

Hohenheim Working Papers

Business Ethics and Business Metaphysics

Chair 560 D

No. 16 (2020)

A Worldview for a Sustainable Bioeconomy

Michael Schramm

Intro: *Sustainable Bioeconomy*

When it comes to “bioeconomy”, it is fundamentally important that it should not be just any bioeconomy, but a *sustainable* bioeconomy. This is precisely what the definition of “bioeconomy”, which the University of Hohenheim has formulated in its research strategy, emphasises:

“Bioeconomy is the transformation of our economy into the economy of the future. Its raw materials are bio-based: They originate from plants, animals, microorganisms, or organic waste streams. It uses biological processes for its products, processes, and services. Thus, it aims at more sustainable, energy-conserving, and resource-conserving production within a circular economy.”¹

So, “sustainability” is the broader, overarching concept, and the “bioeconomy” is one, but crucial component of a comprehensive sustainability strategy.

And the “United Nations Climate Change Conference” in Paris defined in 2015 what sustainability must include in concrete terms. The most important result was the agreement of

“holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels”².

1. Leaving Fossil Fuels in the Ground (Ecology)

If a sustainable bioeconomy is the shift from fossil fuels to bio-based materials (in order to limit the rise in the global average temperature to 1.5°C), then we must leave fossil fuels where they belong: in the ground.

Natural scientists have long since calculated what this means. For example in the British scientific journal *Nature*:

“Our results suggest that, globally, a third of oil reserves, half of gas reserves and over 80 per cent of current coal reserves should remain unused from 2010 to 2050 in order to meet the target of 2 °C.”³

If only 1.5°C were allowed, these figures would be even higher. But how is this supposed to happen in practice?

¹ <https://www.uni-hohenheim.de/en/strategy>

² UNFCCC (2015), p. 2.

³ MCGLADE & EKIN (2015), p. 187.

2. Unrivalled Cheapness of Substitutes (Economy)

Regarding the question of *how* one could manage to leave fossil fuels in the ground, the economist and business ethicist INGO PIES has outlined “three conceivable options”, of which only the third option is realistically feasible for *economic* reasons:

- “The first option is that we provide soldiers with a UN mandate and send them to Australia, but also to the Arab world, Russia and Africa, not to mention South and North America and Europe, to confiscate all fossil fuels, i.e. expropriate them without compensation. In many respects, this is so utopian that no one can seriously want to try it.
- The second option is that we compensate the current owners of resources – from Norway to Russia to the USA – with a global fund at market prices and then, with the help of UN soldiers, ensure that the fossil fuels are actually left unused in the ground. That would be so immensely expensive that nobody could seriously want to do that, especially since a successful shortage would cause prices (and thus compensation payments) to rise further.
- And now comes the third option. It is the only one that is realistic and that I would recommend as an ethicist because of its superior legitimacy. It consists in economically devaluing fossil fuels so that their current owners do not even think of pulling them out of the ground. We need substitutes that are unrivalled in their cheapness.”⁴

But again: how do we get unrivalled cheap substitutes?

3. Bioeconomic Technologies & Negative Emission Technologies (Technology)

If the third option consists in the development of alternative forms of energy that cost significantly less, then this can only be achieved through massive investment in *radical innovation*. These radical innovations are mainly *bioeconomic* technologies and *negative emission* technologies. This is also made quite clear by scientific studies:

Any pathway that can meet the target of the 2015 Paris Agreement (to limit global-mean temperature rise to 1.5 °C) is “characterized by a rapid shift away from traditional fossil-fuel use towards large-scale low-carbon energy supplies [*in other words: “bioeconomy*], reduced energy use, and carbon-dioxide removal.”⁵

