Article:
Heikkurinen, P (2018) Degrowth by means of technology? A treatise for an ethos of releasement. Journal of Cleaner Production, 197 (Pt 2). pp. 1654-1665. ISSN 0959-6526

https://doi.org/10.1016/j.jclepro.2016.07.070

See the published version: Heikkurinen, P. (2016). Degrowth by Means of Technology? A Treatise for an Ethos of Releasement. *Journal of Cleaner Production*, forthcoming in the special volume on Technology and Degrowth. 10.1016/j.jclepro.2016.07.070

Degrowth by Means of Technology? A Treatise for an Ethos of Releasement

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Highlights

- Technological practice cannot and does not let objects be.
- This leads to an increase in the cumulative matter/energy throughput.
- To achieve degrowth, throughput must reduce.
- Releasement of objects leads to a reduction in throughput.
- An ethos of releasement is needed to degrowth.

Abstract

The large-scale ecological damage caused by growth societies calls for economic degrowth in terms of a radical decrease in matter/energy throughput. This article examines the role of modern technology in degrowth with a focus on the question of agency and its ethical implications. After conceptualising technology as practice, the paper finds that while technological practice encompasses an agency for social change, it is restricted to transforming the non-human world to human-made objects. This is because in technological practice the world and its objects unfold as a standing-reserve for human use. Due to this calculative and anthropocentric thinking, technological practice does not and cannot support the emergence of a kind of agency that either does or can let things be. Moreover, the more technological the practice, the more objects are utilised. The paper concludes that technological practice does not support the transition to degrowth, because it directs its agents towards the continuous transformation of non-human-made objects into human-made objects resulting in an increase in cumulative throughput. The paper thus suggests that an ethos of *releasement* is needed to attain, as well as to live in, a degrowth society. The rationale provided for refraining from the technological practice in order to contribute to ecologically sensible social change is the chief contribution of this paper.

Keywords

Degrowth; ethics; practice; releasement; sustainability; technology

1. Introduction

At the dawn of eco-modernisation, which unfortunately seems to succeed the post-modern age, technology is assigned a central role in attempts to solve global and local ecological problems (UN, 2012; IPCC, 2014; EC, 2015). In line with suggestions made by ecological modernisation theorists (e.g. Mol and Spaargaren, 2000; Mol and Sonnenfeld, 2000; Jänicke, 2008), vast amounts of time and energy are directed towards research, and the development and innovation of new, greener or cleaner products and processes. Measured in economic terms, global investments in (so-called) clean energy, for instance, reached USD 318 billion in 2014 (BNEF, 2015). Once it reaches its fullest potential by directing sufficient capital to the brightest minds of the planet, it is believed that the technological revolution will deliver solutions to the most challenging problems of our time.

Within the prevalent system of capitalism, where the accumulation of economic capital must never be jeopardised (Boltanski and Chiapello [1999] 2005; Latouche, [2007] 2009), solutions to the escalating ecological crisis have become narrowly defined as means of decoupling (Næss and Høyer, 2009). This decoupling embeds an idea that further economic growth would not necessarily result in ecological harm, if more modern technology manifests rapidly enough. There is, however, strong empirical and theoretical evidence on the correlation, as well as on the causality, of economic growth and ecological destruction (Naess, [1974] 1989; Daly, 1979; 1996; IPCC, 2014). It is broadly acknowledged in ecological economics that the expansion of economic activity signifies a greater use of natural resources and a greater volume of greenhouse gas emissions (e.g. Victor, 2008; Jackson, 2009). The success claimed for decoupling economic growth from ecological damage is based on selected data in terms of geographical context (see e.g. Zhang, 2000; Tapio, 2005; de Freitas and Kaneko, 2011). The problem with such research designs is that the outsourced production (input) and exportation of waste (output) to other countries are excluded from the calculus. As demonstrated by Wiedmann *et al.* (2015), when examining decoupling with the global material flow data, the reported achievement per country is considerably less than assumed, and is even in some cases non-existent.

Due to the lack of robust evidence in absolute decoupling (Daly, 1996; Victor, 2008; Jackson, 2009), there is a call for a transition from growth economies to degrowth societies in order to achieve sustainability (Martínez-Alier *et al.*, 2010; Cattaneo *et al.*, 2012; Sekulova *et al.*, 2013; Kallis *et al.*, 2012; D'Alisa *et al.*, 2014). In this scenario, instead of building up expectations and furthering ungrounded optimism in technological progress, the economies of the world would be downsized to the extent that their resource use and waste do not exceed the regenerative and/or assimilative capacities of the planetary ecosystem (Daly, 1996; Dietz and O'Neill, 2013). Given the extremely inequitable distribution of affluence (Piketty, 2014) and the relatively small reduction potential in the South (UNEP, 2011), degrowth would have to begin in the wealthiest economies of the world (Georgescu-Roegen, 1975; Daly, 1996; Latouche, [2007] 2009) and comprise affluence reductions in both macro and micro level economies.

Since degrowth[1] signifies that 'societies will use fewer natural resources' (Kallis *et al*., 2014, p. 3), it also necessitates challenging capitalism as a political-economic regime based on accumulation (Foster, 2011; Boltanski and Chiapello [1999] 2005) or any other form of 'growth society based upon the development of productive forces' (Latouche, [2007] 2009, p. 89). It goes without saying that social change of this magnitude would be difficult. Twenty-first century hubris, manifesting as the deep-rooted self-confidence of humans to engineer planet Earth (Hamilton, 2013) combined with capitalistic hegemony and the power of corporations (Suarez-Villa, 2009), ensure that a global transition to degrowth would be close to impossible. Nevertheless, several small communities, operating with diverse drivers, have started to practise alternatives to growth societies (Joubert and Dregger, 2015, see also GEN, 2016). In line with what Kallis *et al*. (2014) listed as the primary significations of what a degrowth society might look like, these organisations are practising voluntary simplicity, conviviality and care by means of cooperation and sharing.

However, perhaps the most controversial question in both the practice and theory of degrowth concerns the question of technology. What kind of needs are there for technology in a degrowth society and on the route to achieving it? For example, is it necessary to communicate via the internet, or to travel by aeroplane? Some communication and travel is necessary, but *how much* technology is actually needed to maintain contact and to provide an occasional change of scenery? For instance, would it be enough to use video calls once a year and travel to distant destinations once a decade? Alternatively, *what kind* of technology is necessary to fulfil needs in a degrowth society? Might people connect by using the telephone and mail instead of high-tech services such as Skype and WhatsApp (be they commercial or open-source)? Or, might people talk face-to-face, or travel on foot to meetings? Would these satisfy the needs related to communication and travel in a degrowth society? Moreover, are they adequate practices to ignite the global degrowth transition? These questions, and many others related to technology, are highly important to the degrowth movement, and must certainly be answered sooner rather than later.

