

‘To understand the climate system you have to look at the land too’

Pavel Kabat, hydrologist and climate scientist

21.10.

01 On 21 October 2001 Pavel Kabat and his colleagues formulated a proposal for research into land use within the context of the climate debate.

Made by Alterra, 2000-2010

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Wageningen,
Lumen
12.11.2009
15:15:30 h

Pavel Kabat has been studying climate change for almost twenty years now. His emphasis on land use seemed strange to some at first. But today Kabat leads a large group of scientists who conduct research both on basic aspects of the climate system – how the atmosphere functions and the interaction between land and land use – and on technologies to adapt to climate change.

by Leo Klep

‘When I started looking at climate change in the early nineties it raised some eyebrows. Wageningen was known as a university for agriculture and land use. And that was precisely the perspective I was working from. When people think of climate change, they think of the weather, atmosphere and the oceans. Climate scientists at the time also thought that the earth’s climate system could best be studied with a model that included just the oceans and the atmosphere. But those of us in Wageningen, along with colleagues from NASA, were among the first to propose that the terrestrial part is also important. Land and land use are essential to understanding how the climate system works. That idea was relatively new at the time, and it is still sometimes forgotten in the climate debate.










‘On the one hand, carbon is to a large extent captured on land; tropical forests, for example, play an important

role in this. On the other hand, carbon emissions are also mostly produced on land. Moreover, ninety percent of nitrous oxide and seventy percent of methane around the world is emitted through agricultural activities, particularly livestock breeding and rice production. We were able to demonstrate this important role played by land by measuring the emission and capturing of greenhouse gases in various places, from the Amazon to the Siberian tundra. We built large measuring masts and later even acquired an airplane. It was an exciting time.

‘We then started to look more closely at all the carbon stored in organic soils, particularly in wetlands. The frozen ground of the permafrost, for example, contains an enormous amount of methane that could be released at a faster rate if the ground thaws. In short, we developed this notion that the land was important. It took fifteen years before all of the world’s large climate models seriously took into account changes in land use and the processes that take place on land. It actually took until about 2005, when two books came out about the synthesis between vegetation, land use and water in the climate system. I recently explained how we got land use into the climate debate to Princess Maxima when she visited Wageningen.

‘Land and land use play a role in the climate system, but they are also the first place that the effects of climate change will be felt, for example through droughts, flooding



-  free discharge will no longer be possible without increasing the upstream water level
-  freshwater supply limited / attention should be paid to the limited possibility for discharge
-  sea impact area shifting upstream in the river
-  attention needed for height and stability of dykes
-  attention needed for height and abatement of dunes
-  freshwater intake Bennisse and Gouda has to be stopped more frequently
-  risk of river flooding is increasing
-  seepage of salt water
-  river water retention area

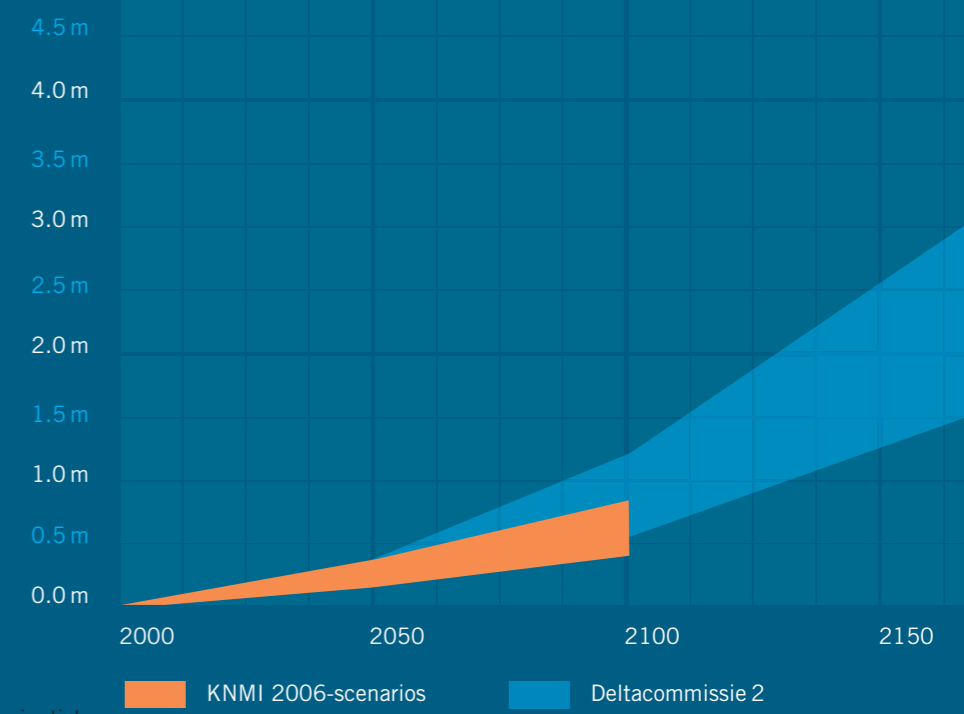


The Delta Commission 2
 Front row, from left: Pavel Kabat, Louise Fresco, Cees Veerman, Tracy Metz, Bart Parmet.
 Back row, from left: Marcel Stive, Jaap Duijn, Andries Heidema, Ineke Bakker, Koos van Oord.



< The map shows an impression of the Delta Commission 2's points of attention for 2010, assuming a scenario of 65 to 130 cm rise in the sea level.

> The graph shows that the Delta Commission 2 assumes a 'plausible rise in sea level' in 2100 that is 35 cm higher than that in the KNMI scenarios from 2006.