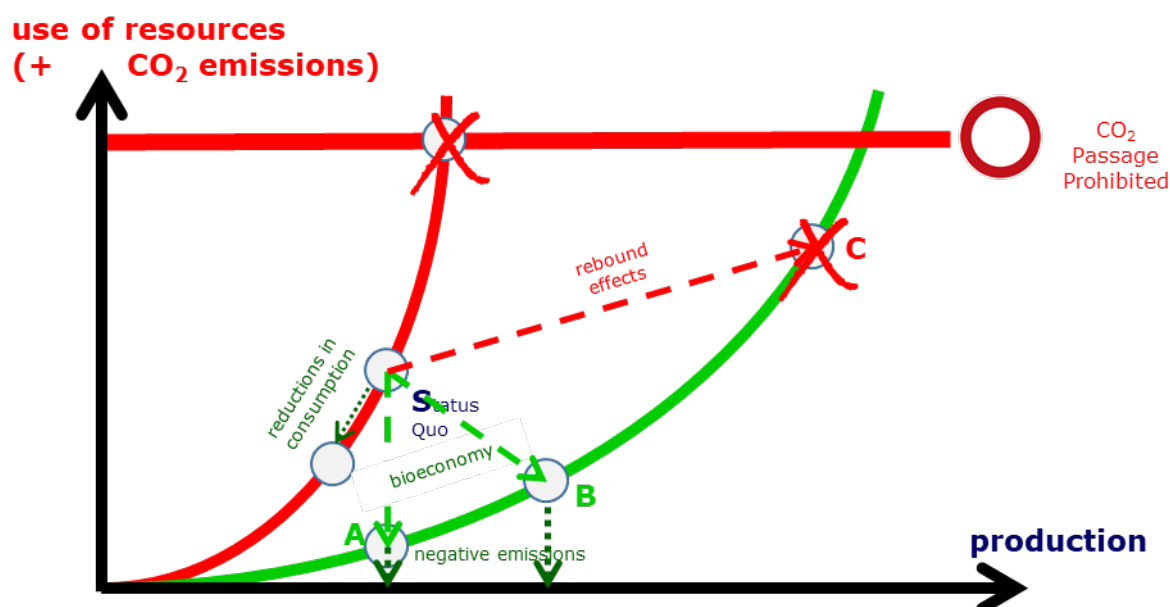
⁴ PIES (2020), p. 7.

⁵ ROGELJ ET AL. (2018), p. 325.

So, what we need are, on the one hand, technological innovations in *bioeconomy* and, on the other, innovative *negative emission* technologies, i.e. methods of extracting CO₂ from the atmosphere on a large scale and storing it permanently.

Without these technological innovations, nothing will work. As far as climate change is concerned, in any case not much can be achieved with a little reduction in consumption and self-restraint. Reductions in consumption are a good thing, but they do not solve the problem. This is illustrated in the following chart:

Fig.: Moving the Production Function (modified after PIES 2020, p. 17)



On the x-axis we have the amount of production (output), on the y-axis the input (resources) and the consequent amount of CO₂ emissions. The point S indicates the status quo. If we now continue as we have done up to now, we will inevitably be heading for that red deadline, the exceeding of which means that the climate collapses and we are all dead. If we now seek our salvation in consumption reductions, it will take us a little bit in the right direction (in this respect, reduction in consumption would be helpful from an ecological point of view), but we will not get far enough. That is why we urgently need a shift in the production function. And then the only promising way forward is the innovative combination of bioeconomic and negative emission technology, i.e. to produce the production output of the status quo with less CO₂ emissions (reduced by bio-economy) – that would be point A –, and afterwards brought to zero by negative emission technology. If the negative emission technology works particularly well, one could also generate more output (this would be point B). But what would not work is point D, which symbolises rebound effects.

In any case, we need radical technological “greenovations”. Without them, saving the earth cannot be successful at all!