For one of the (arguably) greatest philosophers of technology in the twentieth century, Martin Heidegger, the above-mentioned examples would perhaps only qualify as ontic questions as they are concerned with situational, tangible and specific matters of technology (Heidegger, [1927] 1962). In order to clarify the phenomenon of technology, an enquiry must also enter the ontological realm that underlies the ontical. This signifies that before dealing with the more situational questions, the objective of a study should be to examine the essence of technology:

> We are questioning concerning technology in order to bring to light our relationship to its essence. The essence of modern technology shows itself in what we call Enframing. But simply to point to this is still no way to answer

[1] This study employs a rather minimalistic definition of degrowth. Degrowth is first and foremost used to refer to the reduction of the size of an economy, which is measured in matter/energy throughput. The degrowth movement, however, is not limited to this definition but encompasses a wider perspective on cultural change (e.g., Latouche, [2007] 2009).

> the question concerning technology, if to answer means to respond, in the sense of correspond, to the essence of what is being about.
>
> Where do we find ourselves brought to, if now we think one step further regarding what Enframing itself actually is? It is nothing technological, nothing on the order of a machine. It is the way in which the real reveals itself as standing-reserve. (Heidegger, ([1952–1962] 1977, p. 23).

Following the call for an in-depth investigation into the essence of technology, this paper first aims to gain an understanding of the phenomenon of technology and then to analyse its suitability for ecologically sensible social change. The paper asks what technology is (in a more ontological sense) and how apt technology is to prompt degrowth (in ontic terms). The focus of the enquiry is on agency embedded in technology and its ethical significance. The paper begins by discussing the ecological problems of growth economies and the necessity of transition to degrowth societies; it also describes the possibilities for and sources of social change from a practice-theoretical perspective (espoused mainly by Theodore Schatzki). To begin bridging the ontological and ontic levels in the study of technology, modern technology is defined through its essence as *Enframing*, following Heidegger. Enframing manifests as the technological practice of varying degrees (similarly with Alan Drengson). The paper proceeds to examine the agency entrenched in the technological practice and the ethical relevance of technology for degrowth. Before the concluding remarks, the paper discusses an alternative, namely the *ethos of releasement* (Heidegger, [1959] 1966; Zimmerman, 1983; Introna, 2009), which is suggested to offer a suitable normative basis for the degrowth movement in the process of developing alternative social practices.

2. Towards Degrowth Societies

This section briefly reviews the main causes and mechanisms of ecological damage (2.1.), as well as the main measure of destruction, namely matter/energy throughput (2.2.), and by doing so presents a case for the degrowth transition from the ecological point of view. The possibilities for social change are then postulated through a practice-theoretical lens.

2.1. Ecological Damage

Since the Industrial Revolution, the global biosphere and its local ecosystems have undergone drastic changes in terms of rising temperatures and a reduction in biodiversity as the consequence of rapid warming and habitat destruction (Zalasiewicz *et al*., 2008; Barnosky *et al*., 2012). The principal causes of global warming are anthropogenic greenhouse gas emissions, which are in turn undesired outcomes of economic and population growth (IPCC, 2014) – particularly the former (UNEP, 2011; Lorek and Spangenberg, 2014). Economic growth has meant increasing demands for food, mobility, housing, and other goods and services (Latouche, [2007] 2009; Jackson, 2009). The production of the mounting needs and wants has led not only to growing pressure on the atmosphere through emissions, but also to growing pressure on land and water signifying habitats being exploited

for production purposes (Barnosky *et al*., 2012). During the period of fierce industrial growth, '[a]nnual global resource extraction and use increased from about 7 billion tons (7 Gt) in 1900 to about 55 billion tons (55 Gt) in 2000, with the main shift being from renewable biotic resources to non-renewable mineral ones' (UNEP, 2011, p. 17). The expansion of human activities has also signified the transformation of the terrestrial biosphere into anthromes (Ellis, 2011), or human-made objects, 'passing the 50% mark early in the 20th century' (Ellis *et al*., 2010). For example, 'about 40% of all ice-free land on Earth is in direct use for agriculture or urban settlements' and '[a]n additional 37% of ice-free land is not currently used for these purposes, but is embedded within anthromes having these uses' (Ellis *et al*., 2010, p. 603). Hence, it is rather apparent that the consequences of industrial production have been global and detrimental for the ecosystem's beings.

Economic growth has been empowered by the advances in technology and the utilisation of natural resources (Hornborg, 2014), particularly fossil energy (Wrigley, 2010). This development, however, is now being confronted as ecosystems are setting limits to the expansion of economic activity (Rockström *et al*., 2009; Steffen *et al*., 2015). As regards material limits, stocks of non-renewable non-human resources are heading towards depletion, and renewable resources (such as forests and stocks of fish) are being consumed faster than they can renew (Lorek and Spangenberg, 2014). With regard to less tangible limits, again, the atmospheric carbon dioxide concentration has been found to be too great and the global nitrogen cycle too disrupted to ensure a safe operating space for humanity and other species (Rockström *et al*., 2009; Steffen *et al*., 2015). These estimates concerning the state of the planet are beset by uncertainties, but the principal point is that if humans are to steer away from the current worst-case scenario of collapsing ecosystems, social practices must be radically reorganised (Goodland and Daly, 1996, also Barnosky *et al*., 2012).

2.2. Throughput

As there are strong indications that economic growth is the main cause of ecological destruction, degrowth scholars call for economic downsizing in terms of decreased matter/energy throughput (e.g., Schneider *et al*., 2010; Martínez-Alier *et al*., 2010; Sekulova *et al*., 2013; Kallis *et al*., 2012; D'Alisa *et al*., 2014). Throughput, of which GDP/GNP/GWP is a rough measure (Boulding, 1966), is 'whatever flows through a system, entering as input and exiting as output' (Daly, 1992, p. 333). For a sustainability analysis, the most important *inputs* are the so-called natural, non-human resources, while the central *outputs* are climate emissions and other pollution.

It is important to recognise that '[t]he global average metabolic rate has doubled from 4.6 tons/capita in 1900 to 8–9 tons/capita at the beginning of the 21st century' (UNEP, 2011, p. 18). In this metabolic process of going through, finite matter/energy travels from states of low entropy to high entropy, and because of entropy, humankind cannot rely on resources always being in a form that facilitates their easy utilisation (Georgescu-Roegen, 1975). According to the Laws of Thermodynamics, all forms of matter and energy become dissipated when used, and

are hence become less accessible to the users, humans. In addition to the problems of resource scarcity (inputs), the ongoing, fast-paced transformation of objects produces waste (output) at a rate that has undesirable ecological consequences. When forests are cut down faster than they can renew, it results in deforestation, destruction of habitats, and the absence of carbon capture. When stocks of fossil fuels are burned in the atmosphere, it results in harmful emissions heating up the climate and reduces air quality. The prevailing unsustainability is thus an effect of too intense a throughput. In other words, the matter/energy 'flow beginning with raw material inputs, followed by their conversion into commodities, and finally into waste outputs' is not 'within the regenerative and absorptive capacities of the ecosystem' (Daly, 1996, p. 28), underlining the urgency of the need for economic degrowth.

