Climate
as an indicator

They both have Delft roots, but their standpoints in the climate discussion are by no means similar: Professor Pier Vellinga worried publicly, whereas Professor Salle Kroonenberg qualified climate change. Strangely enough, they do agree on the solutions. “If you take a long, hard look,” Prof. Vellinga says, “climate is an indicator of the need to adopt a different approach to nature.”

Jos Wassink

Let’s start with the statistics. Scientific literature reveals that over the last 200 years the CO_2 concentration in the atmosphere has risen from 275 parts per million (ppm) to 392 ppm today, and continues to rise by 2-3 ppm per year.

Vellinga: “The CO_2 concentration is rising by 1-2 percent per year and is currently 400 ppm, I believe. But that doesn’t make much difference.”

Temperature change and atmospheric CO_2 concentration go hand in hand, don’t they?

Kroonenberg: “No, they don’t. It depends on which time scale you use. Between then and now temperatures have risen. But if you look more closely, you’ll also see fluctuations.”

Vellinga: “Generally speaking, a high CO_2 concentration does indeed mean a higher average temperature. Yet both are in the air and subject to all kinds of effects.”

I read that parallel to the CO_2 increase over the last 200 years, temperatures have risen by 0.8 degrees. Is that right?

Vellinga: “Broadly speaking, on average, yes. I have a 20-year old publication here, which states: ‘based on the theory of greenhouse gases, we expect temperatures to rise’. Now, 20 years later, we see that temperatures have indeed risen, more or less as expected. It is not proof, but it does further substantiate the assumption that greenhouse gases have a warming effect.”

Kroonenberg: “In physical terms, CO_2 is a greenhouse gas, that is a totally accepted fact. In a laboratory you can see how CO_2 absorbs the infrared radiation emitted by the Earth. The question is: how much is the Earth warming – we call this climate sensitivity. How much will the temperature rise if the CO_2 concentration doubles? This is a continuous point of discussion. Besides which, many other processes are also involved.”

Vellinga: “Salle points at clouds, volcanoes and vegetation. We knew all that back in 1990. I’ve examined those calculations and see that the figures for 2010 were almost exactly as predicted. My conclusion therefore: despite the complexity, the calculations reflect the greenhouse gas effect fairly accurately.”

Kroonenberg: “The Intergovernmental Panel on Climate Change (IPCC) says you can see the human influence over the last 50 years. But if I examine the statistics myself, I can see that for half of that 50-year period the direct correlation between CO_2 and temperature does not hold. Apparently there are other processes which have a counter effect on the rising CO_2 concentration. Either that or the effect of CO_2 is less than we initially thought.”

Vellinga: “I agree with Kroonenberg that there is a natural variation in climate which we only partially understand. But we also see a rising trend over and above that normal variation. I see it as an uphill climb in a hilly landscape. On average there is an overall rise, but for 30 to 40% of the time there is a fall. Kroonenberg says: look, you often go downhill, too. To which I say, that’s all very well but the trend is still a rise.”

Despite the uncertainties, CO_2 concentrations have been translated into political objectives, such as a 20% reduction in emissions by 2020, which will reached by promoting energy saving with electric transport, low-energy light bulbs, and building insulation. Is this worthwhile?

Kroonenberg: “I believe so, although I’m not sure all measures are equally significant. As I see it: we owe it to future generations to use fossil fuels sparingly. It’s absolute lunacy to think that we’re burning all that fossil fuel, when in fact we use those same fossil resources to produce our plastics, medicines and cosmetics. Regardless of how you view energy transition, we must make an all-out effort to produce renewable energy, especially solar energy. If that helps the climate by emitting less CO_2 into the air then that’s an added bonus. And if it doesn’t help, you will at least have saved some raw materials.”

Vellinga: “I respect that reasoning, but my argument is that you really must reduce energy consumption for

Photo: Sam Rentmeester/FMAX

Shell refinery in Pernis near Rotterdam.

environmental reasons: CO_2 emissions, air pollution, transportation, and working conditions. I believe this will lead to a more sustainable economy in terms of energy."
Kroonenberg: "I believe that investing renewable energy will also boost technology tremendously. Even if you think

'Temperatures are rising, and with the resulting rise in sea level, this poses a considerable threat'

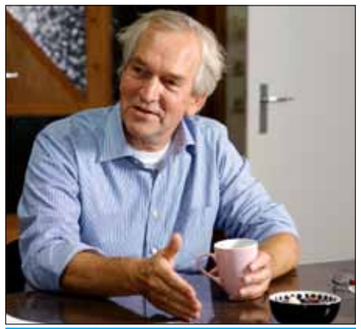
it's too expensive now, solar cell prices are falling rapidly. I find it incredible that we do invest in the underground storage of CO_2 but not in the development of solar cells. That's ridiculous reasoning."