4. “Discovery Procedures” for Greenovations (Science & Economy)

So, we need these innovations (“greenovations”). And to discover these necessary innovations we need “discovery processes”. Here I use an expression coined by the Austrian economist FRIEDRICH AUGUST VON HAYEK. What is at issue? If you want to be successful in competition – be it competition in science or competition in business – you have to be innovative. And if many take part in that competition, then in the end you have a large number of innovative ideas on the market – ideas that the public would *not* have had access to *without* this competition, which provides incentives to bring your innovative ideas to market. Therefore, according to VON HAYEK,

competition is “a procedure for discovering facts which, if the procedure did not exist, would remain unknown or at least would not be used”.⁶

Competition is thus a process for the discovery (or invention) of *innovative knowledge*. And it is precisely this innovative knowledge that we need for a sustainable bioeconomy. This knowledge must be “discovered” by science and companies. Just as we currently need scientific institutes and private companies to “discover” suitable vaccines during the Corona pandemic, there will be *no* sustainable bioeconomy *without* science and business, but only *with* them and *through* them. But – one thing is still missing.

5. The Worldview for Bioeconomy: Cosmic and Social Creativity (Philosophy)

The world view I have outlined so far as necessary for a sustainable bioeconomy has the dimension of *ecology* (the knowledge of the limitations of nature and the effects of using different resources), the dimension of *economy* (prices are crucial), of *technology* (we need bioeconomic & negative emission technologies), which have to be “discovered” by *science & economy*. But all this is not enough. Why not?

There is empirical evidence that mere knowledge alone – whether ecological, economic or scientific – is not enough to generate sufficient interest (motivation) to tackle ac-

⁶ HAYEK (1968 / 2002), p. 9.

tively the sustainability problem. As an example, I refer to a study by DAN KAHAN and others:

“Seeming public apathy over climate change is often attributed to a deficit in comprehension. The public knows too little science, it is claimed, to understand the evidence or avoid being misled. Widespread limits on technical reasoning aggravate the problem by forcing citizens to use unreliable cognitive heuristics to assess risk. We conducted a study to test this account and found no support for it. Members of the public with the highest degrees of science literacy and technical reasoning capacity were not the most concerned about climate change.”⁷

To the ensuing question: “Why Do We Disagree on Climate Change?”, the Dutch social scientist ANNICK DE WITT answers:

“The current gridlock around climate change and how to address our global sustainability issues can be understood as resulting from clashes in *worldviews*.”⁸

What clashes here is above all the – let us call it – “*philosophical*” component in any worldview. And I would like to illustrate the point which seems important to me by illustrating – in a somewhat simplified way – the “philosophical” worldview dimensions of two natural scientists: namely the physicist STEVEN WEINBERG and the biologist STUART KAUFFMAN.

In his book “*The First Three Minutes*” the physicist and Nobel Prize winner STEVEN WEINBERG comes to the following conclusion regarding his view of the world:

“As I write this I happen to be in an aeroplane at 30,000 feet, flying over Wyoming en route home from San Francisco to Boston. Below, the earth looks very soft and comfortable – fluffy clouds here and there, snow turning pink as the sun sets, roads stretching straight across the country from one town to another. It is very hard to realize that this all is just a tiny part of an overwhelmingly hostile universe. It is even harder to realize that this present universe has evolved from an unspeakably unfamiliar early condition, and faces a future extinction of endless cold or intolerable heat. The more the universe seems comprehensible, the more it also seems pointless. But if there is no solace in the fruits of our research, there is at least some consolation in the research itself. Men and women are not content to comfort themselves with tales of gods and giants, or to confine their thoughts to the daily affairs of life; they also build telescopes and satellites and accelerators, and sit at their desks for endless hours working out the meaning of the data they gather. The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy.”⁹

⁷ KAHAN & PETERS & WITTLIN ET AL. (2012), p. 732.

⁸ DE WITT (2015), p. 906.

⁹ WEINBERG (1977 / 1993), pp. 148 f..

