

Braunschweigische  
Wissenschaftliche Gesellschaft

# Jahrbuch 2019

Sonderdruck  
Seiten 300–304



J. CRAMER Verlag · Braunschweig  
2020

## **Protecting the climate, biodiversity and sustainable diets – rethinking land-use for bio-sequestration\***

PETER JOHNSTON

Chateau de Ranton, Ranton, 86200 France

E-Mail: johnston.pd@gmail.com

It is an honour and privilege to talk to you today: To thank Professor Rademacher for his remarkable achievements over many years. We have worked together since the early 1990s, sharing our ideas and experience on the transition to an Information Society and on climate change. Nobody has done more to drive the discussions on climate change than Franz Josef.

Few issues remain in the forefront of scientific, political and public debate for as long. It is now more than 25 years that we have both been involved. This is a real marathon, and we are still at the beginning of the changes we need. As on any long journey, the landscape changes. For climate change, the science is still evolving; new opportunities for change are emerging; public and business awareness is changing, and political commitments are hardening. In 2019, there have been some excellent new reports, notably from the Lancet on food and diets, on Biodiversity, and from the IPCC on Land-use and forestry.

The “Paris” agreements were a milestone, but they are a beginning of a new awareness, not an end in themselves. And they only address part of the challenge. Climate change is driving the catastrophic loss of biodiversity and current unsustainable land-use is driving climate change and contributing to unsustainable diets and a crisis in human health. All three challenges must be tackled together, and all are linked to complementary changes in agriculture and land-use.

The key issue is, of course, the rising concentration of CO<sub>2</sub> in the atmosphere. We will need to restore the balance between emissions to the atmosphere and removals from it. A natural balance has always existed, with the equilibrium level of CO<sub>2</sub> concentrations reflecting the climate. To restore and sustain the inter-glacial

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\* Der Vortrag wurde am 26.11.2019 anlässlich der Verleihung des Abt Jerusalem-Preises an Prof. Dr. Dr. Dr. h.c. Franz Josef Radermacher gehalten.

The lecture was held on 26.11.2019 on the occasion of the awarding of the Abt Jerusalem prize to Prof. Dr. Dr. Dr. h.c. Franz Josef Radermacher.

climate of the last 10,000 years, we must learn to make more efficient use of energy, to replace fossil-fuels by low-carbon sources and restore the natural capacity of the biosphere to remove CO<sub>2</sub> and store carbon. We must learn to manage the climate.

In the last few years, the agenda of scientific, public and political debate has changed. The goal of zero “net-emissions” has become mainstream. This recognises the need to enhance the natural removal of CO<sub>2</sub> from the atmosphere to compensate for residual emissions from burning fossil fuels. In 2019, many countries have set a target of zero “net-emissions” by 2050 or earlier. In the UK, the Committee on Climate Change published a “net-zero” technical report in May complemented by an excellent report on “behavioural change” in October.

There are three good reasons why zero “net-emissions” is a credible political target: Some emissions will be too expensive to avoid for many decades (alternatives to fossil fuels will be too expensive or impracticable); We will anyway need to assure a “soft-landing” for the fossil-fuel industries – a gradual phase out over many decades; and zero “net-emissions” will not anyway be the end point, but we need to get there first. With a concentration of 408ppm already in the atmosphere, we may need to draw down to below 400ppm before the end of this century.

There has also been a recognition that the natural removal of CO<sub>2</sub> can be enhanced. It can be most efficiently done to the scale needed by massive reforestation. Increasing forest cover by about 30% - half-way back to the pre-industrial level – could compensate for about 10-15% of current fossil-fuel emissions. However, reforestation alone will not be enough. Trees are efficient at CO<sub>2</sub> capture because of the large surface area of their leaves but are not a secure long-term store for carbon. Mature trees need to be harvested for the wood to be used and preserved as building material. Wetlands and soils are more stable complementary stores of carbon. We therefore need to look in a more complete way at land-use and agriculture.

This brings me back to the synergies with biodiversity and diets. Reforestation, protection and restoration of wetlands, and agriculture that restores the carbon-content of soils all slow the loss of biodiversity but have never attracted enough financial incentives. The best “proxi-measure” for biodiversity is the total area of forest and wetland, but simply setting aside huge areas as nature-reserves is not a credible strategy. Now, these changes can be financed by paying the price for CO<sub>2</sub> removal in managed forests and wetlands that also provide other ecosystem services: flood protection, wood as building material, and recreation.

