Blog

The Carbon Brief Interview: Thomas Stocker

28 May 2015, 17:00 | Roz Pidcock

Thomas Stocker is a professor of climate and environmental physics at the University of Bern. He served as Co-Chair of working group one for the IPCC's fifth assessment report, Coordinating Lead Author in the third and fourth assessment reports, and is now running to succeed Dr Rajendra Pachauri as IPCC chair.

On new, more realistic climate scenarios: "There are different policy stories that are being developed as we speak."

Big climate questions left to answer: "Science doesn't stop, doesn't stand still."

On 2015 being the hottest year on record: "I think it's extremely daring to - before even half of the year has completed - to come out with that statement."

Attention on the "hiatus" in AR5: "If there is a topic out there that is debated … I think it's entirely mandatory that we look at it."

Climate sensitivity: "I think climate sensitivity lies somewhere between 2.5 and 3C."

Climate targets: "It will only be a few years [before] the 2C target will become as ambitious as what we are now discussing for 1.5C."

Adaptation and mitigation: "There is a very intimate link … The more you mitigate, the less you are required to adapt."

A role for the IPCC in assessing countries' climate pledges: "On an annual basis, year to year, I don't think that's the task of IPCC."

Climate skeptics and the IPCC: "Well, it's in the nature of truth that sometimes you hate it."

Scientists speaking their mind: "As a citizen in this world, I certainly feel the urge to express my personal views."

Social media: "I simply did not have the time."

CB: The IPCC has confirmed there will be an AR6 [sixth assessment report]. How do you think its scope or function might differ from AR5? How might it signal a move forward for the IPCC?

TS: Well, there are a few ideas around, but one thing is clear - that there will be three working groups. So, this model of addressing the climate change issue and inform about what the science can tell about this problem is still organised into three groups that look at the physical science basis, the impacts and vulnerability, and the socio-economic challenges. So that's the framework within which we are, however, free to develop new ideas. Certainly on the radar screen is the fact that as science progresses, the working groups come closer and closer

Blog posts by issue

Factcheck (334)
Climate science (635)
Science communication (247)
New research (376)
Climate policy (442)
Energy policy (564)

Most read

The what, when and where of global greenhouse gas emissions: A visual summary of the IPCC's climate mitigation report
This week's top six rebuttals to David Rose's "warming has stopped" claim
Cabinet reshuffle 2014: Who's in and out in the key energy and climate positions
Claims that climate models overestimate warming are "unfounded", study shows

Archive

2015
2014
2013
2012
2011

together and are working on these areas that are cross-cutting between the working groups. I'll just give you two examples: the first example is the way impacts in the climate system on a regional basis are being projected. I could see - and I certainly hope for it in AR6 - that the physical projections provided by working group one would actually be utilised to a much larger degree by working group two than has been possible up till now. The second example concerns scenarios and calculations of different pathways. As you know, a new set of scenarios is being discussed as we speak and that process has started well in advance in the hope that the two working groups that are most deeply affected by this change in scenarios - that is, working groups three and one - will establish a close collaboration very early on, hopefully even before the scoping.

CB. It has been suggested in the past that the working groups work a bit too independently of each other, in separate silos. So, that's something you'd like to address - closer ties between working groups from the early stages?

TS: I think we have made great progress in the past assessment report cycle. One aspect, for example, is the special report on managing disasters and extreme events to advance climate change adaptation, which was done under the leadership of working group two but with strong involvement of working group one - an extremely good collaboration which serves as a model for further enhancement and strengthening of the collaboration. The second, is that in the synthesis report, I think it's fair to say this time around we have delivered a synthesis report that shows a high degree of integration between the three working groups. But I agree, we should do much more and I am very confident that for the sixth assessment cycle, thanks to the advance of the science in all three areas, there will be a natural move towards a more integrated assessment.

CB: A favourite for the topic of the next special report is food security. Would that be your preference, or is there something that you think is more urgently needed, such as Monaco's suggestion for a focus on the ocean, for example?

I think there are quite a large number of burning issues. You've mentioned just two, but I think the whole issue about water resources, desertification, the loading of aerosols and its link with human health are also on the radar screen. Whether or not these issues will be dealt with at the level of a special report - being carried out during the sixth assessment report cycle - or integrated in the form of chapters, or perhaps even in the form of joint chapters between the working groups, is an open question. I think that is something that should be looked at very carefully in the preparation towards the scoping and at the scoping meeting.

CB: You mentioned a new set of scenarios. Is it right that there are two completely new RCPs: one that represents a more realistic business-as-usual and one that takes us to 3C? Why was it felt those scenarios needing adding?

TS: Well, there are two aspects. One aspect is to fill in gaps in knowledge by supplementing the RCPs with an additional set of targets for the radiative forcing. The second aspect is that there are different policy stories that are being developed as we speak. They are not finalised yet, but the scientific community - primarily in working group three - have started a process of discussing and developing these pathways and what they mean for transformation, the degree to which such pathways are attainable. That's being discussed now, and I think will add quite a new layer of information for policymakers.

CB: The summaries for policymakers have been criticised as being too hard to read. What do you think of the suggestion to seek advice from science writers and graphic designers to help make them more accessible?

