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Walk the talk: Towards an ecological futures framework for our designed cultures

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Abstract | Based on the bleak trajectory of the near and far future due to climate change, this paper outlines some of the assumptions that makes relevant actions so hard to implement. We suggest a framework that enables us to radically rethink sustainability as well as both human and design agency. Based on a simple "Walk-the-Talk" model, potential actions are mapped for both (i) established and (ii) more alternative approaches. The former being the one espoused in today's discourse, while the latter seems to get surprisingly little support. By describing three concrete product concepts we illustrate how by shifting focus to more alternative approaches, we can precisely address the challenges that more traditional approaches have obviously failed to address. In order to find relevant leverage points for both design and required systems change, the paper finally discusses why the traditional approaches still are so dominant in our quest to address climate change.

KEYWORDS | CLIMATE CHANGE, DESIGN, DEVELOPMENT, LONG-TERM SUSTAINABILITY, SYSTEMS CHANGE

1. Background

Design has for quite some time been concerned about the changes needed in how we humans design, build and organize our sociocultural and techno-economic environment. An important insight from long-term sustainable systems is that they are typically characterized by cooperation and diversity. For many centuries, however, the western cultural sphere, with its initial European epicenter, has worked in the complete opposite direction. The hallmarks of this direction have been expansion, exploitation, competition and domination. It can be argued that it is primarily facilitated and accelerated by the global implementation of an economic and industrial 'monoculture' with infinite exponential growth as its primary and essential strategy for survival, which in turn is predicated on continually plundering the life-sustaining biosphere. This monoculture is contrary to everything we know about resilient and long-term sustainable systems. In this 'race to the bottom', the natural world is swept out of the way, as a mere externality.

Modern human civilisation has now arrived at an evolutionary cliff—towards a literal "hothouse" Earth (Steffen et al., 2018), stripping the life carrying capacity of the natural world (Ceballos et al., 2017; Díaz et al., 2019). It has been argued that it is a feature of our existing economic system tied to infinite growth which has historically *cheapened* the natural world in order to dominate and exploit it (Patel & Moore, 2017). However, in order to discuss the situation and its implications we first need to get some fundamental assumptions in place.

1.1 Rethinking Sustainability and Development

Sustainability as a concept has been frequently used, and probably also misused, since at least the late eighties when UN's Commission on Environment and Development (WCED) published 'Our Common Future' (WCED, 1987). A unique insight of the report was how it understood the environmental crisis as an interlinking of seemingly disparate systemic crises that could not be addressed in isolation. In particular, it had highlighted sustainability's relation to development, as it was explicitly written in both the commission's name and in their oft-quoted definition of *sustainable development*:

> "Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Generally speaking, sustainability can be described as the ability to 'exist constantly', while today it more specifically refers to the capacity for the biosphere and human civilization to coexist. One tension becomes highlighted when 'sustainability' is linked to 'development', as what is perceived as development today just as well could be unsustainable. If true, should one still try to sustain that development? It has even been argued that 'sustainable development' is an oxymoron as the development paradigm is possibly inherently unsustainable (Brown, 2015), which of course depends on what is meant by 'development'. With the hindsight of more than 30 years since the UN published their report, it is therefore important to ask if it is development, as we know it today, or should we rather refer to a more 'terrestrial' (Latour, 2018) or 'regenerative' (Wahl, 2016) notion of the concept. Regardless, it is becoming increasingly obvious that what we today call 'development' is destroying the life sustaining biosphere, while both increasing the gulf between the few very rich and the many poor (Hickel, 2017) *and* exponentially increasing the extraction of resources and emissions (Martenson, 2011; Raworth, 2017).

The UN's attempts in the early 21st century to resolve this inherent tension between sustainability and development resulted in 15 years (2000-2015) of Millennium Development Goals (MDGs), but as an exercise, it nearly ended in complete failure (Hickel, 2018). Eventually, after some statistical maneuvers, which included moving the baseline year for measurement from 2000 to 1990, it was claimed that the goals had been more or less reached (Ibid.). Following this, 17 Sustainable Development Goals (SDGs) were announced, to be achieved within 15 years from 2016 to 2030. While it is still too early to know the exact outcomes of these goals, there seems to be consensus emerging on the *very* bleak prospects for our planetary future (Díaz et al., 2019; Wadhams, 2017). Especially as the SDGs still set the goal for economic growth (SDG 8), as a condition to solve the crises, which for many is the primary driver of the crises (Brown, 2015; García-Olivares & Solé, 2015; Hickel & Kallis, 2020). In figure 1, Rockström & Sukhdev (2016) sketch out how the SDGs link up to the 'biosphere' and 'human civilization', illustrated as 'society' and its 'economy', respectively.