How does WEINBERG arrive at this worldview of a “hostile” and “pointless” universe? The reason lies in his *physicalistic reductionism*, which he advocates emphatically in a chapter of his book *Dreams of a Final Theory*¹⁰. The *scientific* method of physical reductionism, which WEINBERG then made the *philosophical* core of his worldview, is best summarised in the following quotation from WEINBERG, as quoted by many, including STUART KAUFFMAN¹¹:

“All the explanatory arrows point downward, from societies to people, to organs, to cells, to biochemistry, to chemistry, and ultimately to physics.”¹²

The “reductionist” method is a “*nothing but ...*” approach: there may be many different things, but at the end of the day all these things that exist, including our whole life, our feelings, joys and sorrows, are *nothing but* physical particles thrown together¹³.

“The reductionist worldview *is* chilling and impersonal. It has to be accepted as it is, not because we like it, but because that is the way the world works.”¹⁴

But, is this really “the way the world works”? Is this the whole truth? I don’t think so. I believe that physicalistic reductionism is just that: a reductionism, a *shortening* of the whole of reality. As a scientific *method*, these reductionist shortenings are perfectly fine, but as a *philosophy* of nature they are shortenings. Let’s just take our human feelings. We humans are 100 percent nature.¹⁵ And our feelings are also part of our nature. They are also 100 percent nature. But this part of nature, our feelings, is simply not adequately or completely described if we reduce them to the buzzing around of physical elementary particles. When we are happy or sad, when we are merciful or angry, when we hate or love, then of course the physical elementary particles of our brains are involved, but the reality of these feelings is not described at all by a reductionist formula of physics. But the reality of these feelings is a fact of nature. As a *philosophy* of nature, physical reductionism divides the whole of reality. The mathematician, physicist and philosopher ALFRED NORTH WHITEHEAD formulated this as follows:

“Science can find no individual enjoyment in Nature: science can find no aim in Nature: science can find no creativity in Nature; it finds mere rules of succession. These

¹⁰ WEINBERG (1992 / 1993), p. 51 – 64.

¹¹ KAUFFMAN (2008 / 2010), p. ix.

¹² I can’t resist to tell you a funny story about this quote. I could not find this “quote”, which is attributed to STEVEN WEINBERG, in his writings. So, I e-mailed him, and an hour later he answered: “No, I never said the sentence you quote, and I have no idea where it comes from. This is not an uncommon occurrence. Some of the best quotes of me are things I never said. Best, Steven Weinberg” (e-mail October 08, 2019). So, WEINBERG hasn’t lost his sense of humour, but the *philosophical* result of his worldview declares the world to be an ultimately “hostile”, “senseless” and “chilling” place.

¹³ Here I adopt a (critically meant) formulation from RONALD DWORKIN. He speaks of “particles thrown together” (DWORKIN 2013, p. 24).

¹⁴ WEINBERG (1992 / 1993), p. 53.

¹⁵ We humans are „100 percent natural“ (MESLE 2008, p. 35. 37. 40. 44).

negations are true of natural science. They are inherent in its methodology. The reason for this blindness of physical science lies in the fact that such science only deals with half the evidence provided by human experience. It divides the seamless coat [*of nature*] – or, to change the metaphor into a happier form, it examines the coat, which is superficial, and neglects the body which is fundamental.”¹⁶

A natural philosophy that goes well together with WHITEHEAD’s but contradicts STEVEN WEINBERG’s reductionistic worldview, was presented by biologist STUART KAUFFMAN who is an explorer of biocomplexity. In a first step, he notes that the reductionist worldview

“leaves us in a meaningless world of facts devoid of values.”¹⁷

In a second step he then says – and he does so as a scientist, as a biologist (!): Reductionism cannot adequately explain how the world really works, how evolution really works. What reductionism ignores is the following:

“The evolution of the universe, biosphere, the human economy, human culture, and human action is profoundly *creative*.”¹⁸

So, for KAUFFMAN, one of the most striking features of the universe is an ceaseless *creativity*:

“[B]oth natural law and ceaseless creativity partially beyond natural law are necessary for understanding our world”¹⁹. Therefore: “reductionism alone is not adequate”²⁰.