Well, with that first assertion, as co-chair of working group one, I would actually slightly disagree as we have taken great care in our working group to come up with very clear and simple messages. We call those the headline statements and they were designed so as to inform the quick reader and the layman in a very succinct and non-jargon way about the findings of the science. They are firmly embedded in the summary for policymakers, so these very simple and concise statements are also approved by all governments in consensus, which empowers these assertions quite a bit. So, I think we have [had] quite a good experience with this new model of communication. It can certainly be enhanced, but I am particularly proud of the fact that the panel has seen value in this approach, in this supplemental information for the summary for policymakers, that they have adopted the strategy for the synthesis report. So, you now have a synthesis report summary for policymakers which also has a number of headline statements. These, taken together, inform you quite comprehensively about the findings of the scientific assessment.

CB: Interestingly, looking at the budget for AR5, working group one seems to be the only one that spent its full communications budget. Were you aware of that, and do you think it signals a difference in priorities between the working groups?

TS: Well, not really. I am not known to look very deeply into budgets. But the budget you have in front of you is not the full cost. The Swiss government, through the working group TSU [Technical Support Unit], has supported quite a bit in terms of additional cost, in terms of to copyedit and advise the production process of the Frequently Asked Questions (FAQs) by a

professional science writer. That also included a critical review of the graphics in the FAQs. So we have done quite an additional step [on top of] the means that were allocated to the working group one TSU, and I think has paid off. I think it is an additional value - an added value - to the reader and to the public, who tries to digest the complex material in this rich report. It is over 1500 pages for working group one and even more for the entire assessment report.

CB: Looking back, do you think more could have been done to make the IPCC's findings more media friendly? How much of a priority will improving communication be if you get the job?

TS: Absolutely, improvements are always possible and the approach that we have taken in working group one is just one possibility to render the often very complex messages simpler and more accessible to a wider range of readers. I've learned a lesson in the past report and that is that it's absolutely crucial to start the process of shaping the results into communicable units very early on in the process. Because what you want to achieve is the full ownership of the scientific community into very simple and straightforward - and yet scientifically correct - assertions and statements. That process has to start early, as you also want to take advantage of the specific characteristic of a comprehensive IPCC style of assessment, which means that you go with your material through an extensive review - twice actually, worldwide and with governments. I think the power at the end of good communication lies in the fact that all people involved have been consulted, have had the possibility to contribute to one of the important elements of the assessment.

CB: Separate to the IPCC findings, how do you think the IPCC process can be made more transparent? For example, do you think the SPM plenaries will ever be open to the media?

TS: Well, you could even think they would be open to the public, though I see some quite large and high managerial challenges there. No, ultimately, it's a decision of the panel how open and transparent the process shall be at every stage. I think there is already a high degree of transparency. I, for my part, know of no other process where - in a worldwide review that collects over 50,000 review comments - essentially all who think [they] are experts on the issue of climate change are invited to contribute through their comments. Their comments are recorded and are made public after the approval of the assessment. I think we can certainly enhance this process by, for example, making review comments public already during the process because they are intimately tied to the document that a person has reviewed and, therefore, once we move forward another step in the drafting of the report, one could consider to make the previous review comments, including the responses by the assessing scientists, public. However, again, that is something that the panel will decide and will have to deliberate. Looking back, I see various arguments for making it more transparent. I also see some of the arguments that try to preserve some space to freely discuss - primarily for the scientists when they debate contentious issues, issues that are contentious within the scientific community - in a space where opinions can be expressed without them having bigger consequences, until the team finds it appropriate to go public, or go outside the discussion room with these deliberations.

View on YouTube

CB. So, let's talk about some science. As a climate scientist, what areas of current or future research excite you most? What remaining questions would you like to see answered more than any others?

Well, I'm really excited by the fact that after every assessment there is this feeling: now we've done it, we know so much what else could we possibly assess in the next cycle? However,

science doesn't stop, doesn't stand still and already now there is a lot of progress in several areas that I think would be extremely exciting and important to have a closer look at in the future assessments. For example, there is the ominous warming pause that was hotly debated toward the end of the fifth assessment cycle. I think there have been a lot of new and insightful studies that are in the pipeline for the next assessment that will provide us with a much richer knowledge on this interesting phenomenon of natural decadal variability. That brings me to a second point, regarding decadal predictions. I think that science is taking huge strides in improving the ability of decadal prediction. We could hope that the process we have initiated for AR5 - that is, to look specifically in a dedicated chapter at projections over a couple of decades, the timeframe that is relevant for policymakers - that this could be enhanced in AR6 with better models with new scenarios and hopefully with insights from working group two, when it comes to impacts. That would be, I believe, a really exciting area. Another issue concerns the whole topic of tipping points in various components of the climate system. As we speak, there are many research groups that actively investigate tipping points. For example, in the carbon cycle, in vegetation cover, but also in the Arctic - both physical and biological, when it comes to ecosystems. I think it's of crucial importance to take a closer look at what the science can tell the policymakers, concerning the consequences of such tipping points and, basically, their imminence, if the science finds evidence for that. A very large area, I think, that needs extremely good coverage in the next assessment report is ocean acidification. Ocean acidification is really a cross-cut across primarily working group one and two, but also has implications for issues that are looked at in working group three. Ocean acidification is physically a very clear phenomenon with surprisingly small ranges of uncertainty, but the uncertainties really kick in when we ask questions about how marine ecosystems will react to a change in [their] chemical environment, compounded with the increased temperature. And even, perhaps, changes in ocean circulation, upwelling in coastal systems. So, these are very complex questions that require, again, very careful scoping so that we cover this very important area comprehensively in the next report.