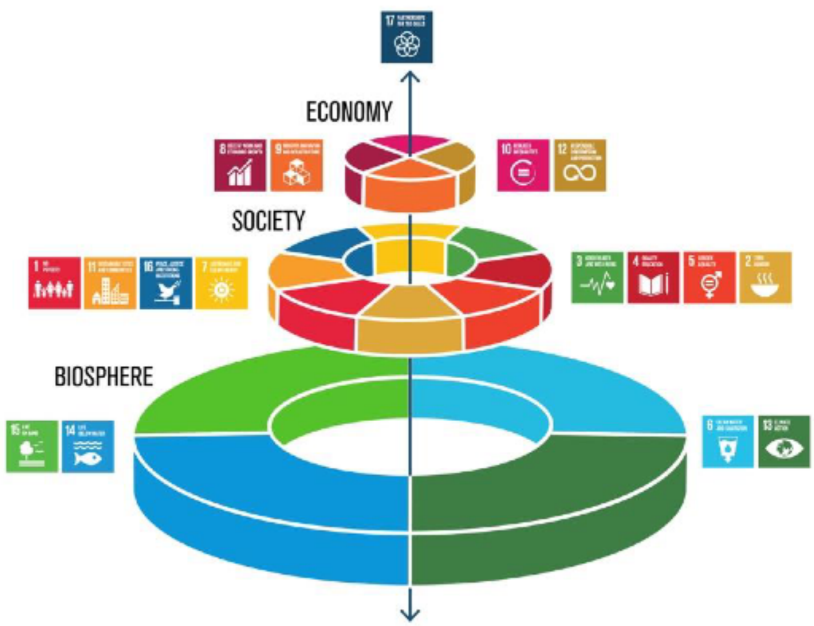
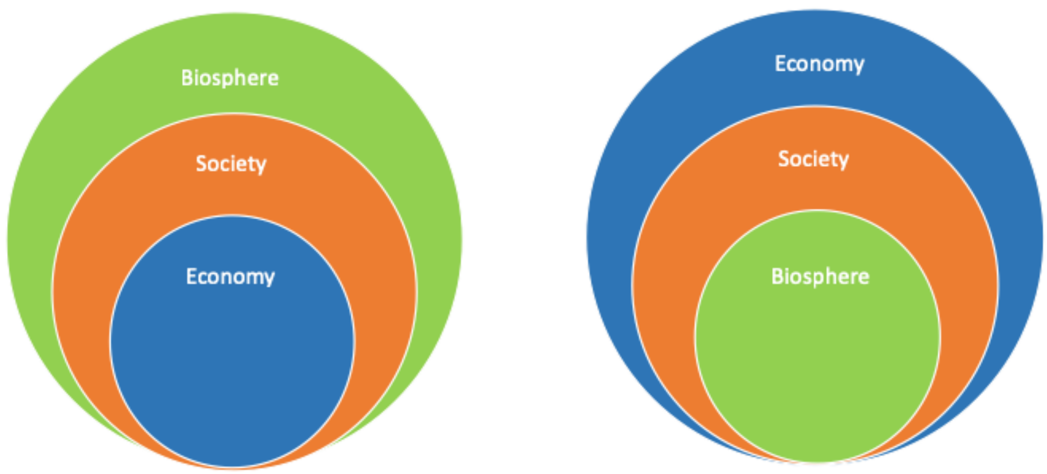


Figure 1. Rethinking and reconnecting the 17 UN SDGs with food. Credit: Stockholm Resilience Centre (Rockström & Sukhdev, 2016)

1.2 Rethinking Human Agency

The discourse surrounding both sustainability and sustainable development tends to be highly politically charged (Fry, 2011; Giddens, 2011; Latour, 2018). Much of that goes beyond the scope of this paper. However, we believe that figure 1 above at least needs to be clarified by adding the actual relation between the three levels at hand.

