

The Environment Has More to Fear than Only Warming-Up

Rough translation of article in the NRC (*≈ centre right national newspaper in Nederland*) on 5 January 2019, an interview by Marcel aan de Brugh of Detlef van Vuuren : Het milieu heeft méér te vrezen dan opwarming alleen.

Detlef van Vuuren models the world: how can we make sure that there is enough food, water and energy, and that the earth warms up as little as possible?

Many large environmental problems race through Detlef van Vuuren's head. And they are all related. Take the warming of the earth. To avoid that, you could and mass plant trees. Because growing trees remove CO₂ from the air. But more forest needs more land. And then you still need more land to grow food for the growing world population. That collides, because fertile land is scarce. And when you grow more food you need more water. That is also scarce.

„So there are flying constantly arrows through my head. If something changes here, has that a consequence elsewhere”, says Van Vuuren.

Luckily he has the computer to help him. At the PBL Netherlands Environmental Assessment Agency (PBL), where he works four days a week, a model that depicts the image of the world and maps changes in the use of land, water and energy. Because it's all about those three things. And they are closely related. Scientists talk about a nexus, from the Latin 'nertere', to connect.

The model of the PBL is called IMAGE. Van Vuuren won three months ago a scientific prize. He can explore possible futures with his research team. What if, for example, sustainable technologies breakthrough? What if we drastically adjust our behavior and start eating much less meat, for example? Or, if we just continue on the current footing? The underlying question is: how can man organize his world and life in such a way that there is sufficient food, water and energy, and the earth warms as little as possible. What choices are there? And what are the consequences?

Governments use this kind of scenario studies to base policy on. At the climate summit in Katowice in December, Van Vuuren presented various scenarios. We talk to each other on the university campus in Utrecht in a small meeting room on the eighth floor. Because Van Vuuren also works one day a week at that university, as professor of integrated assessment of global environmental problems.

What does the world of 2019 look like?

"For our Scenarios is that is a far too short term."

OK, then 2050?

"If we continue as is, water scarcity will have increased. There will be more conflict about land. And we will emit too many GHGs to stay within 2 deg.

Where will the water shortage be?

At many places. In the Middle East, parts of India and Africa, the west of the USA. There is extracted more water than is added.

You do not hear much about that here. The focus is mainly on climate change. You have to look at more. In the battle against warming up we can consider large scale solutions, like reforestation or the growth of crops for biomass, so that you need less fossil fuels. But in relation to land that has risks. Because the world population increases to 9.5 billion by 2050. And prosperity grows as well. The food production has to increase with 50%. The question is : how much extra land and water will it need? The past decennia the agricultural productivity increase came mainly from higher yields per hectare. A smaller part from expansion of lands. But that was an area the size of India. Do we need in the coming 30 years another piece of land of that size? Than more rainforests will disappear. But them we need for to fight climate change and loss of biodiversity. You have to continue to look at the nexus.

Are there more problems than you might think at first glance?

Heaps. That just makes it complex. In lots of areas you could increase the yield per hectare quite a bit, for example by using more fertiliser. But their production costs lots of energy. And once on the land it will emit lots of nitrous oxide. That contributes to water pollution. Or you could start using on massive scale EVs. But then you get a surplus of oil. A price slump. Will that oil be used somewhere else?

Can it all be combined?

The challenges are large. The yearly increase of crop yield is lowered by 1%. How can we increase the yield in order to fulfil the rising food demand in poor regions while we at the same time make agriculture radically more sustainable? We see it is possible, and via different routes.

Can eating less meat be a key factor?

Eating less meat would save a lot of land. Agriculture takes up 35% of the earth's land area, of which 3/4 for the animal sector, both for the animals themselves as well as growing feed. Meat consumption is a very inefficient way to deal with space. We do not have to go to zero, but eating less would help a lot. Not only for the land, but also for the climate.

What is better : eating less meat or flying less?

If you look at the world averages is it logical to say : the first. The animal sector emits 12 - 15% of all GHGs, aeroplanes 2-3%. But for the western consumer who travels a lot, flying less will quickly contribute similarly as eating less meat.

Are you a vegetarian?

During the last few years our daughters of 10 and 14 have helped my wife and I to eat less meat. They do not only for the environment, they think especially about the animal welfare. Shifting the eating habits was easier than we expected. The meat replacements become better, and we also eat regularly cheese.