Schneider *et al*. (2010, p. 511) 'distinguish between depression, i.e. unplanned degrowth within a growth regime, and sustainable degrowth, a voluntary, smooth and equitable transition to a regime of lower production and consumption'. In physical terms (*physis*), a degrowth society is one whose throughput is made to decrease in order to avoid the depletion of natural, non-human resources (input) beyond their regenerative capacity, and to avoid pollution (output) beyond the absorptive capacity of the bioregion. So, unlike growth economies, a high throughput is not desired in a degrowth society – instead, it is 'regarded as something to be minimized rather than maximized' (Boulding, 1966, p. 9). Moreover, since the reduction in throughput is incompatible with further economic growth, it will entail, in all likelihood, economic degrowth (Kallis, 2011). An ever-decreasing throughput, or degrowth, is not, of course, an end in itself, but a means to a sustainable society (see Kerschner, 2010). In order to reach sustainability, degrowth societies are a necessary form of organisation, which those economies whose throughput exceeds the sustainable level must enter.

2.3. Agency for Social Change

The idea of the degrowth society is exceptionally revolutionary as it signifies a large-scale cultural change, including changes in social structures, values, and practices (Latouche, [2007] 2009). The transition is considered to be far from simple as it touches upon the very fundamentals of the contemporary social organisation, including the understanding of how this social change could take place.

The question of agency – the performance of doing and saying (Schatzki, 2002, p. 240) – is assumed to be crucial in understanding change and the opportunities it offers. The notion of agency is often used to refer to an actor's ability and/or capacity to act in a specific situation by overcoming the structural and institutional constraints of the surroundings. While agency is conventionally theorised as a privilege of the rational human individual[2], contemporary social studies stretch

[2] Plumwood (2001) argues that the over-emphasis of human agency and under-emphasis of non-human agency is a trait of an anthropocentric culture: 'Hegemonic conceptions of human agency are fostered in human-centered culture; these are linked to denials of dependency, which in turn are linked to the application of inappropriate

agency to include collective entities (Lockie, 2004; Vincent, 2008; Schwinn, 2008) and non-human actors (Johnson [aka Latour], 1988; Barad, 2014), as well as to human–nonhuman assemblages (Bennett, 2010). Moreover, the source of agency is often situated *in* social practices, instead of simply attempting to explain change as a product of either the individual agent's traits or the structures surrounding the agent (e.g. Bourdieu, [1972] 1977; Giddens, 1984). 'All social action is a concrete synthesis, shaped and conditioned, on the one hand, by the temporal-relational contexts of action and, on the other, by the dynamic element of agency itself' (Emirbayer and Mische, 1998, p. 1004).

Taking a practice-theoretical view, social change is hence neither considered to be merely an outcome of the internal drivers of an agent, nor something caused by the external forces of social structures (Shove *et al*., 2012): Rather, change is fabricated in the practices of (more or less) amalgamated human and non-human agents that act within (more or less) amalgamated material and non-material structures. In other words, social practices are neither fully determined by structures nor fully free of them – making the old tug-of-war between proponents of free will and determinism unnecessary (Emirbayer and Mische, 1998). When agency is entrenched in practice, the opportunity for social change lies in the emergence, reproduction, and disappearance of practices making 'each present activity … potentially a new start, potentially itself a change or the beginning of change' (Schatzki, 2014, p. 17).

Moreover, as the social world is always in the composition alongside materiality (Bennett, 2004), the 'future is made in the ceaseless advance of human and non-human agency' (Schatzki, 2002, p. 210). In other words, agency for change is highly relational and embedded in the nexuses of practices, as explained by Schatzki (2014, p. 17):

> This advance is not, however, a leap into an empty, unfurrowed, isotropic space that receives motion in any direction. Agency does not invent the future wholesale from its own resources. Instead, it arcs through a variegated and folded landscape of variously qualified paths: Agency makes the future within an extant mesh of practices and orders that prefigures what it does – and thereby what it makes – by qualifying paths before it. Indeed, the incessant advance of agency is the endless happening of the social site, from which nascent agency "starts" in the twin senses of originating (taking place) at and being formed as the doing it is.

This time and place that agency is situated in signifies that different activities embed a varying degree of agency that is socio-culturally mediated (Ahern, 2001, p. 109) and that each agency 'varies considerably in different settings and societies' (Knappett and Malafouris, 2008, p. x). That is, agency is always contained within practices, and that being so, agencies take shape, and are shaped by, social practices. It is important to note here that change to a degrowth society must also reside in

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strategies and forms of rationality that aim to maximize the share of the "isolated" self and neglect the need to promote mutual flourishing' (p. 5).

social practices rather than merely in the structures or values of agents. What counts is the change in practice.

3. Theorising Technology as Practice

This section describes the origins and the essence of modern technology as Enframing (3.1.) and then proceeds to conceptualise technology as practice (3.2.). From this position, the section then analyses the question of agency (3.3.) and ethics in technology (3.4.). The section ends by exploring an alternative to technology, namely *releasement* (3.5.).

3.1. The Origins and the Essence of Modern Technology

The question of technology has perplexed sociologists and philosophers for several decades. One of the starting points for analysing the social side of technology was established by the existential phenomenologist, Martin Heidegger. According to Heidegger ([1952–1962] 1977, p. 255), technology is not merely a means to achieve an end, but also a human *activity*, 'a mode of revealing'. Despite the instrumental definition of technology being correct, Heidegger suggests there is a need for a broader phenomenological understanding of technology in order to comprehend its essence.

The etymological origins of the word 'technology' can be traced to the Greek notion of *techne (*τέχνη). 'To the Greeks *techne* means neither art nor handicraft but rather: to make something appear, within what is present, as this or that, in this way or that way' (Heidegger, [1959] 2001, p. 157). '*Techne* is a kind of revealing or bringing forth—*poiesis*—belonging to craftsmen and poets' (Zimmerman, 1983, p. 108). So in the conceptual frame of Heidegger, ancient techne is the know-how that corresponds to the activity of *poiesis* (Di Pippo, 2000), the 'precondition for any kind of making' (Zimmerman, 1983, p. 108).