Below figure 2a illustrates how the entirety of our human civilization is a mere subset of the biosphere; completely dependent on and 'nested' within the Biosphere, what is typically termed as a 'nested system' (Capra & Jakobsen, 2017). This implies that the larger system of the Biosphere does not have the same kind of dependence to us humans. As long as we don't mess up the Biosphere, it's remarkably resilient. However, there is a limit to what it can take and many of these limits might already be on the brink (Steffen et al., 2018).



a) A Nested System relying on the laws of nature b) A Nested System relying on the laws of economics

Figure 2(a,b) The nested systems model modified from Temesgen et al. (2019)

The biosphere, bound by the laws of nature, offers the bedrock from which society emerges and from within society, the economy emerges. Contrastingly, our present civilization seems to follow a completely reversed nested order as illustrated in figure 2b, implying that the 'laws of economics' set the limits to what can be done in the system. So arguably, in spite of the *talk* about what's required to restore and renew what human society has damaged, we seem to *act* as figure 2b illustrates, i.e., the complete opposite to figure 2a and by that challenging the laws of nature in favor of economically feasible solutions. Or as Naomi Klein puts it:

> "What the climate needs to avoid collapse is a contraction in humanity's use of resources; what our economic model demands to avoid collapse is unfettered expansion. Only one of these sets of rules can be changed, and it's not the laws of nature." (Klein, 2014, p. 21)

1.3 Rethinking design's agency

Design has been criticised for being a mere instrument for developing the consumerist 'wants' for sustaining economic growth, which the present system seems to depend on far more than the 'humans' that designers are told to be focusing on. Giving a "perception of designers as creative, capitalist nerds delivering sexy looking things" (Fry, 2009, p. 120).

The full enormity of the climate and ecological crises has brought us, a small international research group in design, to confront and deliberate on our role as designers as we look to change this bleak trajectory that is leading us towards the complete collapse of our life sustaining biosphere. How then do we as designers explore, develop and use our disciplinary tools and mindsets to address issues related to climate breakdown and comprehend the radical changes that are essential within nearly all levels of our society? Instead of looking from within a human centred point of view, in this paper, we will take a step out of most typical frames by asking what we, as the human species, need to do to better fit into the larger system of the biosphere that we both threaten and depend on. In this paper we'll therefore discuss what is required to *'walk the talk'* towards a more long-term sustainable trajectory.

2. The Walk the Talk Model

As discussed by Amsale Temesgen et al. (2019) it makes an immense difference whether we restrict our options and goals to be feasible within the present economical paradigm or not. In this paper we'll explore if this distinction can be generally useful in order to discuss the multitude of approaches available today, how 'densely they tend to be populated' in present day discourse and the leverage points (Meadows, 1999) to change the present system to a more 'long term' sustainable one. We'll do so by first establishing a rather simplified map illustrating the 'tension field' at play.

We call it the 'Walk the Talk Model', which first maps out different kinds of possible responses to global warming based on our actions and claims (i.e. walk and talk, respectively). In addition, it also makes a distinction between those that try to respond within the present mainstream system versus those who try to find solutions outside it. We follow it up by describing three illustrative cases relating to energy production. The model illustrated in figure 3 below shows how we do, or do not, *walk our talk in relation to climate change* (CC). Exactly how the different approaches are allocated on this, admittedly simplified map is a bit arbitrary and should only be understood as illustrations of what could be there. Illustrated by the tone of grey in the background, we argue that the lower right triangle currently dominates the present-day discourse.

The lower left quadrant is populated by those that neither walk nor talk in relation to CC. Lower right quadrant is populated by those that rather talk than walk, while the upper left is the opposite, consisting of the ones walking without talking about it; i.e. those communities that just live and thrive in a sustainable manner. All these three quadrants relate in different ways to the approaches populating the upper right quadrant. The upper right quadrant, is also where both the tension and the contrast between the attempts to solve the crises *within vs. outside* the present system becomes most obvious.