There is much debate on the right price for CO<sub>2</sub> emissions. The EU Emissions Trading System has set a “scarcity” price, but too low to be effective. We have various levels for a “Carbon tax”. However, **there is now only one right price for emitting a tonne of CO<sub>2</sub> – The cost of removing it again.**

“Carbon offset” markets which offer companies (and individuals) to compensate their emissions already exist. However, the “off-sets” currently on offer are largely reductions in other people’s potential future emissions. The price is low: currently 3-5 Euros/tonne of CO<sub>2</sub> emissions avoided. These markets may provide some useful funding for lower-carbon initiatives in poor developing countries, but the emission-reductions they offer are often hypothetical (promises not to deforest), difficult to validate, and anyway emissions from poor countries are not the problem – 80% of emissions are associated with emissions from consumption by the richest 15% of the world population. Initiatives to reduce future emissions from poor countries will never be sufficient to compensate for 10-15% of emissions from the rich.

A market in which emissions are traded against credits only for validated additional removal of CO<sub>2</sub> and carbon sequestration doesn’t yet exist. It would require a certified baseline of the current carbon store of forest, wetland or soils, with credits only for certified increases. Satellite imaging could provide part of this monitoring and certification would either have to be by Government agencies, or peer-assessment (as for on-line purchases). The part of current “off-set” schemes related to re-forestation could be scaled up. They could then mobilise massive reforestation and restoration of wetlands: they could become the main safeguard for biodiversity as well as the enabler of a “soft-landing” for fossil-fuel use. The price of genuine CO<sub>2</sub> removal credits will rise (it is currently only about 10 Euros/tonne) but will only mobilise the scale of change needed at 50–100 Euros/tonne.

The market can be stable but will need the ceiling of a carbon-tax for uncompensated emissions during the next decades. This market must be global: Natural bio-capture is more efficient in the tropics; the impacts on biodiversity and on rural employment and poverty will be greater. However, it will also transform land-use in Europe and will require complementary changes in lifestyles and diets.

Targets for zero net-emissions only make sense if we adopt **consumption-based accounting for carbon emissions**, rather than the production-based accounting embedded in the ETS and most National commitments to the Paris agreement. With production-based accounting, OECD countries can continue to cut emissions by externalizing more production to Asia while keeping lifestyles unchanged. Consumption-based accounting would show that the USA and EU have achieved very little in the last 20 years.

Consumption-based accounting is also the only way people and businesses can measure their impact of the climate and their progress towards more sustainable lifestyles and business activities. We will need to introduce supply-chain tracking and net-emission (including “net-zero”) labelling at the point of purchase and use before most people see how to change their lifestyles and can choose between similar products with radically different emission origins. The alternative is to

impose import tariffs to reflect the “embedded carbon-emissions” in goods and services. This is being seriously discussed in the EU, but would be difficult to implement; it would spark new trade tensions, notably with the US and China, and would anyway require businesses to implement supply-chain tracking of emissions in the same way as for consumption-based accounting, but with declaration at frontiers rather than at the point of sale.

Agriculture and changes in land-use in the EU contributes about 15% to current net-emissions. In a zero net-emissions future, agriculture and land-use will need to be net removers of CO<sub>2</sub> from the atmosphere – removing possibly up to 10% of current emissions. Changes in farming practices (low-till, changes in animal feeds etc) and reforestation can achieve this, but a major increase in forest cover must be complemented by reductions in cereal production. Currently, 70% of EU cereals are used as animal-feed, and 70% of EU cattle are fed on cheap soya from Brazil and the US. Changes in land-use will only be possible with changes in diet., and carbon-emission pricing alone will not change diets.

The excellent recent report on behavioural change<sup>1</sup> covers transport, heating and diet, but I will only comment here on changes in diets as the aspect most closely linked to land-use. In the UK, and most of the EU, a change to plant-based diets would reduce diet-related emissions by over 70% and require 70-80% less farmland. Halving consumption of meat, dairy produce and eggs would cut diet-related emissions by about 35%. Fortunately, lifestyle changes and health-advice to eat less meat are already shifting to more sustainable and healthy diets, compatible with land-use changes.

The drivers of climate change and loss of biodiversity are the lifestyles and consumption patterns of the richest 15% of the world population. The transition to zero net-emissions must therefore be changes in these lifestyles, enabled by informed choice at the point of purchase or use of goods and services. Recent research has shown that 75% of UK shoppers want information on the climate impacts of their purchases. The Danish Government has committed to climate impacts on food labelling. There are huge differences between the impacts of similar foods: High-impact beef producers emit 12-times more GHGs and have 50-times the land-use on low-emitting producers. However, even including the carbon-emission price into that of red-meat is unlikely to shift the balance of commercial advantage to more sustainable husbandry. Only the mobilization of consumers through more informative labelling, and campaigns like that of school children, will change consumption sufficiently.

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\* Behavior change, public engagement and net-zero. A report to the UK Committee on Climate Change, Richard Carmichael, Imperial College, London, October 2019.

To conclude:

The transition to a stable and managed climate will remain the dominant challenge for the next 50 years. It will transform society, industry and lifestyles. The transition can be done. It can be synergetic with protecting biodiversity but will require a revolution in agriculture and land-use, as well as in the energy industry. It will need to be driven by people choosing better lifestyles, for themselves and for the planet.

Thank you for your attention