Another necessity for making something appear in the activity of *techne* is *physis*, or *phusis* (often translated as 'nature' in English), which forms the matter-energetic basis of being. Even though this remark is not explicitly stated in Heidegger's philosophy, he does consider that '*techne* and *phusis* belong essentially together' (Di Pippo, 2000, p. 32). Heidegger 'explains that the bringing forth of Being involved in human production is ultimately grounded in the bringing forth of *phusis'* (ibid, p. 32). Moreover, 'it is through the experience of the *poiesis* of *phusis* that human production takes its bearings and distinguishes itself'. In summary, *techne* can be considered to refer to the processes of revealing by means of making that is enabled by the physical, non-human world.

While the ancient *techne* was characterised by Heidegger as a sort of poetic openness to the world, the modern technology arose from the attempt to control the world, and thus 'does not unfold into a bringing forth in the sense of *poiesis'* (Heidegger, [1952–1962] 1977, p. 14; also p. 131, xxv) but of something else. And the more humans began to seek control and believe in their power to master the laws

of the non-human world (*phusis*) by means of technology (*techne*), the more modern the technology became.

In terms of the second precondition for *techne*, namely the physical basis of any activity of revealing, the modern technology follows the ancient description: all technological activity requires *phusis*. Unlike its earlier form, however, technology today places on the non-human world an unreasonable demand of supplying matter/energy for extraction and storage (see Heidegger, [1952-1962] 1977, p. 14). Partly due to this, the speed of bringing forth in the contemporary world has increased to an unprecedented level and making has reached a global scale (with drilling for oil in every corner of the world and experimenting with geoengineering being the most radical examples).

In the lifeworld dominated by technology, all matter/energy is taken as a resource, what Heidegger ([1952-1962] 1977, p. 17) aptly calls the 'standing-reserve' [*Bestand*], and utilised for production. So fundamentally, 'the sway of [techne] does not consist [only] in manufacturing, but in representing producing, such that what is handed over and what is deliverable secures calculating availability of the whole of everything with which what is produced right now is interconnected above all according to its producedness' (Heidegger, [1936-1944] 2006, p. 154-155). It is through this constant producing that modern technology pursues its insatiable ambition 'to re-create the world' (Meagher, 1988, p. 163).

The essence of modern technology, according to Heidegger ([1952-1962] 1977), lies in *Enframing* (*Ge-stell*). This 'Enframing means the gathering together of that setting-upon which sets upon man, i.e., challenges him forth, to reveal the real, in the mode of ordering, as standing-reserve' (ibid, p. 20). Heikkerö ([2012] 2014, p. 5) explains this notion eloquently:

> In Martin Heidegger's thinking, 'enframing' (*Ge-stell*) names the framework within which Being is revealed during the technological epoch. Enframing refers to a way of disclosing the world. There is always such a way: in the Middle Ages, Being was unconcealed as creatures in relation to the Creator; in the modern age, Being becomes unconcealed as a resource (*Bestand)* to be used. Within enframing, modern science and technology disclose a truth about the world, but another way of disclosing would open the world differently.

Following Heidegger, this study defines technology through its ontological essence *Enframing*, a mode of human existence. In the next section, technology is conceptualised as practice. This conceptualisation is an important precursor to examining the question of agency in technology and the related ethical implications.

3.2. Technological Practice: A Manifestation of Enframing

In a pragmatically-oriented analysis, technology can be, and often is, defined merely as an instrument (e.g. Georgescu-Roegen, 1975), which is justifiable; but Heidegger ([1952–1962] 1977, p. 4–5) expounded a broader view of technology with *Enframing*, which includes the practices of 'manufacturing and utilization of equipment, tools, and machines, the manufactured and used things themselves, and

the needs and ends that they serve'. However, as Heidegger directed his main focus on to the phenomenal questions of Being and existence, he paid less attention to the more practical sphere of technology. Nevertheless, Heidegger's early philosophy (alongside Ludwig Wittgenstein's later works) has been considered to offer a central philosophical background for the so-called 'theories of practice' that analyse the social through everyday practices (Reckwitz, 2002; Schatzki, 2014). Although Heidegger can be read as a practice theorist, his view on modern technology was not very practice-based. Thus, in order to study the implications of technology, Heidegger's work on technology should be connected to, and completed with, ontic investigations (something that can also be studied empirically).

This study accordingly proceeds to posit that *Enframing* manifests at the ontic level as practice, a technological practice. The term technological practice refers not only to the framework where the world unfolds as a standing-reserve but also to the kind of activity that emerges in parallel with, and as a consequence of, the mode of existence. This technological practice repeats and reinforces *Enframing,* forming a sort of spiral of modernity. But while the technological practice 'responds to […] Enframing, [...] it never comprises Enframing itself or brings it about', as Heidegger ([1952-1962] 1977, p. 21) pointed out. Furthermore, Enframing as a *human* mode of being cannot contain or capture the technological practice in its totality as non-human objects are also involved in the lifeworld. Hence, there is always an element of surprise in the manifestation of Being.

3.3. Technology and Theories of Practice

In the task of understanding the role of technology in social change, the conceptualisation of *technology as practice* seems pertinent, as it is not limited to scrutinising certain technological instruments from a benefit–harm calculus (which can also be considered a technological practice), but instead allows an enquiry to examine what technology (as a whole) is and does.

Theorists of practice have defined technology as a constitutive part of social practices. For Reckwitz (2002, p. 249), for instance, a practice is:

> a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.

Technology, from this view, is merely an element of routinized behaviour. According to Schatzki (2014, p. 15) the site of the social consists of practices, which are 'open spatial-temporal nexuses of doings and sayings that are linked by arrays of understanding, rules, and end-task-action combinations [...] that are acceptable for or enjoined of participants' (Schatzki, 2014, p. 15). In Schatzki's view, technology becomes conceptualised through material arrangements that are linked to social practices. Whereas Schatzki (2002) sees technology as arrangements that are co-produced with practices, but are nonetheless distinct from them, Shove *et al*. (2012)

declare a more constitutive role for technology by positioning it as an element of social practice.

Drengson (1995) also uses the notion of technological practice when developing his ecophilosophical approach to the study of technology. By studying practices, he identifies different stages of technology, ranging from that of hunter-gatherers to agriculture, to industrial and information technology practice. In the descriptions of these stages, it becomes evident how technological practice is a product of its time and place, and how diverse degrees of technology can be identified.