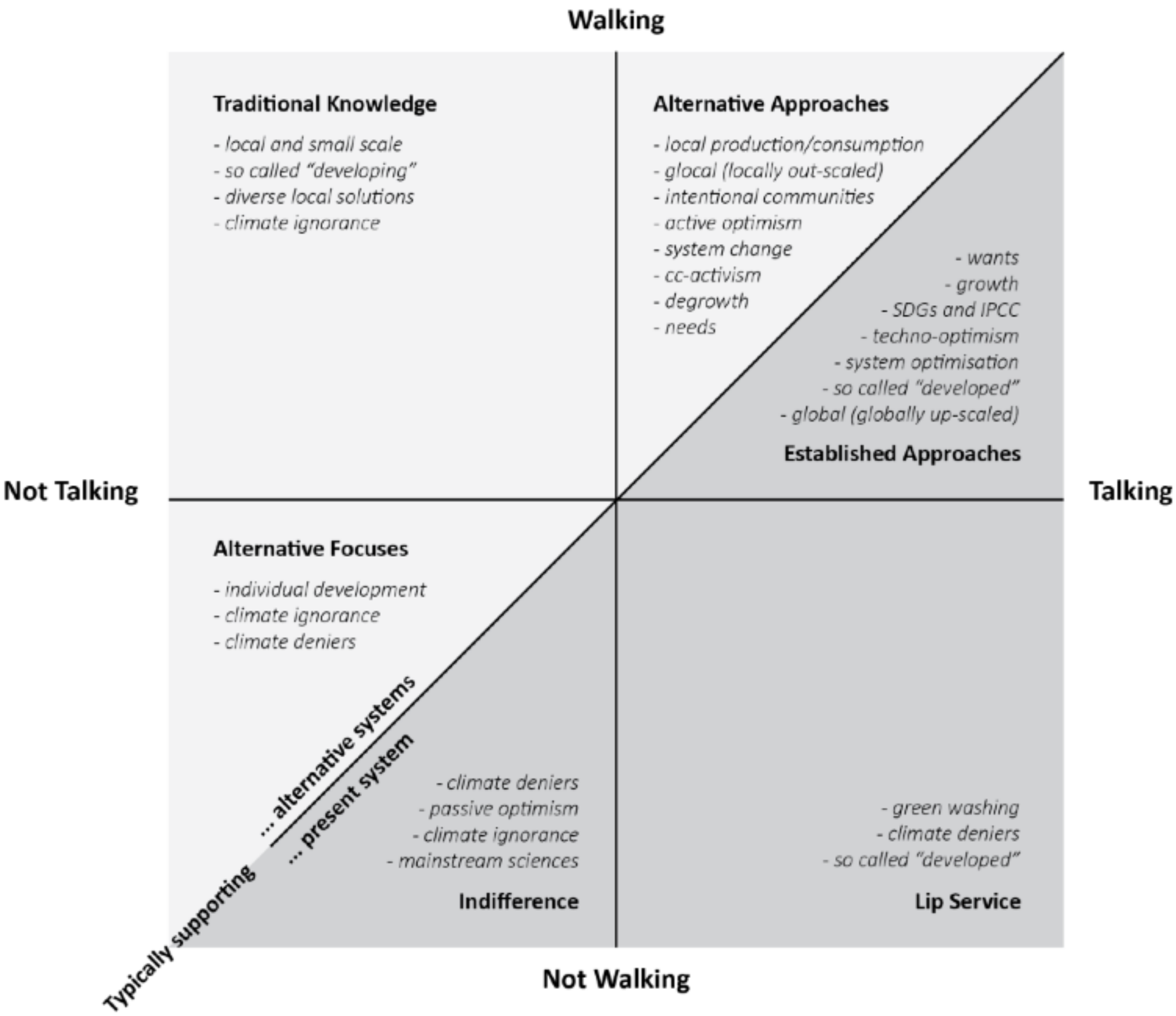


Figure 3. The walk the talk model. Credit: Authors

If one considers figure 3, an explicit tension emerges between the 'alternative systems' of the upper left quadrants and the established present system of the lower right triangle. If one assumes an '80-20' distribution, we note that while *most* of the world's population resides in the upper left triangle, they are continually impoverished yet much of the resources and energy are being consumed by those in the lower right triangle, by a privileged few. When we zoom in on the upper right quadrant of "walking-talking", this tension becomes even more apparent when talking about energy and resources allocated for climate action today. Essentially, we seem to avoid solutions that might disrupt our present economic order, focussing much less on alternative 'Societal Transformation Scenarios' (STS) which might be especially relevant today for staying below 1.5°C (Kuhnhenn, et.al., 2020). We will expand on this tension further, explored through three cases that highlight the kind of additional solutions we might be able to create if we could dare to *walk* outside the hegemonic box of our present, growth-dependent economic system. What might happen if for a while we freed ourselves from the economic feasibility of the short term and screen new ideas and more thoroughly explore the long-term alternative approaches above the diagonal line in figure 3?