CB: Do you feel that AR5 didn't give enough attention to ocean acidification, or just that the science has moved on so much that the next one will have to?

TS: No, I think we gave it a good start, I would argue, in working group one. Because, for the first time, we had a figure in the summary for policymakers that speaks directly to ocean acidification. That has given quite some prominence to this important topic, rightly so. But I think the white spots on our knowledge map are the way ecosystems react to these fundamental changes of ocean conditions. There, I do hope that the science will take great strides and make much progress on time horizons of five to seven years. We can also inform the public and policymakers about what it means for ecosystems in the marine area but also what it means, for example, for marine food production.

CB: Some people are already saying that 2015 is likely to be the hottest year on record and, according to today's Times, it's being suggested this could signal the end of the so-called "hiatus", which you mentioned a minute ago. What do you think about headlines like that?

TS: Well, I think it's extremely daring to - before even half of the year has completed - to come out with that statement. I'm actually very happy that this quantity is on the radar screen of people, and so a very clear quantification of that will take place later on in the course of the year. But it's certainly too early to draw a conclusion on this year - even though perhaps with an impending El Niño later in 2015, which would boost global mean temperature - I think we should take the scientific approach and wait until the real, hard data in the box has been analysed and quality-checked before we draw our conclusions. I also think that there is much more than global mean temperature. It's something that we certainly all have learned in the debate about the warming hiatus, there are many other quantities that tell us about global change, about the various aspects and impacts of global change. Global mean temperature is one metric - and it's a very important one - but it's not the only one.

CB: But should 2015 end up as the hottest year on record - and yes, we should wait before declaring that - is it wrong to suggest that would signal the end of the surface warming slowdown?

TS: As you know, the "hiatus" - if you prefer that notion - has been a period of 15 years that started precisely in 1998, and anything that has this short time period that looks at trends is extremely unrobust, as we have shown very carefully even in the summary for policymakers of the working group one contribution. For example, if you start to calculate a temperature trend that starts only two years earlier, the trend would result in a number that is almost three times bigger than the trend that we got for 1998 to 2013. So, it's an unrobust quantity when we talk about climate change. I think the really interesting thing about such decadal variability is that it tells us something new about the processes, the interaction between the atmosphere and the ocean, between atmospheric circulations - wind - and the reaction of the ocean, perhaps even with the involvement of sea ice in the northern hemisphere. These are really the interesting questions that lie ahead and not whether the warming pause is over, or may be resumed, or whatever. It's a very narrow view of the climate system.

CB: If it is such a narrow view and, as you say, an unrobust way to assess climate change, why was it given such attention quite late in the day in working group one?

"Seepage" is the suggestion that scientific research can be shaped by something other than a scientific agenda, such as a media or a skeptic agenda. Was the addition of a box specifically addressing the so-called "slowdown" in AR5 prompted by discussion outside scientific circles?

TS: Well, if you carry out a comprehensive assessment - and that is the mandate of IPCC for each working group - and there is a topic out there that is debated, even in the public, but it relates intimately to our understanding of natural variability, of decadal variability (which we have made a special emphasis in the fifth assessment report by dedicating a whole chapter to the short term projections) then I think it's entirely mandatory that we look at it. Even if the scientific evidence at the time of our assessment is extremely fragmentary, as was the case by March 2013 - our cut-off date for scientific publication. The literature now is much richer, we could write a completely different box with many more aspects. But one aspect has not improved, which I find crucial and that is the really high precision temperature measurements in the deep ocean. This is one element, I think, that we cannot go back and reconstruct to the precision that would be required to respond to certain physical questions as to the origin of that natural variability. But other than that, models have informed us in quite an interesting way about the various processes that could be responsible - most likely a combination, as usual - for this 15-year period of lesser temperature increase, on the global mean.

CB: What do you make of El Niño's behaviour this year? Do you think it will be a big one, now that it's been officially declared?

TS: Well, prediction of El Niño is one of my slight disappointments in the last assessment report. That's not a blame on anybody or on the scientific community, it's an extremely difficult topic where seven years ago, perhaps naively, I thought that we could make some progress in this new assessment with better models, more coupled earth system models and models that actually do show quite good skill in current day El Niño simulations. But it turned out that again both intensity and frequency of El Niño, as well as character of El Niño, is something extremely difficult. The models' projections for these quantities, which would be extremely important for regional climate projections in a tropical area, do still not show a clearly distinguishable signal that would allow us to make the statement: "Yes, there will be more frequent El Niños" or "Yes, perhaps there will be a different character or preponderance of El Niño". We could not make that statement and, again, in my optimism, I would hope that this will be the case in AR6. But I think, still, a lot of research has to be carried out in this extremely important topic.