So, to interpret technology as practice is to first acknowledge that technological practice varies in degree. While the definitions by practice scholars (e.g. Reckwitz, 2002; Shove *et al*., 2012; Schatzki, 2014) give technology a central role in organising the social world, discussion about the degree of technology in practices seems to be implicit, or non-existent. The notion of degree means that practices are either higher technology or lower technology. For example, swimming in the ocean can be considered a *less* technological practice than swimming in a heated, human-made and maintained pool. Second, conceptualising technology as practice, instead of assuming technology is just an element of practice, importantly broadens the analysis to include those activities that enable the specific technological practice being practised. For instance, in the case of swimming, the manufacturing and heating of the pool are such enabling and provisory practices. As most theories of social practice would readily limit their analysis to technologies in use, questions on closely related and conditional object-relations would attract less research attention (Rinkinen *et al*., 2015). This is not to say that theories of practice are silent on the questions of, for example, production and supply (e.g. Røpke, 2009; Mylan, 2015), but it does indicate that the analyses have emphasised technology as merely a part of daily practice. Conceptualising technology as practice permits exploration of a broader analysis scope. To recognise the cumulative and overlapping character of technological practices is central to accessing the criteria of measurement for how technological, as well as how matter/energy intensive, a certain practice is.

Lastly, the study of technology as practice does not lose sight of the essence of technology, the ontological realm of technology. To connect the technological practices back to the ontological sphere, it is arguable that the degree of technology depends on whether a specific practice leads to more or less Enframing. This is of course impossible to assess in terms of grades as the essence of technology implies a specific mode of thinking and Being. So albeit the degree of technology can only be assessed on the ontic level of practice, ontological attention may reveal some of the fundamental, inherent limitations and expected directions of technology. According to Heidegger ([1952-1962] 1977), it is an illusion of modernity to think in terms of technology merely as a practice without seeing the essence of technology underlying the activity.

While an exponential increase in technology defines the history and present of the social world to a great extent, the continuation of such development is not predetermined. Contrary to what Heidegger ([1976] 1981) famously declared on the future on humanity, it is *not* only a God that can save us. Every situational action,

including a departure from technological practice, is potentially a new start and a catalyst for social change, as Schatzki (2014) stated. However, in order to understand who or what determines the degree and reach of technology in practice (and why), and the possibility of social change and degrowth, the present study turns to discussing the question of agency in technological practice.

3.4. Moral Relevance in Agency and Technological Practice

'The pursuit of perfection and increasing power in technology practices, and the spread of technology throughout our culture, have now become so pervasive that it makes sense to call the twentieth century the Age of Technology' (Drengson, 1995, p. 86). While some may still consider technology something manageable and controllable, critical voices have declared the technological development to be autonomous and beyond human control (Ellul, [1954] 1973; Winner, 1977). For instance, 'Was the Fukushima nuclear facility, say unit 3, controllable before the tsunami and uncontrollable only after it?' Vadén (2014, p. 1) promptly asks, also supporting the view that technological practice can become self-directed.

According to sociologist and philosopher of technology, Jacques Ellul ([1954] 1973), technology has, in fact, come to obey its own laws, proclaimed itself as an independent agent, and rejected all other reasoning, including traditional morality:

> The power and autonomy of technique are so well secured that it, in its turn, has become the judge of what is moral, the creator of a new morality. Thus, it plays a role of creator of a new civilization as well. This morality – internal to technique – is assured of not having to suffer from technique. In any case, in respect to traditional morality, technique affirms itself as an independent power. Man alone is subject, it would seem, to moral judgement. We no longer live in that primitive epoch in which things were good or bad in themselves. Technique in itself is neither, and can therefore do what it will. It is truly autonomous. (Ellul, [1954] 1973, p. 134).

In a similar way to Heidegger, Ellul ([1954] 1973) also goes beyond the instrumental definition of technology and sees modern technology as a totalising phenomenon imposed on human activity that follows the single principle of efficient ordering of things. Technological instruments and the practice of technology have certainly changed the way humans perceive and encounter things, be they objects labelled as belonging to the human, animal, vegetable or mineral realms. Verbeek (2006), for instance, neatly illustrates how technological instruments are providing answers to ethical questions of how to act through the design of products and processes:

> Technologies are able to evoke certain kinds of behavior: a speed bump can invite drivers to drive slowly because of its ability to damage a car's shock absorbers, a car can demand from a driver that he or she wear the safety belt by refusing to start if the belt is not used, and a plastic coffee cup has the script "throw me away after use," whereas a porcelain cup "asks" to be cleaned and used again (Verbeek, 2006, p. 362).

This example also demonstrates how thin the line between the categories of technological instruments and practice really is. Technological instruments – as non-human agents – are able to direct change in practice by means of supporting a certain kind of behaviour over another. But despite the realisation that technology can, and has, gained agency in today's societies, it is difficult to recognise how technology (whether examined as an instrument, a practice or any other phenomenon) could become fully autonomous, as suggested by Ellul ([1954] 1973) and Winner (1977).

From the *technology as practice* point of view, the agential autonomy of technological instruments is difficult to adopt, as it would denote that they are independent of all other elements of practice. As theorised earlier, while non-human agents may have agency, it is always entrenched in situational practices, and the human-made always exists in relation to the non-human (see Latour, 2009; Schatzki, 2014). Moreover, the assumption that humans would be able to create a fully autonomous technological device is not empirically valid and seems to over-estimate human engineering capacity. In fact, statements expressing ungrounded self-confidence in human technological skills are hubristic, and hence dangerous (von Wright, 1978). As Drengson (1995, p. 48) put it:

> Saying that technology becomes autonomous implies that it takes on a life of its own. However, it has such a life only as a projection of our own shadows. Technology only *appears* to have its own inner life, dynamic, and logic. In reality it is driven by our own subconscious intelligence, and the crafty ego of its makers. These makers can be unaware that the "autonomy" of technology is only a projection of the shadowy fragments of a larger self. This larger Self is hidden because the small self (ego) is not completely integrated with the whole context and is still engaged in defensive maneuvers.

In addition, to consider technological practice autonomous is quite troublesome as, according to Schatzki (2014), practices are always intertwined with other bundles of practices and hence have no clear boundaries. Thus, to say that *a* practice is independent of other practices loses its grounds. Each technological practice is not only dependent on the all-previous technological practices but also on other coexisting practices that are unfolding simultaneously. As reviewed previously, every 'action is a concrete synthesis, shaped and conditioned, on the one hand, by the temporal-relational contexts of action and, on the other, by the dynamic element of agency itself' (Emirbayer and Mische, 1998, p. 1004).

However, technological instruments '[…] can both act by themselves in varied independence and structurally shape human agency' (Heikkerö, [2012] 2014, p. 28), as technological practice can direct thinking in the direction of *Enframing*, as well as change behaviour. As Carlile *et al*. (2013, p. 8) note, 'any form of agency is made all the more poignant by the fact that its consequences will be made material and can last over time', as in the case of a nuclear disaster, for example. An uncontrollable explosion in an atomic energy reactor shapes the affected human and non-human agency by setting limits to which doings and sayings can be performed, if any (in the case of fatalities).

