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It's not (all) about efficiency: Powering and organizing technology from a degrowth perspective

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ABSTRACT

Transgressions of ecological boundaries and increasing social inequality question the paradigm of continual economic growth guided by technological efficiency - often cited as the only solution to these crises. This paper develops a critical and diversified viewpoint on technology for degrowth. 'Classical perspectives' of Illich's convivial society, Elull's critique of technique, Mumford's tools and machines, and Schumacher's critique of gigantic techno-infrastructures are explored and combined with Arendt's instrumentality of technologies and Marxist perspectives on ownership. Two questions are posed regarding technology. First, which technologies are 'suitable' for a degrowth context? Previous frameworks by Illich and Schumacher are extended by ecological aspects to assess the suitability of technologies. Second, how should 'suitable' technologies be structured to enable egalitarian utilization? Here, Schumacher's "intermediate technologies" and ownership are central elements. The frameworks and analysis add value for degrowth activists and bridge the gap scientifically between Marxist views and those of degrowth. In conclusion, technologies in degrowth are suitable if they reduce ecological impact, enhance autonomy and conviviality, and are structurally available in an egalitarian way based on open-access regimes. In the discussion further research questions are posed regarding transforming agents and power relations between grassroots and the state. Limitations of the framework include the role of digital technologies for communication, here treated as electric tools, and the focus on industrialized societies.

1. Introduction

Technological inputs and innovations are a key driver of long term economic growth (Solow, 1957). Through technological advancements, increasing efficiencies, and a shift from the industrial to the service sector various countries in the Global North have improved wealth and development indicators whilst ostensibly decoupling greenhouse gas emissions from economic growth (OECD, 2012). This seeming success is often cited to encourage expanding economic growth and technocratic efficiency solutions to lift millions out of poverty while simultaneously paving the way for future environmental improvements, emission reductions, and dematerialization of the economy (Naam, 2013).

However, increasing material and energy efficiencies have actually *increased* total throughput by reducing costs of production (Sorrell, 2009). Despite efficiency gains and regional decoupling the total amount of CO_2-emissions globally have increased almost steadily between 1990 and 2013 (Friedlingstein et al., 2014). The same is observed for the total global resource appropriation of biomass, fossil energy carriers, metal ores, tailings, and industrial and construction material which has potentiated from 7.1 billion tons in 1900 to 59.5 billion tons in 2005 (Krausmann et al., 2009).

Further, technological advancements played a crucial part in this development. For instance, the industrial synthesis of ammonia from atmospheric dinitrogen known as Haber-Bosch process has significantly altered the global nitrogen cycle leading to an unintentional loss of biodiversity and the decline of water quality whilst creating dependency on the process itself (Erisman et al., 2008). As far back as 20 years ago this had already added "at least as much fixed N to terrestrial ecosystems as do all natural sources combined" (Vitousek et al., 1997: 497).

Coinciding with such technological advancements are the breaching of planetary boundaries (Rockström et al., 2009) and overshooting of planetary biocapacity (WWF, 2012). 15 out of 24 assessed ecosystem services are being used unsustainably (MEA, 2005). Simultaneously, relocating industrial production has

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increased international trade while displacing negative environmental, ecological, and social externalities (Peters et al., 2011), creating environmental distribution conflicts (Gerber, 2011; www.ejolt.org), and resulting in cost shifting. These issues pose questions of fairness, distribution, and equity often times completely absent from deliberations on technology.

In a world characterized by scarcity, technological progress presents shifts, not solutions by substituting one resource for another, e.g. uranium for oil (Heinberg, 2007). These substitutes are themselves scarce, even in the case of being 'renewable.' For instance, production of solar panels, wind turbines, or batteries requires lithium and other rare earths. Thus, biophysical limits of natural resources imply limitation to the expansion of the economic sphere and material consumption (Daly and Farley, 2011; Meadows et al., 1972). In light of these findings it is necessary to reassess the role of technology and the (failed) expectations towards it.

Commonly, degrowth advocates propose a sufficiency strategy, realized through reduction of production (Hueting, 2010). Instead of 'better' machines restrictions in the need for resources are required to alleviate ecological degradation and resource exploitation (Paech, 2012). According to Alcott (2010) transformation strategies should address ecological impacts directly through caps, limits, and restrictions rather than indirectly through technological fixes.