CB: Another topic of quite intense media interest is climate sensitivity. What's your feeling on where in the IPCC's range the true value lies? And how important do you think it is to find out?

Well, we are not putting a science agenda in an assessment but we note that it is extremely exciting to look at this number because it's one of several metrics of the climate system, the coupled climate system between the atmosphere and the ocean, the land surface and ice - the cryosphere. So, I think also in the sixth assessment report, climate sensitivity will be a big topic along with other metrics, for example, the transient climate response to cumulative emissions, which, in addition, takes into account how the carbon cycle reacts to perturbations - something that is ignored in equilibrium climate sensitivity. Looking back at AR5, I just note that we had extremely fruitful discussions when we were assessing this quantity throughout all four lead author meetings, because new studies would raise additional considerations regarding constraints in the climate system, such as the current energy balance which was newly informed by the ocean heat uptake - something that was not available in the fourth assessment report. [This] made really very lively discussions in the author team that ultimately came out with the new assessment that provides the public with a slightly larger range, but I think that's the consequence of the present state of the science as it was evident to us at that time. I think in AR6, the scientists and the team of working group one will be open again, as ever, to look very carefully at what the studies will be able to tell us, on what basis of evidence, then, and make up their minds about what can be carefully and robustly said about this metric.

CB: So, having heard all the evidence on this so far, do you have a feeling on - when the range narrows - what value it will home in on?

TS: One of the big progresses that we have made - and which I think is undervalued in the public - is that we also informed about the tails of climate sensitivity, both the high end as well as the low end. And I think these results of the assessment are as important as being able, perhaps, in the sixth assessment to, again, give a best estimate of climate sensitivity. My personal feeling is - and I should clearly state that this is not a preconception for the future assessment - but I think climate sensitivity lies somewhere between 2.5 and 3C. But, as a scientist, you have to be open, you have to be receptive to all evidence that is presented and that is the nature of a comprehensive assessment. We look at all the evidence presented and also tie back to the earlier assessments, I think that's a very important element, to also look at publications and papers that appeared several years ago and how they inform us in the light of potentially new evidence.

CB: How can climate scientists strike the right balance between talking about areas of uncertainty which the media tend to pick up on - we've mentioned a few, and Arctic Amplification might be another - and areas of well-established science which are arguably more important for policy?

TS: This is a difficult question but a very relevant question when it comes, for example, to designing the summary for policymakers, which is obviously based on what is available in the report but if you analyse the summaries for policymakers in the past five reports for working group one, you see how [they] evolve over time but they always show certain elements that have always been shown in all previous assessments. Because as time marches forwards and knowledge becomes richer, you still want to go back and see what that means for global mean temperature, for example, or the distribution of surface temperature change over the past 100 years, etc. To strike the right balance, I think the uncertainty language helps us a lot there. If you look back at AR5, that is certainly one of the nice areas of progress that the three working groups have done jointly by very early on agreeing on a paper that explains how uncertainty is assessed in all three working groups. So, laying out the commonalities of uncertainty assessments but also the specificities of the three working groups' science. I think that guidance has proved its merit and value. Certainly small things could be refined where the level of uncertainties or the confidence levels may have led to imprecise language. I think these are minor adjustments. I think the paper as such and the guidance as such for AR6 will be very useful.

CB: Carbon budgets were a new concept for the last IPCC report. How effective do you think the concept of budgets is, and do you see a difference in the message getting through?

TS: I personally was very excited when I realised that there is enough robust and substantial science in the chapters along with a good process understanding of the interaction between the physical climate system and the carbon cycle, that we could bring this new concept to the level of the summary for policymakers. Because what you want there is really robust science that doesn't fall apart if one piece of evidence perhaps crumbles. We are looking at multiple lines of independent evidence, and that was certainly given in this new topic. I think the policymakers - after a first slight hesitation - I think they have embraced this concept now. Not as supplanting an earlier concept of, for example, concentration limits or temperature targets but as an additional instrument to inform policymakers about what can we do, what are the options that are still left, barring active removal of carbon from the atmosphere. As such, I think it is an extremely important instrument that basically allows you to inform the policymakers where we stand, without prescription. And that is the beauty of the concept, that

it is not policy prescriptive if we say this is the budget that is consistent with the 2C or 1.5C climate target, plus and minus the uncertainty which we've carefully assessed. But it opens up a new level of discussion where you can talk about pathways within that budget constraint to meet a declared climate goal.

CB: Quite a late addition to AR5 was a budget for 1.5C, calculated using emissions up to 2011. Brought up to date, I think I worked out that means there is essentially six years worth of current emissions left in that budget. That's obviously extremely tight - is it really feasible?

TS: Well, the numbers are there. The uncertainties are also there. After a careful assessment, I think these numbers need to be revisited in the new assessment. Also, in the light of the emissions from now hence - another five or six years, depending on when the new budget will be calculated for AR6. But, yes, that's the essence of a budget - that if you are using up your budget, the budget will be over at some finite time.

CB: There have been suggestions recently that the 1.5 target, given the reliance on BECCS, isn't particularly feasible. And in having a scenario that actually somehow dents climate scientists' credibility. Do you agree with that? Or how do you respond to that suggestion?