3. Three Illustrative Cases

The three cases, in 3.1 – 3.3 illustrate the tensions in how to address the daunting challenges we face today. The narrative today tells us that renewable energy is growing much faster and even becoming cheaper than the traditional fossil fuel sources used today (Gore, 2016). However, on scrutinizing figure 4 below, at least 3 problems of that story emerge:

1. In order to make the narrative compelling, it needs to compare relative growth instead of absolute growth. The present story becomes invalid if one compares the more important absolute growth.
2. In contrast to case 3.1, the narrative completely forgets that during the last few decades we have emitted more CO_2 than the whole of humanity, had ever done before that (Wallace-Wells, 2019). Due to the Climate system's inertia most of this CO_2 is still in the pipeline without revealing its final consequences today.
3. In contrast to case 3.2 and 3.3 the present narrative assumes that we can produce the required equipment for 'renewable' energy production, without using even more fossil fuels and minerals.

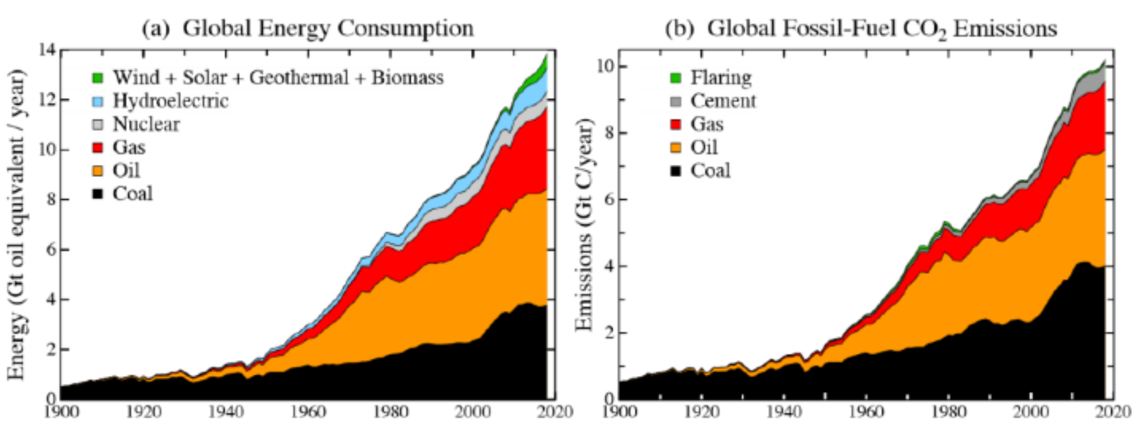


Figure 4 (a,b). Global Energy consumption and fossil fuel emissions. Credit: Hansen, (2020) We will therefore discuss three different cases developed within design master program at AHO that can all be juxtaposed as 'alternatives' to the way we produce and use energy today. The design concepts themselves are all feasible in principle but haven't been able to scale *up* on the market yet. The first case is indeed used in certain niche markets, but far from what's required to unleash its CO_2-negative potential. The two other cases, are speculative concepts based on basic science, but as such get less attention than one would expect if one considered the urgency to *replace* and not add to the already extracted fossil minerals and fuels. The three cases are all divided in two subsections: 'How things are', which roughly represents the lower-right triangle of our 'Walk-the-Talk' model (figure 3). While the second subtitle, 'How things could be' goes on to illustrate possible alternatives that rather might appear in the upper-left triangle of the same model.

3.1 Reversed Carbon Emissions

How things are: from soil to atmosphere

Since the advent of industrial revolution, we have organized our societies and developed technologies, products and their production capacity around a seeming abundance of fossil fuels like oil, gas and coal. The social, technical and economic systems we live in today are typically so dependent on these resources, extracted from the deep soils of our globe, that the comparison to a severe drug addiction easily come to one's mind (Raworth, 2017). But just as with any other drug's immediate and addictive comforts, it also comes with severe negative, long-term consequences. One can argue that the most serious one, with numerous negative and cascading effects, is that it takes fossil carbon from the earth and in the process emits vast amounts of CO_2 that cause both global warming and acidification of the oceans.

