-industrial average temperature. Since then we have lost a great deal of time, and this goal has become much more ambitious. Yet even a temperature increase of one degree can have drastic consequences. The question now is how much damage we can sustain on our overcrowded planet. At stake is the planet's so-called "habitability", which we are continually reducing through our behaviour.

**Thomas Stocker** studied environmental physics at the Federal Institute of Technology in Zürich. He started developing efficient climate models and studying rapid fluctuations in the climate back in the 1980s. Since 1993 he has headed the Department of Climate and Environmental Physics at the University of Berne, which is a global leader in research into

greenhouse gas concentrations over the past 800,000 years. As part of these studies, research scientists work with ice cores from Greenland and the Antarctic. Since 1997 Stocker has also been a lead scientist with the Intergovernmental Panel on Climate Change (IPCC), and currently co-chairs with Chinese climate researcher Qin Dahe the "Science" working group which is drawing up climate change projections for the IPCC Fifth Assessment Report to be published in 2013.

**The IPCC**

The Intergovernmental Panel on Climate Change (IPCC) was awarded the Nobel Peace Prize in 2007. The organisation was awarded the prize, which it shared with US politician Al Gore, for their efforts to build up and disseminate greater knowledge about man-made climate change. Founded in 1988 by the World Meteorological Organization and the UN Environment Programme, the IPCC has established itself as a globally respected think tank thanks to its reports on climate change which are authored by experts, with contributions from all countries. The Fourth Assessment Report on Climate Change was published in 2007 and provides the basis for current negotiations on global climate policy.

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