TS: No, I don't see that as a problem. In fact, you can define a scenario that will inform you what the requirements would be to achieve that scenario. And I think, in this light, the 1.5 degree target appears to us as an extremely ambitious target. And that's the reality. Even the two degree target, as was shown in AR5, requires in the second half of the 21st century - for most of the cases, barring the extremely optimistic cases of low climate sensitivity etc - negative, net-negative emissions. This is the finding of the science as it is now. The point is that with continuing emissions - and again, that's a consequence of the budget approach - each climate target becomes more and more ambitious as time and emissions progress.

CB: So what's your personal feeling? You said 1.5C is obviously very ambitious, do you think it's doable?

TS: That's a very difficult question. It's still considered as one of the climate targets in the convention and, as such, the IPCC also has the mandate and the obligation to look carefully at what can science tell us about the requirements of that target. But again, that target had a much lesser ambition 20 years ago when the basic knowledge about emissions, their consequences, and the cycling of carbon in the climate system more or less was known on the global scale that these calculations could be made. I see it more as a timeline in which, indeed, it will only be a few years [before] the 2C target will become as ambitious as what we are now discussing for 1.5C.

CB 1.5C relies so heavily on negative emissions but, as you say, is still being considered. Why not aim for 1C then, where are the limits for negative emissions?

TS: Well, 1C is already in the system as we know - 0.85C since the beginning of the 20th century, and then with the climate change commitment we are almost there. So, that is something that, yes an academic question that is of interest - what would it take to come back to 1C. But we also know from recent research that there is an extremely large amount of inertia in the climate system, so you cannot simply revert back and choose, say, 1C and then in a couple of decade, or perhaps a century or two, we will be back at that target. That's not possible, as we know from the assessment of AR5. In fact not only AR5, but also previous

assessment reports have already put that into evidence.

CB: Some people argue that adaptation should play second fiddle to mitigation; if you cut emissions, you erase the problem. Others argue that we can adapt enough so that the impacts becomes manageable. Obviously both of those are simplistic but what do you think is the right balance to strike between adaptation and mitigation? And do you think that the IPCC reports are clear enough that it's not an either/or situation?

TS: I think the reports are clear enough, we mention always adaptation and mitigation. It's clear adaptation is already happening now as we see that climate is changing. In certain areas, climate impacts have been detected and to these impacts, people and communities have to and do adapt. So, adaptation is already with us and it's of prime importance that lessons about adaptation and future requirements for adaptation to whatever degree - dictated of course by the level of ambition by mitigation - needs to be done. So you see, there is a very intimate link between adaptation and mitigation. The more you mitigate, the less you are required to adapt. Or, the larger is the chance that you will not face surprises of inadaptability - in other words, changes to which certain communities no longer are able to adapt.

CB: Framing climate change as a risk features heavily in the IPCC reports. But sometimes that doesn't carry over very well to the media. Do you think that policymakers, the general public or the media have difficulty understanding probabilities and risk-language?

TS: No. It's perhaps asking too much of a report that has been with us for a bit over a year or two now. The risk concept was put forward very strongly by working group two, who produced their report in April 2014, so a little bit more than a year. It requires some time to firmly establish a new way of looking at the problem. We are used to look at smaller problems in our day-to-day life from a risk perspective, but looking at the entire planet? At all components, including human systems, and ecosystems from a risk perspective? I think that requires a new way of thinking, requires time - and, frankly, as it has started, this is something for AR6 that I would hope for - is that many of these assessments regarding risk levels will be quantified in a much better form, in the sense that going from qualitative assessments into quantitative assessments of impacts, of risks, where it's possible. I'm really optimistic that the research community concerned would now start to also be utilising the more regional simulations that come out of working group one, both from the higher resolved global models, but also from the initiatives of regional models and high-resolution models, to implement into their research and put numbers where possible on to these risk assessments.

CB: Arguably the most policy-relevant areas come out of working groups two and three. How important do you see working group one continuing to be in the future?

TS: Well, obviously as the outgoing co-chair of working group one, I see still a great need for that type of science. Because how else would you want to quantify impact of, for example, extreme events, when it comes to asking the question: how frequent will heatwaves be in this particular region, in 2050, or towards the end of the century? This is a typical working group one question that needs to be responded to before you do your numbers on the impacts and on the projections, and on the costs. So, in many aspects - I've given you just this one example but there would be many more, for example sea-level rise is another one, regional expressions of sea level rise, an arising topic of great importance - there you need the physical science basis, crucially. The point is not whether you need it, the point is how can you integrate that knowledge into the research communities that then research the risks and the impacts?

CB: Something that's emerged relatively recently is single-event attribution, which is where you are able to say very quickly after an event how much more likely that event has become because of climate change. How useful do you see that kind of research, and just how much of a step forward is that in recent years?

TS: It's an absolutely fascinating area, an area that is close to communication. And it's even closer to climate services, something that is discussed heavily within the meteorological offices and services as an additional new step, we're talking about establishing almost a second organisation of meteorological agencies for the future. When it comes to assessment - and that is the task of IPCC - I see still quite large fundamental questions that need to be considered. For example, what is the requirement of observations in such a single event attribution? What is the requirement of model resolution in such a single event attribution? So, I think a chapter in AR6 that would explore what we know about this emerging science would be extremely helpful and would perhaps put AR6 in a position where one could say something, in principle, about the capability of the scientific community to carry out such single-event attributions.