Why do you say that?
Kroonenberg: "Because I'm not convinced that CO_2 is so important that you should devote so much energy into storing it underground. What if it doesn't help (combat climate change, ed.), then we'll have gone to all that trouble for nothing."
Vellinga: "Why do the conclusions you reach differ from those of most other climate scientists? Before coming here, I visited the websites of NASA, NOAA, Max Planck Institutes, the Dutch meteorological institute (KNMI) and the Belgian and French meteorological institutes. They all hold a different opinion to Salle. They say: CO_2 certainly does seem a problem to us. Temperatures are rising, and with the resulting rise in sea levels, this poses a considerable threat. With all due respect, I feel that an individual researcher, former-researcher, geologist in fact, is entitled to have a different opinion. However, policymakers should also consider NASA, NOAA and the KNMI. You cannot base climate policy on the views of a few people who say things might not be that bad, and the effect of CO_2 perhaps not that strong, when specialised knowledge institutes, such as meteorological institutes and universities, have identified huge risks."
Kroonenberg: "Science is not a democracy. The KNMI also has a certain way of presenting its information. For example, they state that the last ten years was the warmest decennium in the past century, and indeed it was, but they neglect to say that temperatures did not actually rise over the last ten years, not even in De Bilt. I realise that these institutes themselves have an interest in both the discussion and the research continuing."
Vellinga: "For a whole year I wondered whether the climate sceptics might perhaps be right."

When was that?
Vellinga: "After *climategate*, so around January 2010. For a year I re-read all the articles and blogs by climate sceptics and wondered how things had been in the past. Was it true that environmental scientists often exaggerated the situation? I tried to put it all into more perspective, but my final conclusion is clear: the supporting data that underpin the theory that greenhouse gases lead to global warming, and that global warming leads to a worldwide sea level rise, is so almost certain that I consider it legitimate to invest substantially in a more sustainable, climate-neutral energy supply."

Concerned
In recent years, Professor Pier Vellinga (1950) has often expressed his concern about climate change, especially in combination with sea level rise. He graduated from Delft University of Technology as a civil engineer in 1976 and obtained his PhD in 1984. He worked for the Ministry of Housing, Regional Development and the Environment (VROM) as an advisor on international climate policy and as director of the national climate programme. In 1991 he was appointed full professor in Climate Change at the VU University Amsterdam. He was later also appointed professor in Climate Change and Water at Wageningen University Research. Following the unsuccessful climate summit in Copenhagen (December 2009), he weighed everything up and wrote the book, *'Hoezo Klimaatverandering – feiten, fabels en open vragen'* ('Climate Change, What Climate Change? - facts, fables and open questions')

Relativistic
Professor Salomon 'Salle' Kroonenberg (1947) became particularly well-known as a climate sceptic. He prefers to describe himself as a 'climate relativist'. In his award-winning book, *De menselijke maat (The Human Scale`)*, which was published in 2006 and has sold 25,000 copies, he explains that, from a geological perspective, climate change is perfectly natural. From 1996 to 1 September 2009, Prof. Kroonenberg was professor of Geology in the faculty of Civil Engineering and Geosciences. He earned a reputation as "an agreeable and wise talker who demonstrates just that little bit more vision, wilfulness and individuality than the average professor". This spring saw the publication of his book on the mythology and geology of the underworld: *Waarom de hel naar zwavel stinkt (Why Hell Stinks of Sulphur*).


Prof.dr.ir. Pier Vellinga.


Prof.dr. Salomon Kroonenberg.

Tata Steel in IJmuiden.

A lot of climate-related research is currently being conducted at TU Delft: climate-proof dykes, living on water, as well as hydrogen storage, solar panels and electric transport. What do you think of this orientation? Too much or not enough?
Vellinga: "Climate change is not expected to really impact for another 40 to 50 years. But once it does, there's no turning back. That's why we have to adopt emission restrictions now. So what do you do? Preferably things that will also have a short-term effect. So we change our ways, not only to benefit the climate but in ways which will also create some social value. Like our eating habits, for example: a meat diet produces around six times as much greenhouse gas as a vegetarian diet. So switching to a more vegetarian diet is better for the climate, but it also makes a lot of sense as regards health and biodiversity. If you take a long hard look, climate is an indicator that we need to adopt a new approach to nature, raw materials, water and practically everything else we extract from the Earth."

Climate as an indicator. I like that comparison. Salle?
Kroonenberg: "I'm always in favour of research, regardless of what it's about. As far as I'm concerned, you can research underground CO_2 storage, so long as it's innovative and generates new knowledge. I do feel that TU Delft is somewhat behind the times, presenting itself so distinctively in relation to climate at this late stage of the discussion, because I believe that the whole subject will become much less an issue of social debate than is now the case."

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Vellinga: "Social interest fluctuates. Ultimately, and you have to be honest about it, the benefits of CO_2 reduction will not be felt in terms of a better climate for around another 40 to 100 years. Throughout the history of mankind, we have never been very inclined to invest hugely in something that will not yield a profit for another 30, 40 or 100 years. Unless it was a religion."