Copenhagen: the scientists' view

The United Nations Climate Change Conference is mainly a political affair but it has drawn hundreds of scientists to the Danish capital. **Jeff Tollefson** finds out what they hope to gain.

As the United Nations summit on global warming kicks into gear in Copenhagen this week, upwards of 15,000 people are converging on the city. The official negotiators from 193 countries will spend much of their time behind closed doors at the Bella conference centre, but they will be a minority of the visitors. Orbiting around the negotiators will be representatives of almost every segment of society, including hundreds of scientists.

The researchers will attend scheduled science sessions and gather for countless impromptu discussions in corridors and cafeterias. Many are presenting their latest work — on a vast array of topics including forest carbon, emissions scenarios and green technologies. Some hope to influence policy-makers and provide technical advice on issues that emerge during the negotiations. Others are coming to educate themselves about the treaty process and to network.

A climate summit is a flurry of activity, with the central negotiations surrounded by side shows that last from early in the morning until late at night. When the formal sessions finally wind down (if, in fact, they do, as negotiations have been known to go all night), discussions often continue over dinner and drinks.

The Copenhagen meeting, which runs from 7 to 18 December, is officially the 15th Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change, which was signed at the Earth Summit in Rio de Janeiro in 1992. Negotiators have been meeting each year for a COP since 1995, but the expectations and the stakes for this summit are orders of magnitude higher than for any previous one.

Twelve years after taking their first tentative steps with the Kyoto Protocol, countries are now aiming to restructure the global economy

and to lock in deep cuts in greenhouse-gas emissions for decades to come.

In advance of the summit, *Nature* talked to researchers from around the world about how they plan to take part.

Ottmar Edenhofer, co-chair, Working Group III, IPCC; deputy director of the Potsdam Institute for Climate Impact Research, Germany.

"I wouldn't say that I am depressed, but I feel very sad about the negotiation process as it stands now. But I don't see that this can be changed substantially by scientists."

Edenhofer is wearing two hats in Copenhagen. As co-chair of the Intergovernmental Panel on Climate Change (IPCC) working group on mitigation, he is presenting results from the group's 2007 assessment at several side events and briefings for policy-makers. But those events frequently lead to additional contacts, requests and conversations in which, as an independent scientist, he can offer his own thoughts on the latest research and what it means for policy-makers.

Edenhofer says that the negotiations are falling short of what is needed to address global warming and that scientists are unlikely to change that now. However, he argues it would be wrong to downplay the role of science in the process. Scientists were the first to raise concerns about climate change, and the IPCC's fourth assessment has served as the foundation for the negotiations. He sums up the IPCC's findings this way: humans cause climate change; climate change has severe impacts; and it is not too costly to reduce emissions. "These three messages have already changed the mindset of the negotiators," he says.

Beth Sawin, biologist and programme director, the Sustainability Institute, Hartland, Vermont.

"We have this philosophy that if science is going to be helpful, it has to show up, wanting to serve. What can we do to our model to make it more useful to somebody who is incredibly busy, overwhelmed, with not enough time and a huge responsibility?"

The Sustainability Institute has developed user-friendly climate-modelling software that can be run on a laptop computer to help negotiators assess the ultimate impact of any given emissions scenario. Negotiators can manually adjust the emissions and other parameters to analyse their own proposals as well as those of other countries; the model spits out forecasts for variables such as future temperatures and sea-level rise. In Copenhagen, Sawin says, the team is providing a "widget" that can be installed on computers to get the latest climate readings whenever Sawin's group updates its model with any new commitments announced by countries.

The application has generally received positive feedback from negotiators, but Sawin acknowledges the sobering reality that some delegates are less interested in detailed climate projections than in the next election in their home country. Nonetheless, she finds the whole affair touching. "I see that there are warts, and there is unfairness, and there are flaws in this process, but at least it's happening," she says. "So when I come home and talk to my kids, that's what I emphasize: that we happen to be alive at a time when people are trying to make common decisions about how to protect our common planet."

Albert Binger, science adviser to Grenada and the Alliance of Small Island States.

"I never had the slightest notion in my mind that one day I would be the guy telling everybody that the [target of] 2 °C the majority of the world wants is absolutely crazy. 2 °C is too much for too many people."

Raised in the mountains of Jamaica, Binger did a brief stint as a chemical engineer in the petroleum industry before earning a doctorate in agronomy at the University of Georgia. Today he is an official delegate advising island nations that are seeking to limit average global warming to 1.5 °C — or preferably less. Regularly oscillating between anger and a healthy island humour, he says. "Everybody needs to clean up their own goddamn mess."