CB: Many people will see the new chairmanship as an opportunity for a fresh start, as a time of renewal and re-energising for the IPCC. What kind of things do you think could mark the start of a new chapter?

TS: Well, AR6 is in the tradition of quite a successful story that started with the foundation of IPCC in 1988, and has progressively produced assessment reports that provide you with an

ever-crisper picture of man's impact on the climate system, on all components of the climate system. For the future, for the next assessment, I see a great area of progress in communication, we have already talked about it. I think if we could mainstream the way how an SPM or a technical summary - which is also a very important but undervalued document - could be made more attractive, more accessible to readers and users, stakeholders and policymakers alike. I think we could, with the same system, give much more value to the assessment at hand. The second area, where I hope is not a restart or a re-invention but just very consistent progress in our way forward, is how we can utilise regional information. It's a cross-cutting topic. Regional information from the global models to the regional-model efforts, but also to the high-resolution models - combine those with the impact studies to provide to the policymakers, who all live in the regions, who care for the population and the communities in the regions, to provide the best advice and the best information for their decisions. I think that is, probably the single most important progress that should and hopefully could be made in AR6.

CB: What do you think Pachauri's biggest achievements were in his 12-year stint as chair? And equally, what lessons do you think have been learnt in that time?

TS: Well, Rajendra Pachauri has had a management and leadership style of the IPCC that also led a large leeway to the co-chairs, and I'm very grateful for that. Essentially with the work of the working groups one could, within the framework of the approved structure by the panel, carry out a comprehensive and exciting assessment. I think that's a big achievement. Another achievement is certainly the communication around the world that was very effectively done - very tight relationships to governments - which was important also to bring this information right to the top level of leadership in many many countries.

CB: One of Pachauri's suggestions was that the IPCC could have an annual role in assessing countries' INDCs [Intended Nationally Determined Contributions]. Now, that seems like quite a different direction for the IPCC - is that something that you would think about yourself?

TS: I've traditionally always resisted sort of a regularity on this comparatively short time scale in the IPCC world of one year, for several reasons. The IPCC assessment has a clear process of review, multiple stages of drafting, and then an approval plenary. That simply just takes time. The second is that this is a distinguishing element from other kinds of assessment that are being carried out. It takes this time to really bring everyone on board, to bring essentially the entire scientific community through the expert review, through the broad involvement of author teams on board with a product that, after a while - and I agree sometimes it appears a very long while - to the public. Regarding specifically annual updates - and INDCs is just one, you could think of annual mean temperature or any other metric that is of interest - I think that the role of IPCC is not in that. There are other entities that are capable to basically look at these numbers as they are reported. I think it's also a task of the convention itself to look at what these numbers mean, which are reported by the governments. I do see a role of IPCC in how an INDC, perhaps, is being developed in an individual country. Whether or not we could look at a scientific approach to establish the production of an INDC. Depending on whether you are in a developing country or in an economy of transition or in an industrialised country, there are, I think, profound scientific questions which have not been explored. And so, I could think that in the next cycle the panel should seriously start thinking about the way methodologies could be investigated and could be developed with the countries on a scientific basis that would result in, for example, a practice guidance to establish INDCs for different countries. But on an annual basis, year to year, I don't think that's the task of IPCC.

CB: You mentioned the IPCC review process. Do you think that the panel has done enough to learn from mistakes in AR4? Unfortunately, the ghost of 'Amazongate', 'Himalayagate' as they're called, rear their heads from time to time. Do you think the process has changed?

TS: The process has changed in quite an evident manner. We now have an error protocol where, if an error is claimed, there is a clear process within IPCC [for] how to address such a claim. And we have gone through in working group one quite a number of smaller mistakes since the approval in September 2013 and we have experienced that this error protocol was of great help, because it is a rail on which you can follow through a process in a clear manner that brings you to the end, where you want to be, and that is correcting an error, if the error is found to be a true error. I think we are really in a stage now where these errors cannot be avoided, that's for sure. It's a human endeavour, errors can happen and do happen. But, what we want to do is to have a clear communication if an error has happened, and what we do about it. And also to have a clear, traceable account of how that error is then corrected, on what grounds. And I believe that mechanism is now in place. As in previous assessments, working group one had an errata page up right from the start of the approval, where we would collect entries of mistakes, small errors, typos, mistakes in graphics etc. It's all there.

CB: Do you think that since the Interacademy Council Review following the "Climategate" emails, the IPCC has done enough to meet recommendations around transparency? You mentioned the error protocol there, do you think there's any more to do on that front?