After discussing the employed methodology (Section 2) this paper takes a step back and reviews philosophical concepts related to technology common and uncommon in the degrowth discourse (Section 3). 'Classical perspectives' of conviviality (Illich, 1973), critique of technique (Ellul, 1964), tools and machines (Mumford, 1934), and gigantic techno-infrastructures (Schumacher, 1973) are explored and combined with perspectives on technological instrumentality (Arendt, 1998) and ownership (Marx, 1962). From that suggestions are derived on *which* technologies might be suitable for a degrowth society (Section 4) and *how* these technologies might be organized (Section 5). Questions of agency and power conclude the article (Section 6).

2. Method

The objective of the paper is to answer two questions a) *which* technologies are suitable for the degrowth context; and b) *how* they could be structured. For this purpose existing literature on the topics of degrowth and technology was exploratively reviewed. Here, Ellul's *The Technological Society*, Illich's *Tools for Conviviality*, Schumacher's *Small is Beautiful*, and Mumford's *Technics and Civilization* emerged as 'classical perspectives' on technology within degrowth. In search for outside perspectives, the topics of ownership and instrumentality surfaced. The former is represented in this paper by Marxist arguments (Marx, 1962; Roth, 2010; Schleifstein, 1980), and the latter by Arendt's *The Human Condition*.

A framework is constructed identifying 'suitable' technologies, their structure, and their ownership regimes for the degrowth context. The framework's elements were identified hermeneutically utilizing *preparing interpretation* within qualitative content analysis (Mayring, 2010). Here, concepts of conviviality (Illich), intermediate technologies (Schumacher), ownership (Marxist), the means-end category (Arendt), and Mumford's emphasis to redesign technologies have materialized as central categories to assess technology. They are accompanied by ecological impacts as a major source for degrowth (Latouche, 2009). This inductive category development was followed by deductive category application (Mayring, 2010) onto three kinds of tools powered by labor, electricity, and fossil fuels.

While this framework is certainly not the only possible operationalization it does represent central categories utilized within degrowth as demonstrated in the overviews provided by D'Alisa et al. (2015) and Demaria et al. (2013). Combining 'classical' and distant perspectives this framework is able to provide a heuristic and well-adjusted view on technology enhancing scientific understanding.

3. Different views on technology

This section introduces philosophical deliberations on technology which are later employed to develop a framework to answer the questions on suitable technologies in a degrowth context. The proposed concepts and categories are *conviviality* (Illich, 1973), *self-perpetuating technique* (Ellul, 1964), *tools and machines* (Mumford, 1934), *gigantic and intermediate technologies* (Schumacher, 1973), *labor, work, and utilitarianism* (Arendt, 1998), and lastly *ownership* of technology (e.g., Marx, 1962).

3.1. Conviviality

Illich's (1973) concept of conviviality is based on individual creativity, autonomy, and freedom, and poses a radical alternative to and critique of the industrial society. It is based on the structure and use of "tools" which are broadly defined to include simple hardware (e.g., pots), complex machines (e.g., cars), institutions producing tangible commodities (e.g., industrial factories) and intangibles (e.g., schools and hospitals), as well as infrastructure (e.g., transportation). According to him, the industrial use of tools is exploitative, because it is based predominantly on efficiency, negating human creativity, impairing their autonomy, and reducing them to mere consumers and machine operators. "The hypothesis was that machines can replace slaves. The evidence shows that, used for this purpose, machines enslave men. Neither a dictatorial proletariat nor a leisure mass can escape the dominion of constantly expanding industrial tools" (Illich, 1973: 16–17).

Regarding their structure Illich contrasts "manipulative tools" and "convivial tools." Manipulative tools produce more costs than benefits. They are highly exclusive and limit independence, because additional items and investments (e.g., cars) are needed to use them (e.g., fast transportation). This exclusion reduces autonomy and democratic control. In its extreme, manipulative tools become "radical monopolies." These appear "when one industrial production process exercises an exclusive control over the satisfaction of a pressing need, and excludes nonindustrial activities from competition" (Illich, 1973: 62). By defining what it means to be "educated" or "healthy" together with the exclusive power to diagnose, treat, and measure success experts in compulsory schools and the healthcare system have created structures that are almost impenetrable. Convivial tools on the other hand are accessible to anyone in society. An infrastructure of telephone booths for example enables everyone "who can afford a coin" to talk to people of their choice (Illich, 1973: 30). The same holds true for open-source programming if computers are provided on a similar scale. Thus, convivial tools increase autonomy and enhance creativity. However,

> [w]hat is fundamental to a convivial society is not the total absence of manipulative institutions and addictive goods and services, but the balance between those tools which create the specific demands they are specialized to satisfy and those complementary, enabling tools which foster self-realization. (Illich, 1973: 32)

The industrial society, according to Illich, is based upon the ultimate end of increasing produced goods and services. This creates

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