It seems pertinent to establish that technology defined as an instrument *has* an agency, while technology theorised as a practice *embeds* an agency. The agency of, and in, technology, however, is neither fully free nor determined, but only holds a *degree of autonomy* that is contingent on its context. Following Schatzki's (2002, p. 210) train of thought, it could then be suggested that social change is made in the ceaseless advance of technological and non-technological agents. And when agency is entrenched in the technological practice, the opening for change lies in the emergence, reproduction, and disappearance of the *practices* performed by the agents (Schatzki, 2014).

Even if technological instruments can assert a degree of agency, they do not meet the criteria of moral agents, as 'to be a moral agent is to have the potentiality for living and acting in a state of tension or, if need be, conflict between two moral points of view' (MacIntyre, 1999, p. 318; also 1981). Neither a machine, nor a hammer, has this potentiality. Furthermore, the lack of morality in the agency of technological instruments is showed by their inability to make judgements and situational decisions instance by instance, which is considered a necessary condition for ethical conduct (Introna, 2009). The same deficiencies apply somewhat to the technological practice. Rather than enabling its agents to deliberate on the issue of good and right (in a specific time and place), a technological practice directs the performance towards clarifying, arranging, and rationalising, as well as integrating objects, by aiming to bring efficiency to everything (Ellul, [1954] 1973; Drengson, 1995). In the technological practice, the world not only unfolds as a standing-reserve in the minds of its human agents but the agency in technology is also geared towards an active, universal utilisation of objects.

With this single aim of transforming by means of ordering (Ellul, [1954] 1973) and creating (Meagher, 1988) the world, technological practice does not support the emergence of moral human agency. However, what the technological practice does enable is the calculative deliberation on the different points of view as long as they are within the essence of technology: *Enframing*. In other words, technological practice allows people to ask questions with moral relevance, such as what to do with the standing-reserve, but it does not support its practitioners to work outside this frame where the world does not unfold as a means to an end.

While the technological practice does not offer an exit from instrumentalisation, it does corrupt its agents to varying degrees. It seems that the less technological the practice is, the less instrumentalisation characterises the agency; but by definition, technological practice does and cannot support the emergence of a kind of agency that either does or can let anything just be. Actually, it seems that the embedded agency in technological practice is insatiable in this respect. It constantly craves for more reordering of objects through its inherent determination to constantly calculate and make things from other things. Yet these actions often 'have a certain moral authority because they are taken to impose objectivity and neutrality in a complex domain that is already loaded with moral significance' (Introna, 2015, p. 23).

3.5. Invitation to Releasement

With technological practice, human agents have come to exert a global-scale force on the ecosystem (Barnosky *et al*., 2011) leading to unforeseen rates of extinction of non-human species, and consequently also to human agents jeopardising the existence of humanity itself (Barnosky *et al*., 2012). In line with Introna (2009, p. 28), one 'could argue that it is morally unacceptable to create things that enrol us into programmes that ultimately damage our environment or our fellow human beings', as technological practices currently do. Ongoing development calls for a radically alternative way of thinking about ethics (Introna, 2009) to guide social practices.

The present ethos of technocapitalist societies could be described as plutocentric due to the advocacy of economic growth over social and ecological concerns, but also as technocentric due to the strong belief in technological solutions (Ketola, 2010). What unites these two modes of ethics is anthropocentrism, the 'view that the non-human world has value only because, and insofar as, it directly or indirectly serves human interests' (McShane, 2007, p. 170). Both the epistemic anthropocentrism, which considers humans as the only sources of value (or the only valuers), as well as the moral anthropocentrism, which considers humans as the only locus of inherent moral value, are problematic. In a similar way to humanism that 'proclaims the "right of man" and reduces everything else to the status of commodity' (Zimmerman, 1983, p. 100), anthropocentrism elevates the human species over other beings. By doing so, the anthropocentric view grants ethical legitimacy to seeing the non-human world as a standing-reserve for human ends, and as McShane (2007, p. 179) notes, it 'rule[s] out certain ways of caring as inappropriate to non-human objects'. Zimmerman (1983) even proposes that regarding objects merely in instrumental terms prevents humans from understanding the essence of objects. But most obviously an anthropocentric approach to ethics fails 'because it assumes that we can, both in principle and in practice, draw a definitive boundary between the objects (them) and us' (Introna, 2009, p. 31). These points direct enquiry towards a non-anthropocentric ethos that allows the human and the non-human worlds to peacefully coexist and prosper on their own terms.[3]

Zimmerman (1983; 1994) and Introna (2009) have suggested that Heidegger's ([1959] 1966) notion of *Gelassenheit* (*releasement*) could serve as a basis for the needed morality. Peculiarly, Heidegger himself was as much a critic of technology as he was of traditional morality. He was concerned that the very idea of morals could reproduce the thinking inherent in the technological practice, where humans act towards an aim in a utilitarian sense. *Releasement* applied as an ethos is, however, still distant from any conventional ideas of morality. Borrowing the term

[3] Zimmerman (1983, p. 102) suggests that 'Heidegger would agree that a nonanthropocentric conception of humanity and its relation to the natural order must go beyond the doctrine of rights […]: Proper behavior towards beings can only follow from right understanding of what beings *are*.' However, whether Zimmerman's interpretation is accurate is questionable, as the category of anthropocentric and non-anthropocentric is not employed in the works of Heidegger.

from a mystic, Meister Eckhart, Heidegger's *releasement* offers exactly a break from calculative thinking that has led humanity deep into technological practice:

> This letting-go means that we keep ourselves awake for releasement which, on the other side, means that we open ourselves to something, a 'mystery' that [...] is actually be-ing itself, and is that which lets us in into Gelassenheit. (Dalle Pezze, 2006, p. 1)

For Heidegger, this mystery is 'hidden in the technological world' (Dahlstrom, 2013, p. 121) and hence 'humanity on Earth remains in danger of technology so beguiling that calculative thinking remains the only sort of thinking in use, the only sort of thinking that counts' (ibid, p. 122). Only with meditative (rather than calculative) thinking, human agents can release themselves from technological practice and create spaces for new modes of relating, closer to Being itself. Heidegger ([1959] 1966, p. 52–53) explains this meditativeness and its relationship with technology as follows:

> Is man, then, a defenseless and perplexed victim at the mercy of the irresistible superior power of technology? He would be if man today abandons any intention to pit meditative thinking decisively against merely calculative thinking. But once meditative thinking awakens, it must be at work unceasingly and on every last occasion […]. For here we are considering what is threatened especially in the atomic age: the autochthony of the works of man.
>
> Thus we ask now: even if the old rootedness is being lost in this age, may not a new ground and foundation be granted again to man, a foundation and ground out of which man's nature and all his works can flourish in a new way even in the atomic age?
>
> What could the ground and foundation be for the new autochthony? Perhaps the answer we are looking for lies at hand; so near that we all too easily overlook it. For the way to what is near is always the longest and thus the hardest for us humans. This is the way of meditative thinking. Meditative thinking demands of us not to cling one-sidedly to a single idea, nor to run down a one-track course of ideas. Meditative thinking demands of us that we engage ourselves with what at first sight does not go together at all.