Although Binger has full access to the talks, he leaves negotiating to the negotiators. His job is to harness scientific evidence in the push for more stringent greenhouse-gas targets. In practice, this means helping to answer questions that arise during the talks and providing scientific evidence for use in speeches and debates. As an islander who stands to lose everything to ocean acidification and sea-level rise, Binger takes the issue personally. "We want 1.5 °C or less, and we don't really ask it selfishly. Every person on this planet is better off at 1.5 °C than they are at 2 °C. I can sleep very easily with that."

Lawrence Buja, climate modeller, National Center for Atmospheric Research (NCAR), Boulder, Colorado.

"To a certain degree, the physical modellers have a much easier job than these politicians. Our molecules don't think for themselves and start doing different things midstream."

At COP 14 in Poland in 2008, Buja gave a briefing on NCAR's climate-modelling results for the fourth assessment of the IPCC, issued in 2007. He headed the modelling team at the time but

is now directing a new group that is developing integrated climate models that include social and economic forces. His career change reflects a larger shift — Buja goes so far as to call it a "sea change" — for NCAR as an institution. Physical modelling will remain a core activity as scientists seek to clarify and provide more detail about the potential impacts of greenhouse gases, he says, but NCAR recognizes that it needs to provide policy-makers with more information about potential solutions.

In Copenhagen, one of his colleagues is presenting modelling results analysing the level and timing of emission-reduction targets, focusing on the 2050–2100 time frame. Buja is on hand to talk about these issues as well as to answer questions about the physical modelling, which is now being ramped up for the IPCC's fifth assessment, due out in 2014. But information flows both ways at these meetings, he says. "What this exposes the scientists to is how these negotiations and agreements are developed and what our role in informing them might be."

Martin Parry, climate scientist, Imperial College London.

"For individual scientists like me, frankly, many would say there's not much point in going. But I think it's a chance to meet those at the fringes of the political system who potentially do have quite a lot of leverage."

Were you to bump into him in Copenhagen and ask how the negotiations are going, Parry says he wouldn't have a clue. He has minimal or no contact with negotiators but says he finds value in exchanging ideas with scientists and activists. Those discussions can be particularly important, Parry says, because advocacy groups such as the WWF can then inject the latest scientific thinking into the political process as they lobby negotiators and government officials. In Copenhagen, he is expecting to participate in two side events, one on development issues and a second on agriculture.

Parry is also thinking about how to assess a major hole in how the world intends to respond

to climate change. Some impacts can be avoided by reducing greenhouse-gas emissions. Others can be managed with enough money; in the vulnerable developing world, that means financial aid from wealthier nations. But the current proposals for emissions cuts and monetary support are not enough to avoid major impacts. "We're trying to close a gap here, coming at it from both ends," he says. Parry hopes that framing the issue this way — and quantifying the impacts — in Copenhagen will clarify where the policy-makers are coming up short, both in terms of emissions reductions and money for adaptation.

Paulo Moutinho, research coordinator, Amazon Environmental Research Institute, Brasilia, Brazil.

"I believe that [the forest-protection strategy called] REDD could make a difference in COP 15, not just as a way to address emissions from tropical deforestation, but also to create a new kind of synergy among nations. I believe that. That's exactly why I am going."

Moutinho started his career studying ants but has spent most of his time in recent years looking at ways to use carbon markets to stem emissions from deforestation while protecting biodiversity and the rights of indigenous people. Hopes have faded for a complete treaty in Copenhagen, but he is holding out for a significant decision on the forest-carbon component known as Reducing Emissions from Deforestation and Forest Degradation (REDD). Through REDD, wealthier nations seeking to 'reduce' their emissions would provide money for developing nations to protect their forests. In Copenhagen, Moutinho is presenting his organization's latest work on REDD in the Amazon and discussing Brazil's national greenhouse-gas commitments.

For him, Copenhagen is a perfect fit. Spending time in the field and publishing papers in *Nature* or *Science* is one thing, he says, but the goal must be to translate results into a digestible form for policy-makers. "Science is a tool to reach sustainable development. That's my view about science, and that's exactly what I'm doing." And when it comes to REDD, Moutinho says, the science is evolving rapidly and still plays an important part in the negotiations. ■

Jeff Tollefson covers climate, energy and the environment for *Nature*.

For more on Copenhagen, see www.nature.com/roadtocopenhagen.