How things could be: from atmosphere to soil

The pioneering book, *Biochar for Environmental Management, by* Lehmann & Joseph (2009) proposes reversing carbon emissions by utilizing Biochar. Since then, biochar has been discussed as a way of sequestering carbon from the atmosphere and by doing so *reversing* some of the devastating flow of carbon our society has produced (Bates, 2010). The idea is simple. Instead of burning biomass in air to ash, one burns it without oxygen into coal (as one fraction) and energy (as another). Thus, one ends up with both energy and carbon (or biochar), where the latter can be put back into the soil and make it more fertile. By this process the highly stable biochar, becomes a long-term carbon sink by circumventing biomass carbon emissions to the atmosphere. While promising, enthusiasm for biochar was initially hampered by the sobering fact that, as illustrated in figure 4, the sheer scales of carbon emissions are so immense. In fact, the accumulated carbon emissions turn out to be much more than what could be considered directly economically feasible to be useful for our soil. However, more recently Albert Bates and Kathleen Draper argue in their book *Burn-using fire to cool the earth* (2019) that this dilemma potentially can be resolved by utilizing carbon's inherent versatility and ability to replace fossil oil, not only as a fuel, but in all kind of designed products typically needed in our everyday life. They coin the process 'Carbon Cascading' as it can be used in series of different applications before it eventually ends up in the soil again. Figure 5(a,b) illustrates a very simple concept for application of biochar where an energy loop is maintained by only using the gas produced from the feedstock to cook food and letting the remaining carbon go back to the soil thus enhancing its fertility. Furthermore, with a *cascading* approach one could let the Biochar produced pass several stages of other productive uses before it eventually ends up in the soil.

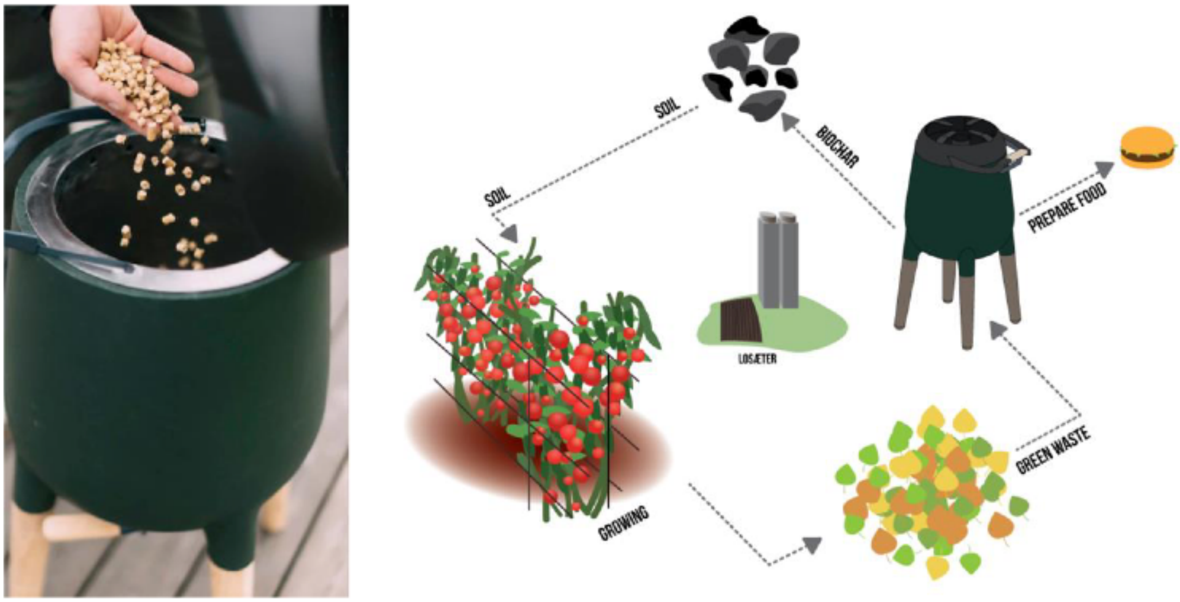


Figure 5 (a) the Emu biochar stove and (b) its systems of reversed Carbon Emissions Credit: Benjamin Ngoma Rodahl.