While Introna (2009, p. 42) considers that an ethos of letting be is impossible, he remarks that it 'is exactly the impossibility that leads us to keep decisions open, to listen, to wait, and to reconsider again and again our choices – to let things be'. This dependence on both calculative and meditative thinking is made evident when examining practices related to meeting basic needs. For instance, dwelling necessitates technological practice and instruments, as well as calculative thinking, to some extent. That is, in human life, not all objects can be released from their use, and be subject to mere meditative thinking. Some clarity, arrangement, and rationalisation, as well as integration and efficiency, are needed in those everyday practices crucial to human existence.

The dilemma, however, is that the technological practice does not support meditative thinking but rather encourages the calculative mind-set to dominate. This

is evident, for example, in the so-called micro-collapses when a technological practice is disrupted. As the technological practice alters from high technology to low technology – for instance, in the face of power cuts when centralised energy provision is replaced with localised low-tech solutions such as wood stoves – new spaces unfold for reflection and change (Rinkinen, 2013). This may be due to more time, a change in tempo, or an increase in autonomy and the altered possibilities for object control. What is important here is that the (often unexpected) collapses of technological systems imply that refraining from the technological practice – either intentionally or by accident – is indeed necessary for a non-technologically dominated ethos and practice to emerge.

4. Discussion

Conceptualising technology as practice has enabled the current research to look beyond technology as an instrument by broadening the scope of analysis to the essence of the technological phenomenon (Heidegger, ([1952–1962] 1977). The practice lens applied to technology (Drengson, 1995; Schatzki, 2002) also led to identifying degrees of technology, suggesting that practices can be characterised by lower technology or higher technology. Varying approaches can be used in assessing the degree of technology, but for the present enquiry, the rate of throughput is decisive. When estimating the throughput necessary to any practice, the analysis ought to take into account all the phases of technological practice, that is, the life cycle of a practice. It is of course impossible to arrive at a number for a specific technology, as technological development is cumulative (Drengson, 1995) and the boundaries of practice are in constant flux (Schatzki, 2002). A further complication results from the multitude of rebound effects in both time and place that forever escape measurement (Finnveden, 2000; Binswanger, 2001). An intuitively plausible rule of thumb would suggest that the humbler the technological practice in terms of the instruments used, the less ecological damage is caused. The practice of shelter building, for instance, is undoubtedly lower in terms of its throughput when operated with 'convivial' tools rather than machines (Illich, [1973] 2009) and fewer of 'exosomatic' instruments[4] (Georgescu-Roegen, 1975).

4.1. The Effect of Technological Instruments and Practice on Throughput

In terms of instruments used in the practice of technology, it goes without saying that use of the endosomatic rather than exosomatic instruments would have the

[4] 'Apart from a few insignificant exceptions, all species other than man use only *endosomatic* instruments – as Alfred Lotka proposed to call those instruments (legs, claws, wings, etc.), which belong to the individual organism by birth. Man alone came, in time, to use a club, which does not belong to him by birth, but which extended his endosomatic arm and increased its power. At that point in time, man's evolution transcended the biological limits to include also (and primarily) the evolution of *exosomatic* instruments, i.e., of instruments produced by man but not belonging to his body. That is why man can now fly in the sky or swim under water even though his body has no wings, no fins, and no gills.' (Georgescu-Roegen, 1975, p. 369)

desired consequences of decreasing the throughput of a practice. Walking instead of riding a bike or driving a motor vehicle is ecologically more sensible, as is talking (face-to-face) instead of speaking on the phone or via Skype. This does not have to signify that humans have to stay where they were born but would certainly set some limitations to the ongoing mobility craze. On a larger scale, desisting from using 'advanced' exosomatic instruments would mean that humans lose access to some of the matter/energy use (e.g. fossil fuels), which is desirable from the ecological perspective. The longer artificial arms become, the deeper humans can drill into the Earth's crust. Furthermore, the more machines and systems evolve, the more humans tend to lose their agency in the vagaries of ever-more complex technological societies (Ellul, [1954] 1973; Winner, 1977).

If technological practice is given the ever-expanding role it craves, objects become more 'cyborgian' and the boundaries between made and born entities, anthromes and biomes, as well as between the natural and the artificial, continue to blur. That is, technological practice leads to dangerous homogeneity in both a cultural and an ecological sense, as the ambition of the practice is exactly about transforming objects to obey the laws of the human calculated order. Most societies are already deeply technological (Ellul, [1954] 1973; Winner, 1977) and the rationale for ecological conservation (i.e. the releasement of *phusis*) is attacked. In the modern world characterised by the technological practice, there is little 'nature' left (as noted by several post- and eco-modernisation theorists), and hence also no objects to be considered 'natural' (or 'wild' or 'organic') that would need to be conserved or released from the technological practice.

It surely is true that things are assuming more and more hybridity, as '[hum]an-made objects are crowding out the environment' (Daly, 2005, p. 100). When thinking about this, it is important to remember that it is precisely the technological practice that is behind this change. Every engagement in the technological practice intensifies the accumulated throughput, the overall amount of objects transformed through human instruments and hands[5]. That is, as technology is practised, objects are forced to travel past the social sphere and transformed into a new state to benefit the human species, but not necessarily the whole. (This practice is legitimised by the anthropocentric ethic). In entropic terms, this means the technological practice always results in a deficit, as 'the cost of any biological or economic enterprise is always greater than the product' (Georgescu-Roegen, [1970] 2011, p. 52). Further, the greater the degree of a technological practice the greater the deficit. A lesser technological practice, again, allows a larger number of objects exist outside the use.

4.2. Implications of Releasement for Degrowth

An alternative practice that goes beyond modern technology is surely necessary for the twenty-first century. 'We need a new way of understanding Being, a new *ethos,* that lets beings manifest themselves not merely as objects for human ends, but as

[5] It is worthwhile to note that endosomatic evolution also increases entropy but the amount and speed is far lower than with exosomatic evolution.

intrinsically important' (Zimmerman, 1983, p. 99), and *releasement* offers this. Heidegger posits that 'we should respect all beings not because they resemble humans, not because they are valued by humans, not because they are experienced by humans, *but because they are what they are'* (ibid, p. 122). Zimmerman (1994, p. 132) explains the practical implications of *releasement* as follows:

> First, it means not unduly interfering with things. Second, it means taking care of things, in the sense of making it possible for them to fulfill their potential. Third, letting be involves not just the ontical work of tending to things, but also the ontological work of keeping open the clearing through which they can appear.