His third step brings the crucial conclusion: evolutionary creativity really does bring forth new realities that *cannot* be *reduced* to the purely physical. So, when creative evolution produces a tree, for example, or when human breeding produces a cow, or when two people fall in love with each other, then in each case a new reality of *actual value* has been created. KAUFFMAN writes:

“I will propose a worldview beyond reductionism, in which we are members of a universe of ceaseless creativity in which life, agency, meaning, value, consciousness, and the full richness of human action have emerged.”²¹

Of course, if you want to remain realistic, you must always heed WHITEHEAD’s warning:

“It is folly to look at the universe through rose-tinted spectacles.”²²

Of course there is also the dark side of creativity: illness, suffering, struggle, destruction. Without the dark side, the destruction, creativity cannot exist in this universe. We are living

¹⁶ WHITEHEAD (1936 / 1968), p. 154.

¹⁷ KAUFFMAN (2008 / 2010), p. 2.

¹⁸ KAUFFMAN (2008 / 2010), p. 5.

¹⁹ KAUFFMAN (2008 / 2010), p. xii.

²⁰ KAUFFMAN (2008 / 2010), p. 3.

²¹ KAUFFMAN (2008 / 2010), p. 2.

²² WHITEHEAD (1925 / 1967), p. 205.

in a universe of “creative destruction”, to use the famous phrase of the Austrian economist JOSEPH SCHUMPETER.²³ CHARLES DARWIN himself was fully aware of this ambivalence of nature. On the one hand, there is the merciless natural selection:

“What a book a Devil’s Chaplain might write on the clumsy, wasteful, blundering low & horridly cruel works of nature!”²⁴

But on the other hand, there is also the wonderful creativity of nature, which constantly creates *valuable realities*. With reverence DARWIN describes in the last sentence of his *Origin of Species* the sublime diversity of life:

“There is grandeur in this view of life, [...] [*in these*] endless forms most beautiful and most wonderful have been, and are being evolved.”²⁵

So, if the world is not just the indifference of physical facts, but a creatively evolving world full of precious life, then in a non-reductionist, but more comprehensive worldview things gain their own “sacredness”. So, the point for KAUFFMAN is

“finding a new scientific worldview that enables us to reinvent the sacred”²⁶ in nature.

This is exactly what the titles of KAUFFMAN’s books are expressing: if we, *Humanity*, are living *in a Creative Universe*, then that means *Reinventing the Sacred* in nature.²⁷ Other books also deal with this spiritual worldview dimension, such as *The Sacred Depth of Nature* by biologist URSULA GOODENOUGH or *Sacred Nature* by philosopher JEROME STONE.²⁸

Anyway, the goal is to preserve this *natural* creativity, and for this we need a human or *social* creativity (in science and economy) that does not destroy this *natural* creativity, but is *sustainable*.

“We are creative in a creative universe”²⁹.

This is exactly what “SustainAbility” means: our *social* creativity must develop the “ability” to promote the ability and creativity of *natural* things to “sustain” themselves.

Outro: A Polydimensional Worldview

²³ SCHUMPETER (1942 / 2003), p. 83.

²⁴ DARWIN (1856).

²⁵ DARWIN (1859 / 2011), p. 546.

²⁶ KAUFFMAN (2008 / 2010), p. 9.

²⁷ KAUFFMAN (2016); KAUFFMAN (2008).

²⁸ GOODENOUGH (1998); STONE (2017).

²⁹ KAUFFMAN (2016), p. xvii.

To sum up: if we want to save the earth, we need a *polydimensional* worldview that integrates ecology, economy, science and spirituality. ANNICK DE WITT therefore speaks of an “*integrative worldview*”:

“the newly emerging *integrative worldview* [...] attempts to reconcile rational thought and science with a spiritual sense of awe for the cosmos”.³⁰

This is precisely the *polydimensional* worldview we need for a sustainable bioeconomy. If we are able to integrate all these dimensions, then maybe we can save our earth, save our little “blue dot”. This tiny “blue dot” is all we have.

