Climate Engineering from a Degrowth Perspective

Summary
Climate Change is about to happen. Policy has not yet reached an agreement on how to tackle this thread, so some scientists have taken matters into their own hands. What they propose is a technical solution: The modification of the earth's climate, called Climate Engineering (CE). In the degrowth-debate the attitude to technology is a matter of dispute. On the one hand, technoscience is considered as part of the problem and degrowth should go beyond technologies. On the other hand, some degrowth scholars have started reconsidering this one-sided attitude and rediscovering technology as an ally for the degrowth project, if embedded in a different understanding. This paper explores two approaches, the concepts of viability and conviviality. On the ground of the two criteria developed in the first part, an argument for a critical analysis of CE technologies is developed and applied to current existing or envisioned CE-technologies. The results of this assessment mean to contribute to the ongoing political discussion about climate engineering.

Keywords: viable technologies; conviviality; Climate Engineering; climate change;
Narrative Steps: Facing the current crisis & strategies for transformation

1. Technology and degrowth

1.1 The exosomatic development of humans and the distinction between feasible and viable technologies

By drawing on Nicholas Georgescu-Roegen, who can be considered as one of the main inspirations of the degrowth movement, it can be said that the evolution of human beings has moved from a merely biological, endosomatic mode to a cultural path of development: humans evolve and develop exosomatically, outside of their physical bodies, by employing instruments and tools that not only guarantee their surviving, but also improve their quality of life. Technology is thus the crucial mode of the creative evolution specific of humans. In their technological development they managed to disentangle themselves from the temporal limitation of the solar flow of energy by employing the terrestrial, fossil stocks of low entropy, which are not infinite in size, yet their flow rate can be fixed at will. The shift from renewable to non-renewable, fossil sources has enabled the amazing acceleration and intensification in the production of new exosomatic instruments that we know as industrial revolution. Yet, in the end, this shift from renewable to non-renewable sources is based on the accelerated depletion of the terrestrial sources and jeopardizes the chances for creative (and technological) development of future generations.

In fact, as long as we consider production processes only in terms of Inputs and Outputs – as neoclassical economics does – technologies represent a chance of increasing efficiency and reducing the consumption of resources. From this point of view it is important that a technology be **feasible**, which is technically and economically realizable. As long as this requirement is met we can speak of an efficient economic path of growth. However, the picture changes as soon as we consider the crucial role of Maintenance Flows for regenerating Funds (the agents of production, Land, Labour, and Capital) and keeping them in good working condition: MF encompass all those assimilative or absorptive services, referred to as sink functions, that render economic processes possible in the long run. Many technologies may very well be feasible under mere the perspective of inputs and outputs but they are certainly not **viable** once we consider the maintenance flows that they require, in order to regenerate the funds factors needed to produce them (Georgescu-Roegen 2003). By drawing on Georgescu-Roegen, Gowdy and O'Hara say that a technology is viable „if and only if it can maintain the corresponding material structure which supports its resource and sink functions, and consequently supports human activity indefinitely under current environmental conditions. A technology that draws down irreplaceable stocks, or generates irreducible pollution, or violates the ability of funds to provide assimilative and restorative services, is not viable" (Gowdy/O'Hara 1997, 242). Precisely this infinite regress constitutes the core of our growth economy: the continuous intensification of productivity and therefore of production is rooted in the possibility of this infinite regress. However, in the end, this acceleration spiral leads back to the only unlimited source of low entropy, which is – again – solar radiation as it is captured by Land and is limited with respect to its flow rate. Non-viable technologies are parasitic.

1. 2. Convivial technologies: ecodemocracy against technofascism

Another significant critique of technologies has been developed by Ivan Illich and André Gorz and represents an important source of inspiration for the degrowth-movement. Due to its immanent logic, industrialization has on the one hand conveyed the overcoming of premodern societies by assuring the satisfaction of fundamental human needs and by fostering processes of emancipation. At the same time, on the other hand, it has turned this very process into its opposite by creating new needs and dependencies, reversing emancipation into alienation (Illich 1973). According to Illich, the Western logic of development reproduces itself by continuously recreating the basis for its self-legitimation until it reaches the status of a "radical monopoly" (Illich 1973) which leads to planned obsolescence, manipulation of desires, and generating a feeling of lack. As a result, medicine makes us sick, school makes us ignorant, cars, which should make us faster, jam up the roads. For Illich humans are driven into a drug-addiction-like state, in which they lose their autonomy (i.e. the capacity to creatively deal with problems and find solutions adequate to the context) and are delivered to the systemic and technical forces of the development machine. As Gorz writes, we are faced with a crucial alternative between conviviality and technofascism: either people agree on imposing limits to industrial production and technology through a process characterized by community-based conviviality and autonomy, or the decision will be taken by a central power of coordination and regulation, which will employ even more complex and less transparent technologies to cut people's autonomy. The bureaucratic understanding of technology promises to solve environmental problems and to improve quality of life, while at the same time creating an élite of technocrats with power of control while leaving the large mass of people depending on them and their technological expertise. Against technocracy or technofascism, as Illich writes, „advanced or "high" technology could become identified with labor-sparing, work-intensive decentralized productivity. Natural and social science can be used for the creation of tools, utilities, and rules available to everyone, permitting individuals and transient associations to constantly recreate their mutual relationships and their environment with unenvisaged freedom and self-expression" (Illich 1973). Convivial technologies are decentralized, reversible, democratically controllable; they serve the good life of the community and are subordinated to the values and ends commonly negotiated.