TS: I think you can always, with good imagination, go further. But again, it's the prerogative of the panel to which extent it wishes to adjust and reform its procedures. I can think of perhaps, one possibility to make drafts available earlier, and even in public. I think the first and second order draft is a document - looking back I wouldn't see a big problem in making that simply available for download, making clear that this is a draft and this draft will change, also making it clear the reason why there is a draft. The raison d'etre of a draft is that people read it and review it and because it is an expert review, as per the procedures, we would then admit only review comments by experts and not by anonymous blogs or any other vehicle - it still should be an expert review. I think one of the big challenges would be to adjust the expert review, which had in AR5 - and people don't really appreciate this - had a very low entry bar for experts to provide comments. This system perhaps needs to be revisited, because there is only so much that you can do. We already - and I can tell you that it was a big challenge - addressed 54,677 comments in working group one alone, plus all the other comments for the other working groups. The colleagues have worked hours, nights and days to address these comments. I think as much as one would wish increase the transparency, we would clearly have to revisit how this burden can be carried by the scientists and those who assess the science.

CB: I think it's probably fair to say the that IPCC is a much-hated institution among climate skeptics. How, if at all, would you seek to address this as chair?

TS: Well, it's in the nature of truth that sometimes you hate it. You don't like the message that comes out of a scientific assessment, you don't like the message that comes out of a careful look at the observations, what they tell us, how far the system has already changed due to the influence of human activity. These are not happy messages, but these are messages that have been made on the basis of the best scientific knowledge, with what I would call a robust process of assessment by going through multiple stages of draft reviews. And, incidentally, a review system that was open for all the climate sceptics on this planet, and surprisingly, it was not utilised. To my personal big surprise, I should say, it was not utilised. Because let's say, after all, review takes a lot of work. It takes a lot of work sitting down, reading a draft chapter, coming up with ideas of where are gaps, where perhaps is the assessment not robust. That takes much more time than writing a few lines of a blog.

CB: How does your experience make you well suited for the job of IPCC chair? What do you think is your USP, if you like, your Unique Selling Point?

TS: Oh, the USP [chuckles]. Well first of all, I don't sell myself. I make myself available for, I think, an extremely exciting job. I've worked now in various roles. In working group one, I should say, since 1998 in the third assessment report, coordinating a chapter. Incidentally, working very closely with one of the most vocal sceptical scientists at that time. Then in AR4, coordinating with a close colleague the projection chapter. And then in AR5, co-chairing with my colleague Qin Dahe from China the working group one, leading a fantastic team of 259 scientists. That, I think, makes me ready to try to integrate now, in those areas that I believe we should try very hard. I mentioned regional, I mentioned the ocean as a cutting theme - to integrate that knowledge across the working groups. I feel ready for that and I would be extremely excited to work with a team of co-chairs - whom we don't yet know - with a team of bureau members, and a panel, and the scientific communities of the three working groups together towards AR6.

CB: IPCC senior positions are unpaid, as I understand, so whoever is elected as IPCC chair will presumably remain an employee of whichever institution they are currently at. Can an IPCC chair give the job their full attention? And should they?

TS: Which job do you now refer to? Because at the moment - and throughout my entire tenure as working group one co-chair - I led an Institute at the University of Bern - with a reduced load, for example, in teaching and committee work at the University - and led working group one. That was only possible because of the organisational measures that I took at the beginning of this assignment, and that was to establish an extremely powerful technical support unit, with the help of the Swiss government. Having said that, a chair position is different. You have the Secretariat as the primary team of support for whatever the chair is assigned to do. But I also anticipate that, within the University of Bern, I will have a small technical support unit, very much in the spirit of what I had in working group one in the past assessment. Smaller and more diverse, because what I would like to establish there is also some expertise in the working group two and working group three areas of assessment, so as to directly interact with people and participate in the discussions in these scientific areas. Such a technical support unit would allow for a more substance that the chair could give to the team-building that I think is required for the next assessment report, among the working groups. I can think of various ways how to facilitate that and how to encourage that, but I think that a small team that is supportive of the role of the chair at his or her location, which for me is the University of Bern, is absolutely crucial. I'm personally very flexible, I was always flexible the last seven years. There were periods I was 150% dedicated to the assessment as co-chair in AR5. But then there were other periods where I would dedicate much more time during that time window to the institute and to the students and the post-docs.

CB: You said 'his or her' there, but there are no female candidates for the role of IPCC chair. Why do you think that is?

TS: Well, at the moment! [Smiles]. At the moment, there are no candidates but the procedures are such that you can throw up your hat or your scarf at the election plenary in October so surprises are not excluded.

CB: Who do you think the contenders could be - do you have any tips?

TS: Oh no, I don't waste any time to speculate here [smiles].

CB: Do you think that an IPCC chair can be free to act and comment from a personal perspective, or would you at all times see yourself at all times as representing the IPCC?

TS: I think that's a very important question, because there's always a person who speaks and therefore as a citizen in this world, in our environment, I certainly feel the urge, also, to express my personal views. So, I think, when it comes to communication, you have to be absolutely clear which hat you wear, and make that clear also in the sentences you express. So, I think in a general interview that you accept as chair of IPCC, it's clear what you say but perhaps there is a question also, that you could answer - and I see no harm in that - with a much more personal flair, with a personal touch, which is informed and developed through your own personal experience. I think that's very important. We are not just machines that are functioning in this office, but we are also humans and we can express our own personal sentiments about the question. It won't be scientific, and it won't be chair, but it will be declared that it is personal.