3.2 Redistributed manufacturing

How things are: Centralized mass production

If biochar forms a closed loop of energy flow within a socio-technical system, then this might also drive the production model in a more generally sustainable direction. Although the centralized mass production model has become a mainstream economic development strategy and has contributed to the creation of economic wealth in many countries, this development has also brought us a series of negative effects, including the vulnerability and inflexibility of the system, resource exhaustion and environmental degradation, the barrier between consumers and producers, etc (Biggs et al., 2010; Johansson et al., 2005).

How things could be: from consumer to prosumer

Arguably, we probably need a more resilient and flexible distributed production model to drive the system from mere optimization to the kind of changes really required. This means that material extraction, manufacturing and other involved processes probably need to change too. Pure consumers could ultimately become more of "prosumers", producing their own goods and services (Kotler, 1986). Instead of relying on infrastructure separated by thousands of kilometers, people could receive a greater proportion of both long-term sustainable products in general and even required energy from their own community or home. The 3D-printer 'biomA' is a solution that aims to facilitate exactly that. It uses algae to 'grow' batteries (Figure 6a,b). This concept speculates about an alternative solution to lithium batteries by combining algae with chitosan biopolymer instead of the extracting minerals for batteries to accelerate the global transition to more long-term, sustainable and distributed energy production. Within such a distributed production network, all users are considered a localized open manufacturing node, or 'terminal', in a network with so called 'prosumers'. The 'prosumer' gets involved in both the production and the consumption of resources, goods, and services on which they depend. The node can therefore more efficiently reflect the scale and context of local needs, conditions and resources. In addition, the networking between multiple nodes can still enable sharing of the information, resources and knowledge required to reflect changes in the demand from individuals to communities, regions and countries. Or in other words, the main driver of the process might eventually move from the needs of our present system to more essential needs for both the user and the biosphere we depend on.

Figure 6 (a) biomA 3D prints organic batteries from algae and chitosan biopolymer. (b) Designed for local production and consumption with prosumers. Credit: Jomy Joseph

3.3 Renewed Energy production

How things are: Non-renewable, renewable energy

The share of, so called, 'renewables' in the global energy supply has never been higher (Figure 4a). However, it is being added over and above the already existing energy sources and not so much *replacing* the fossil fuels as promised but further *increasing* capacities for energy consumption. This compounds into a 'race to the bottom' where technology enables ever *newer* capacities for extraction and consumption in addition to what already exists (York, 2017). Despite offering some growth in the short run, it is estimated that these 'renewables' are on course to deplete global reserves of crucial resources such as copper, lithium and other rare-earth minerals given the inherently unsustainable rates of consumption today (García-Olivares & Solé, 2015). It seems that we are caught within a "double bind" where trying to reduce emissions through the present economic system could end up creating even more emissions if we don't drastically reduce and rethink "civilizational wealth" (Garrett, 2012) as well as "green growth" (Hickel & Kallis, 2020).

How things could be: long-term renewable energy
Given what we know, distributed and scaled *out* nodes of global renewable energy infrastructure might need to be *decoupled* from existing "extractivism" and sourced, manufactured and powered renewably. Speculative Solar, in figure 7, is an alternative, 3D printed optical solar cell that harvests solar energy using optical structures coated with graphene solar inks from sequestered atmospheric carbon. The 3D printed optical structures coated with graphene propose to capture a larger spectrum of visible and infrared solar energy, vastly increasing energy efficiency and effectiveness within the same footprint. In combination with reduced energy consumption, these cells could potentially transform cities to become net generators of energy instead of net consumers, all within the existing frames of today's infrastructure. Designed for modularity and complexity, these solar cells are predicated on adapting to localised production and consumption for community needs rather than market needs, i.e., for scaling *out* rather than scaling up. If one were to carry forward the principles of distributed manufacturing, replacing fossil energy and combine with graphene made from sequestered sources, it might be possible to build a 'virtuous cascade' of renewable energy replacing and regenerating itself through other, locally produced, renewable production systems.