References

- DARWIN, CHARLES (1856): Darwin to J. D. Hooker, 13 July [1856], DAR 114.3:169 (cf. CCD, 6:178); Colp, ‘Charles Darwin’s Reprobation.’ Online: <https://www.darwinproject.ac.uk/letter/DCP-LETT-1924.xml>
- DARWIN, CHARLES (1859 / 2011): The Origin of Species (Collins Classics), London: Harper Press, p. 546.
- DWORKIN, RONALD (2013): Religion without God, Cambridge (Massachusetts): & London: Harvard University Press.
- GOODENOUGH, URSULA (1998): The Sacred Depth of Nature, New York / Oxford: Oxford University Press.
- HAYEK, FRIEDRICH AUGUST VON (1968 / 2002): Competition as a Discovery Procedure, in: Quarterly Journal of Austrian Economics Vol. 5, No. 3, pp. 9 – 23.
- KAHAN, DAN M. & PETERS, ELLEN & WITTLIN, MAGGIE & SLOVIC, PAUL & OULETTE, LISA LARRIMORE & BRAMAN, DONALD & MANDEL, GREGORY (2012) The Polarizing Impact of Science Literacy and Numeracy on Perceived Climate Change Risks, in: Nature Climate Change Vol. 2 (October 2012), pp. 732 – 735.
- KAUFFMAN, STUART A. (2008 / 2010): Reinventing the Sacred. A New View of Science, Reason, and Religion, New York: Basic Books.
- KAUFFMAN, STUART A. (2016): Humanity in a Creative Universe, Oxford: Oxford University Press.
- MCGLADE, CHRISTOPHE & EKIN, PAUL (2015): The geographical distribution of fossil fuels unused when limiting global warming to 2 °C, in: Nature, Vol. 517, pp. 187 – 190. doi:10.1038/nature1401
- MESLE, C. ROBERT (2008): Process-Relational Philosophy. In Introduction to Alfred North Whitehead, West Conshohocken: Templeton Press.
- PIES, INGO (2020): Joe Kaeser, Luisa Neubauer und die Moral der Klimapolitik. Ordonomische Reflexionen zur Wirtschafts- und Unternehmensethik (Diskussionspapier Nr. 2020-02), Halle: Martin-Luther-Universität Halle-Wittenberg.
- ROGELJ, JOERI ET AL. (2018): Scenarios towards limiting global mean temperature increase below 1.5 °C, in: Nature Climate Change Vol. 8, pp. 325 – 332.
- SCHUMPETER, JOSEPH (1942 / 2003): Capitalism, Socialism and Democracy, London & New York: Routledge.

³⁰ DE WITT (2016), p. 203.

STONE, JEROME A. (2017): *Sacred Nature. The Environmental Potential of Religious Naturalism*, London / New York: Routledge.

UNFCCC (2015): Adoption of the Paris agreement. Proposal by the President (Draft decision - /CP.21), Paris. Download: <http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>

WEINBERG, STEVEN (1977 / 1993): *The First Three Minutes. A Modern View of the Origin of the Universe*, Updated Edition, New York: Basic Books.

WEINBERG, STEVEN (1992 / 1993): *Dreams of a Final Theory*, New York: Vintage Books.

WHITEHEAD, ALFRED NORTH (1925 / 1967): *Science and the Modern World (Lowell Lectures 1925)*, New York: The Free Press.

WHITEHEAD, ALFRED NORTH (1936 / 1968): *Modes of Thought*, New York: The Free Press.

WITT, ANNICK DE (2015): Climate Change and the Clash of Worldviews, in: *Zygon* Vol. 50, No. 4 (December 2015), pp. 906 – 921.

WITT, ANNICK DE (2016): Global Warming Calls for an Inner Climate Change. The Transformative Power of Worldview Reflection for Sustainability, in: Dhiman, Satinder & Marques, Joan (Ed.): *Spirituality and Sustainability. New Horizons and Exemplary Approaches*, Springer: Springer International Publishing Switzerland, pp. 100 – 214.