View on YouTube

CB: Because some climate scientists argue that scientists shouldn't be advocates. It sounds like you disagree with that?

TS: No, I think that when we provide a message to the public with the gravitas of an IPCC assessment, it's actually not appropriate to be an advocate. Because that's inconsistent with your task that you have assumed as a lead author, a coordinating author, as a co-chair and as a chair. If you use that weight of your statement then it's clear that you cannot and you must not be an advocate. I also think when you assume a function within IPCC as a scientist, you should be extremely careful in the entire area of conflict of interest. And I see a conflict of interest between being an advocate on the one side and having accepted the task of comprehensively assessing the state of scientific knowledge in a non policy-prescriptive manner. And that is something that everybody who contributes as a scientist, including right up to the chair, have to be extremely clear about it.

CB: How about scientists outside of the IPCC - are they free to be advocates?

TS: Well, I very much believe in the freedom of speech so I certainly think that an individual scientist is absolutely free what he or she wants to do, and how she or he wants or decides to communicate. The only caveat I see is where a person would accept a responsibility in IPCC. That is a responsibility that would, for example, require - as we have done as the first working group - to fill in a form of conflict of interest, which also asks questions about advocacy service in NGOs, for example.

CB: I suppose you could say though that advocacy can mean a whole manner of things. A scientist can advocate a high quality assessment of all lines of evidence, it doesn't need to be advocating a particular policy.

TS: Absolutely. But, you know, in this context of the interview - and when you talk about IPCC

and climate change - advocacy has a clear connotation. And that's the connotation I assumed when you asked the question.

CB: A lot of climate scientists are on twitter, and indeed some of the IPCC chair candidates are. How highly do you rate or value Twitter, or social media in general?

TS: I'm not using it personally.

CB: Why's that?

TS: I think I had so much tasks to do that I simply did not have the time to also tweet out of meetings. I had to focus on the proceedings of the meetings, the meetings I lead or the meetings to which I contributed as a scientist. There was simply no room to send out messages.

CB: Do you think there is a value in social media, in terms of communicating the science?

TS: I think it's an interesting new development. I'm not quite sure that it should be the task of the same people who actually assess the science, which is a completely different style of working, to also tweet about that science that is still in the process of being assessed. I'd rather focus on something that we talked at the beginning of the interview - to craft really crisp and simple headline statements. For me personally - and I think that feeling is shared by the colleagues in working group one - this was an extremely interesting and rewarding process, to try and distill out of complex scientific findings a simple statement or a group of statements. And that's not something that you can capture in 160 characters. And it's certainly not something that you can capture between two conversations, quickly typing a message and then sending it off. A headline statement that carries the power of the scientific assessment has to be discussed with many people, bringing in many aspects, and I think that's where I would want to focus when I communicate.

CB: What advice would you give to young people thinking about a career in climate science? What challenges do you think they might face that you didn't? Or, vice versa, are there any challenges that perhaps you faced that don't exist any more?

TS: Well, there's always the challenge that exists when you come into a field that is maturing. When I started climate science, it appeared to me then that there are so many questions that we could address. And as the field grows, the questions become more sophisticated, more technical and I think that is a challenge that has increased. But it is a natural phenomenon with maturing science. The advice that I would give is certainly that this is an extremely exciting science. It combines physics with biology, chemistry. And it even affords the opportunity that you can talk to practitioners, you can talk to economists, you can talk to even philosophers about this topic. I know of no other scientific topic where you go across the disciplines and, at the end of the day, you even do science that is understood by almost everybody on this planet. Because everybody is affected by climate change, be it natural or man-made, and therefore this science is extremely relevant for everybody.

CB: So if you could write a letter to your past self, at what point in your career might you have found that helpful, and what advice would that letter give?

TS: [chuckles] That's a difficult question! Perhaps I would have tweeted back! I think that letter would perhaps contain and advice to be a little bit less impatient. I've been - I'm known for it - having some innate impatience. I like to see results, I like to move forward, I like not to go around in circles. But at the same time as moving forward, listening very carefully to what's going on around your path and whether what you hear would require a reorientation. And I think that is an advice that I would have communicated to my earlier self, twenty years ago. But I certainly have learned a lot in the last seven years in co-leading with my colleague in the fifth assessment report contribution of working group one.

CB: Do you think that impatience will serve you well as IPCC chair in terms of the focus that's needed at times?

TS: I think a certain impatience is always good. Sometime you can keep it for yourself.

CB: Which of the other candidate would get your vote, if you were not running yourself?

TS: Well, as you know I am not a delegate, so I cannot vote.

CB: Ah...well, if you could vote. Are you willing to say, perhaps, which of the other candidates is the strongest?

TS: No. I think it's exciting that this time around - which is really a new feature for IPCC, and perhaps really a new challenge for the panel, who's the electoral body of the organisation - that they have a choice. They have a choice between very different personalities, very different

backgrounds, very different experiences within IPCC. And I think it's up to the panel to decide what they would want, and what they would prefer for the sixth assessment report.

CB: Excellent, well best of luck!

TS: [Laughs] thank-you very much!

(The interview was conducted by Roz Pidcock on 26 May 2015 at the Institution of Civil Engineers, One Great George Street, London)

Tags | Climate science