Serious concerns about the environment started making Detlef (born in 1970) at the end of his highschool period. He used to live with his parents in Beverwijk. Since primary school

he was a WWF-ranger, tells he. "Halfway the 80s, I think I was 16, you heard in the media a lot about acid rain. I read the book *"The Limits to growth: a global challenge"* by the Club of Rome, about the threat of running out of resources. That was very alarming."

Van Vuuren wanted to study environmental science, but that was only a specialisation. "So I did chemistry in Utrecht." After a year he added management studies. "Because I knew I did not want to totally technical chemistry." He got his undergraduate in management studies, and finished both in 1995. It has been an important mix, says Van Vuuren. "In current work the chemistry is not important, however the abstract thinking has been." While management theory is more in the direction of social science, says he. "You can think as scientist or engineer that you have an objective solution for a problem, but I realize now how value-bound choices often are." Why do people believe or not in climate change, why are people well or not prepared to adjust their eating habits. "There is a lot of wishful thinking." For that reason is viewing differently at scenario studies. "Not only because to create more possible solutions, but also to support discussion about possible pass ways."

What is so special about IMAGE? There must be more of these type of models around?

Worldwide there are five other groups that run similar analytical models. Every model has its strength and weakness. Ours is strong in the detail about geography and energy systems. Geographical we have divided the world in grid cell of 10*10km. For every cell we describe the land use. So if you use a grid cell for biomass it is not available for reforestation. We overlay with other information. We divide the world in 26 regions which are economically and politically quite uniform. The USA is a region, so is Western-Europe, Central-Europe another, Brazil, Russia. Africa is divided in five regions. Of all these regions we know trends in population growth, economic, energy consumption, you name it. All regions are linked to each other, via trade and prices.

Does IMAGE also contain a climate model? To run a model like this you will need a supercomputer.

We have integrated a simplified climate model. It copies the behavior of the complex climate model in relation to temperature and GHGs, but than in a few seconds. So an analysis does not take months, as is the case with complex models.

How accurate are the predictions of IMAGE?

We are not soothsayers, but cartographers. With our maps we like to show how the landscape possibly will look like abased on certain decisions. Which path there are, what the consequents will be if turn left or right somewhere. Those paths have adjusted constantly. We cannot predict the result of the next USA elections, or something like Brexit. We will never be finished. But the maps contain as much as possible of the information that we have.

You have for years counted on the effect of behavioural change. What was the reason?

The models à la IMAGE evolved. In the first instance we looked at the effect of technologies : wind and solar energy, electric cars, subsurface storage of CO₂. In 2007 we got the question from the IPCC if the 2-degree goal was still achievable. And if so, how? We did as one of the first the negative emission scenarios. That means that you shoot past your goal, but in the end it still reaches, because you actively get CO₂ from the atmosphere and so lower the concentration. This could be possible by growing in mass crops for bio-energy and afterwards capture the CO₂ it releases when burning and sequester it. In 2013,

in the 5th report of the IPCC, of the 114 2-deg scenarios were 110 that dealt with negative emissions. That mounted to strong criticism. You still take a mortgage on the future. Does that land for bio-energy or reforestation exist? What is the efforts to improve the yields of production per hectare are disappointing. and you need more land for agriculture? What if the world population does not stabilise, as assumed, and the demand for food rises? Moreover, when you use all that land for bio-energy, it will be offsetting biodiversity. In answer we started looking at behavioural change. Can we achieve the Paris target if we change our behaviour? And it is possible. But only if the adaptations are drastic. Less meat, travel less.

Is that realistic?

Honestly I think that we the 1.5 degree goal basically cannot reach. And the 2-degree goal will also very difficult.

That sounds very sombre.

The Paris accord gives hope, but the international policy does not progress, as we saw at Katowice. I am negative about that. We sketch all sorts of scenarios to achieve goals, but the world is always much more complex. The energy system in India and China are very inefficient, so it would have a great effect if we as the West invest in a turnaround in these countries. But how do you explain that to a citizen? There are also all sorts of industrial and political interest that take priority in the short term.

Still I see bright spots. The price of wind- solar-energy has fallen in the last ten years quicker than expected. Now we see the same happening with battery technology. And look around the discussion about meat. In 2008 we had already taken alternative diets into account. But our report about that was on the NOS-Journaal (*≈ Dutch national news*) by a butcher demonstrative chopped in pieces. At the moment is the idea to eat less meat already much less controversial.