Pavel Kabat, hydrologist and climate scientist

or damage to the ecosystem. That's why we have been focussing in recent years on those effects: how does the changing climate influence functions such as availability of water, water safety, transportation, health and energy supply? To answer such questions you need a combination of knowledge about the climate, agricultural systems, nature, and so on. These are all areas that we are working on here in Wageningen.

'I think it is especially important that you don't look at sectors such as agriculture, nature and water safety individually, but at how the system works when you combine them. Functions do not stand alone. The combination of functions represents a scientifically interesting system, which we in Wageningen have been able to place on the global scientific agenda. Against the background of climate change, how can we achieve a robust system with respect to water safety, economy, agriculture and nature? Can it be calculated? How would it be managed? This is clearly something to be studied at the regional level – in contrast to the work being done by the Intergovernmental Panel on Climate Change, the IPCC, for which we as co-authors, together with Al Gore, received a Nobel Peace Prize in 2007.

'At first we were thus looking for a way to study land use as part of the climate debate within the Netherlands. Then we came across the FES (Economic Structure Fund), the natural gas monies, and especially the BSIK (Decree regarding Subsidies for Investment in the Knowledge Infrastructure). I remember it well. One Sunday afternoon in the fall of 2001 we got together to write a proposal in response to KPMG's call for possible knowledge themes. This involved millions of euros in subsidies. We wrote half a page; it was one of over a thousand ideas that were submitted.

'As an extension to our thoughts about land use and climate and the combination of functions, we concluded that every adaptation in the Netherlands – including to climate change – would come down to competition for scarce space. That's when I came up with the concept 'Climate changes Spatial Planning'. If you want to solve climate issues in the Netherlands, you can't avoid the topic of spatial planning. You'll have to link and combine the various functions that are influenced by climate change. This idea was born on that Sunday afternoon, and it became the basis for many ongoing research programmes, worth hundreds of millions of euros. The research programme Climate changes Spatial Planning, for example, of which I am the scientific director, currently involves three hundred research-

ers, seventy of whom are PhD students. The idea has also subsequently spread into other arenas, such as the Delta Commission, of which I was also a member. To be sure, that Sunday afternoon was one of the most important turning points of the past ten years.

'The shift from focusing on the role of land use within the large climate system to looking specifically at the shortage of space at regional level with all its spatial planning implications struck a chord in the scientific world but also in society at large. Policy soon followed. Every province now has a structural vision that incorporates climate change and climate resilience.

'In 2005 we published the article 'Climate proofing the Netherlands' in *Nature* magazine, followed a month later by a large conference in the Kurhaus in Scheveningen. This was attended by ministers, including the Prime Minister Jan Peter Balkenende, and four hundred officials from the national to local governments. The conference focused on how to implement the notion of climate proofing. In that same year, the Dutch Senate passed the Lemstra motion, which we contributed to, about the robustness of long-term investments in light of climate change. All of this together led in 2006 to the national programme ARK (Adaptation Space and Climate). Can it get any better? I still use a PowerPoint sheet with an image of Balkenende during his speech shown above our article in *Nature*: a perfect example of a science-policy interface that really worked.

'Towards the end of 2007 Dutch Cabinet and the Royal Netherlands Academy of Arts and Sciences got in touch with me about the Wadden Academy. We approached this area in the same way that we had approached the Amazon years earlier, namely as a system with countless interactions between climate, ecology, economy, cultural heritage and society. So I am still looking at the bigger picture, but at the same time we have miraculously managed to translate this into a context that policymakers are eager to embrace. I even dare say that the Delta Commission would have been quite different, in terms of composition and results, if our programmes had not existed. Within that arena too we were able to strongly advance our idea that you have to look at the interaction between various functions in order to come up with a robust adaptation strategy. This is how we came up with the idea of sand suppletions. You can build these up or flatten them out depending on how much the sea rises, and you can create more land for the establishment of new nature, for example. This kind of idea would not have come out of the first Delta Commission

Delfzijl, Netherlands
Waddentoogdag
(open day)
30.05.2009



Terschelling,
Netherlands
July 2008



The Board of the Wadden Academy on the island of Terschelling.
From left: Hessel Speelman, Jouke van Dijk, Jos Bazelmans, Peter Herman.
In the foreground: Pavel Kabat.

(1953). The objective back then was to shorten the coast and keep the water at bay with solid dams. Period.

'I believe it would be by definition cheaper and more efficient in regions such as Rotterdam, Schiphol Airport and the 'Green Heart' to adopt a cross-sectoral spatial planning and climate-proofing approach and to strategically combine functions. But we don't have any models to calculate this yet. The Bureau for Economic Policy Analysis understands this concept, but has no economic methodology to adopt it. You can't get there using the classic cost-benefit analysis. It is not clear how to incorporate non-monetary concepts – like the value of nature – into existing theories. Another problem is the discount rate. Until recently, the standard was four percent. But this means that every project with a horizon of thirty to forty years – which is always the case for climate proofing – is by definition not cost effective. If you calculate it in this way, you can't speak in terms of sustainability.

'In any case, our position is that for climate adapta-

tion, you have to take a cross-sectoral approach, and there is money to be gained in this way. Space is scarce in our country; and the same can in fact be said about all of the deltas in the world. This is why we set up the Delta Alliance, with government support, to talk to colleagues from other deltas like New York and Bangladesh. Because seventy percent of the global economy is generated in deltas - from San Francisco and the Thames to Djakarta, Tokyo and Shanghai. Eighty percent of the world's population lives in deltas or within a hundred kilometres of the coast. So if we in the Netherlands can figure out how to deal with lack of space in relation to things like the rising sea level, interannual variability in river flows and siltation, then we will have developed an entirely new export product.'