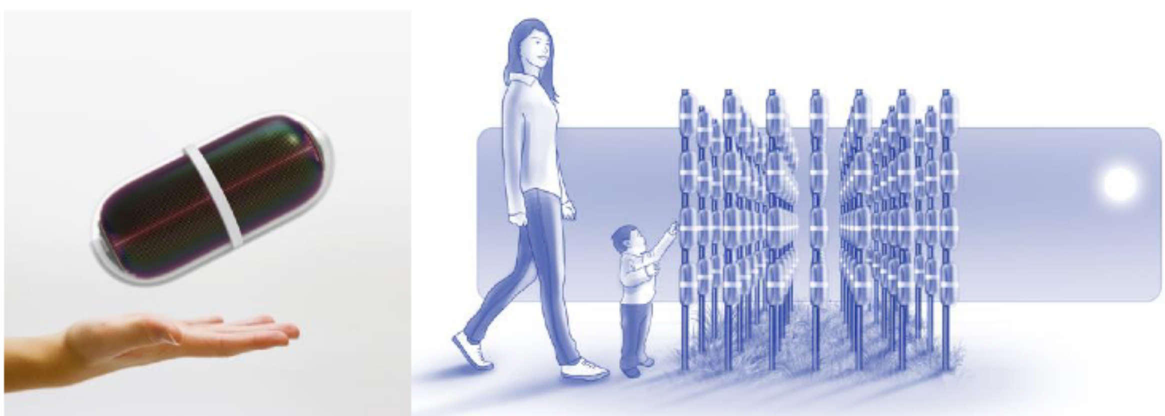


Figure 7 (a) 3D Printed Optical Solar Cell Concept. (b) Cells mounted on vertical structures and facades of buildings to capture reflections and scattered sunlight. Credit: Jomy Joseph

4. Discussion

In this paper we have tried to question some contemporary discourses, which typically seem to be 'marinated' with assumptions that are often taken for granted regarding sustainability and how to best combat climate change. Comparing some established and alternative approaches reveals to us that even the best of the more established sustainability interventions only does *less* damage yet receive *most* of the world's resources and investment, but on the whole, leaves the damaging engine of infinite growth unchallenged. On the other hand, the kind of alternative solutions we briefly illustrate in our three product cases (3.1 – 3.3) could as a contrast, not only potentially *replace* existing technology, but even reverse some of the damage already taking place. However, these mostly remain relegated to the margins today, revealing the tensions as described in figure 2(a,b) and figure 3.

The upward trends of global energy consumption and CO_2 emissions (Figure 4) make it fairly evident that in the foreseeable future, it will not be possible to replace *all* fossil-based energy we use today with *truly* renewable alternatives. However, we are still asking ourselves why isn't more being done to start the seemingly most logical development trajectory to address this dilemma; i.e. (i) to develop solutions that facilitate a way of living that require radically *less* energy and (ii) to make sure that the energy sources really are long-term renewable. One quite obvious answer is that these alternative product approaches do not make 'economic sense' when the focus is on economic hegemony where cheap fossil fuels are preferred over renewables, scaling *up* over scaling *out*, centralised production and consumption over localised prosumers. One might also contemplate if there is an even more powerful, albeit also more hidden, reason behind this. Might it just be that the alternatives we sketched, being inherently small scale and local, also are too disruptive for a system that is built on gigantic, globally up-scaled solutions? Is it that these alternative approaches, in essence call for a fundamental rethink that challenge the established approaches of the 'laws of economics' (Figure 2b), where the biosphere is *not* a mere 'resource' waiting to be exploited for economic growth?

In this paper we have tried to illustrate how design's agency could be expanded to explore alternative climate solutions at the local level, in ways that could potentially help build resilience and be better suited to addressing the environmental and social crises due to climate change without resorting to the same historical vicious cycles of domination and exploitation of the natural world.

However, underpinned by our own frustration, we have also tried to understand why this is not an easy route to take. Even though many realize that human society might be at stake, we don't seem to address this serious challenge in the required way. One may ask why we don't do what is obviously needed to be done to rein in the worst possible outcomes of a system we still seem to support. Where are these leverage points of change in this system that we as designers might be best suited to address and, to get the required impact, how do we best mediate the work we do? However, in those efforts we probably also need to pay attention to Fredric Jameson's famous words:

> "Someone once said that it is easier to imagine the end of the world than to imagine the end of capitalism."

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