2. What is Climate Engineering?

Climate change confronts us with a new, unprecedented challenge regarding technology. The need to critically overcome the hegemony of intransparent and uncontrollable technology contradicts the belief, that climate change can only be solved by technical means. Given the inertia of the climate system as well as the missing commitment of the Industrial World to cut emissions, it seems less and less likely that we will be able to stabilize temperature-rise globally at 2°C. This provokes the concern, that the climate system may reach certain tipping points, such as the melting of the Greenland ice shield or the turning of the Gulf Stream. If climate sensitivity turns out to be higher than expected, climate change might have devastating consequences.

Facing this – seeming – catastrophic worst case, many climate scientists advocate Climate Engineering (also known as Geoengineering). It is defined as the "*deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change*" (Royal Society 2009). Climate Engineering thus aims at delaying or even offsetting climate change technically by a. stabilizing the temperature or b. removing CO2 from the atmosphere. According to those two basic features, one can distinguish two sorts of CE-technologies:

a. Solar Radiation Management (SRM)

SRM-technologies influence the energy balance of the earth by either reflecting the incoming sunlight back into space or by hindering sunbeams to reach the earth in the first place. Some surfaces absorb sunlight and thus add to the greenhouse-effect. Other surfaces however mirror the sunbeams back into space, like white surfaces (*white roofs*) or clouds (*marine cloud brightening* and *seeding*).

The observation of temperature declining after the Mount Pinatubo eruption in 1991 brought about the idea of *sulfate aerosol injection* (*SAI*) (Crutzen 2006). Small particles of sulfur in the upper atmosphere will reflect the incoming sunlight, thereby stabilizing the ambient air temperature at a certain degree. SAI currently is the most prominently discussed SRM-Technology, for it is deemed to be cheap and effective. Many scientists think of it as a 'Back-up-plan', an insurance if all other efforts to combat climate change fail (Keith 2013, Betz 2012).

Many studies have been conducted, that attest SAI the ability to stabilize the temperature. However, temperature is by no means the only problem of climate change. SAI thus poses many technical, ethical and political problems. First of all, since SAI does not change the carbon dioxide concentration in the atmosphere, it cannot address problems caused by this, e.g. the acidification of the oceans (Robock 2008). It will most likely affect precipitation patterns over the world, thus leading to droughts or floods in countries already affected by climate change. It is also not clear who will regulate the development, let alone the deployment. Last but not least, precisely because of its ability to serve as a Plan B and a last resort for catastrophic climate change, the danger of lessening mitigation efforts is a real problem (this problem is known as *moral hazard*, cf. Royal Society 2009, Betz 2012).

b. Carbon Dioxide Removal (CDR)

SRM has one major deficit: It does not affect the CO2 concentration in the atmosphere. For many authors this alone is reason to abandon any SRM technology. There is an alternative climate engineering approach, which aims at reducing the CO2 amount. This may happen through mechanical or technical carbon air capture, e.g. via 'artificial trees' or biochar, or by enhancing natural CO2-sinks, such as ocean fertilization, enhancement of oceans alkalinity, and afforestation. Even though those technologies treat the root cause of climate change, i.e. the concentration of carbon dioxide in the atmosphere, they too have great influence on natural cycles. It is not clear, for example, how the enhancement of the ocean's alkalinity affects the natural habitat "ocean". Even such seemingly harmless approaches like afforestation come with their own problems, like landuse-conflicts, changing of wildlife habitat, or a trade-off with albedo (Royal Society 2009).

3. Establishing a prima facie Degrowth-Argument against CE.

A technology that fits a de-growth-society needs to be both **viable** and **convivial**. Each of these two terms enlists a series of criteria. To state, that SAI is neither viable nor convivial, is to say, that it does not meet at least one criterion and that it should be rejected altogether from the point of view of a degrowth-compatible technology. This paper aims at a detailed analysis of arguments that can be drawn from the degrowth view on technology. Moreover, it will outline criteria for judging CE-approaches that go beyond an overall repudiation of any possible form of climate engineering and substantiate the critique to CE, by articulating following steps:

a. Substantiating with good arguments the normative claims, that a technology needs to be viable and convivial,
b. Assessing how this applies to SAI and to other CE-technologies, some of which might show to be more compatible with the assumptions of viability and conviviality than SAI.
c. Discussing the implications for CE-technologies in general and possibly outlining alternative paths to address the issue of CE.

Even though CE is not being discussed in a wide public yet, it is just a matter of time. In face of a possibly catastrophic climate change, CE provides help, but without the effort of changing the 'business as usual'. This makes it very attractive to 'conservative' economies and parties. In fact, in the USA Climate Engineering is advocated openly by a number of conservative think tanks. Especially SAI allows for neo-capitalist, fossil-fuel based economies to continue as before. It might but delay the overdue change of society. Bearing this in mind, degrowth is the perfect viewpoint under which CE should be analyzed, and it is vital to do so.

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