According to Heidegger ([1959] 1966, p. 55), *releasement* 'grant[s] us the possibility of dwelling in the world in a totally different way'. In the current situation where technological practices continue to have severe ecological consequences (e.g. Drengson, 1995; Parkes, 2003), it seems that the transition to degrowth necessitates the *ethos of releasement* to a large extent. An ethos for degrowth must be strongly connected to a frame of thought that allows non-human objects to unfold not as a standing-reserve but on their own, and hence manifest their complex genesis.

One way to *releasement* could be to cease to partake in those practices where the essence of technology dominates. Participation in technological practice, including its calculative mode of thinking, reinforces the embedded agency for more technological change. This signifies a shift from active engagement in multifarious technological practices that necessitate a global production and distribution network to 'conviviality' (Illich, [1973] 2009), which is rooted in a region. 'The region gathers – just as if nothing were happening [*gleich als ob sich nichts ereigne*] – each to each and everything to everything else, gathering all into an abiding while resting in itself' (Heidegger, [1944] 2010, p. 74). Openness to *releasement* through meditative thinking may denote not only a change in the degree of technological practice and instruments (quantity) and the kind of technology (quality)[6], but may also unfold as 'atechnology'.

[6] A solar panel, for instance, is certainly a different instrument in terms of its quality than a coal plant but the quantity is a key issue for matter/energy throughput. Because of the physical base of our existence, even solar panels cannot be produced without limits. A single coal plant on the planet is not a problem but a billion factories manufacturing solar panels certainly would be. Based on this rationale, it could be suggested that for degrowth it is ultimately a question of *quantity*. For Heidegger, however, a central question was *quality*: the unlocking of energy. 'The revealing that rules in modern technology […] puts to nature the unreasonable demand that it supply energy that can be extracted and stored as such' (Heidegger, [1952-1962] 1977, p. 14). An old windmill, for example, does not do this as 'its sails do indeed turn in the wind; they are left entirely to the wind's blowing' (ibid). It appears that Heidegger did not see the matter/energetic limits of building windmills.

Releasement offers a plateau for new ethics to emerge, but the interpretations and conceivable political consequences warrant careful consideration and must be implemented with caution. As Zimmerman (1983, p. 102) put it:

> Humanists would argue that it is politically dangerous to abandon the principle of human rights in favor of the obscure notion that we should "let things be," while some radical environmentalists would maintain that Heidegger himself remains a humanist because he overestimates the importance of the human being's supposedly unique ability to speak.

At first, it is possible to think that this alternative ethos that calls for letting things be may lead to passivity in the face of injustice – be it the recurrence of fascism in Europe, the global march of neoliberal capitalism, or the extensive destruction of species' habitats. However, as Heidegger ([1944] 2010, p. 70) himself notes in *Country Path Conversations*, the releasement of things lays 'outside the [very] distinction between activity and passivity'. Maybe it is possible to talk about deliberate inaction or active passivity in the case of an ethos for encountering the non-human world. This is because, in order to reduce matter/energy throughput, it is exactly the collective refraining from – and ceasing of – technological practice that is indispensable. To have a degrowth society, a great volume of fossil fuels must be *left* in the ground, a vast portion of forests must be *left* to grow, and most fish must be *left* in the oceans. For the ecology to recover, human activity must shrink.

An answer to an important question of 'does the degrowth movement need technology' begins to take shape. Is there a need for more clarification and arrangement, calculation and assessment, as well as more organisation, rationalisation, mechanisation, computation, digitalisation, artificialisation, and integration of objects with the predefined aim of having control and bringing efficiency and order to everything? The short answer is 'no'. 'Under this regime [of technology] the mechanistically defined world becomes primarily a storehouse of raw material and a source of power for the engines of industry to turn out commodities and services for the market' (Drengson, 1995, p. 88). It is hence somewhat evident that a degrowth society *needs* neither technology as a general frame that manifests in the increasingly technological practice nor new instruments. The world is already full of tools and artefacts for dwelling. In fact, the converse can be considered the case. In order to reach degrowth in terms of decreased matter/energy throughput, practices must shift away from technology. *Releasement* is the only way out of technology (Heidegger, [1952-1962] 1977).

Given the prevailing unsustainability, the study suggests that expectations of technology as a means to deliver ecologically sensible change are reconsidered in a critical light. Consequently, the paper calls for humans to refrain from the technological frame and practice. While this is difficult, because most of us are deeply entrenched in the routines and habits of technological society, there is always an opportunity for change. Schatzki (2007, p. 17) explains this constant flow of opportunities:

> [...] each present activity is potentially a new start, potentially itself a change or the beginning of change. Whether present activity is a new start depends on what is done and how others react to this.

Moreover, it follows that, similarly to ethics, meditative thinking cannot be above or detached from practices, but must rather unfold within the plenum of practices (e.g. Schatzki, 2002; Introna, 2009).

4.3. Limitations and Further Enquiries

Somewhat paradoxically, the rationale offered in the paper would probably be a re-enactment of technological thinking for Heidegger, as it describes things in terms of their purpose or aim. This paper claimed that *in order to* attain degrowth in terms of decreased matter/energy throughput, practices must shift away from technology. This statement that seems to contradict itself and yet might be true (or wrong at the same time), could be considered a limitation.

To problematise the claim even further (from the very framework of the paper) is to remark that this paper (as an object) is also human-made, which means that the process of making the claim has caused an increase in the cumulative throughput. In fact, quite a lot of matter/energy was first perceived as a standing-reserve and then used in order to complete the study. In the practice of letting be, fewer academic articles and arguments are undoubtedly needed and created, as meditativeness is even beyond language, the chief human-made object. *Releasement* leads to stillness and meditative presence. That being so, this study should not be taken as an example of practising *releasement,* or even a Heideggerian interpretation of technology. Building on the works of, inter alia, Heidegger, this study presents a viewpoint on the relationship between technology and degrowth.

As the motivation and focus of the paper was on built on the minimalist definition of degrowth, namely the reduction of matter/energy throughput, it is important to acknowledge additional limitations of the approach. 'Being concerned with resource scarcity, or with ecosystem destruction, but not with world justice can lead to top-down anti-population proposals and anti-immigration discourse' (Demaria *et al*., 2013, p. 206). The present study by no means seeks to put forward an eco-fascist message, in fact, quite the opposite. Refraining from technological practice is perceived as a way of ensuring that any form of totalitarian organisation is ungovernable. As the present and history so vividly demonstrate, transition to, as well as maintenance of, a fascist regime would almost certainly need technology. In fact, totalitarianism and fascism can be seen as manifestations of the very essence of technology. But how can a radical confinement to a region, which is almost an inevitable consequence of moving to a lower degree of technological practice and the use of less exosomatic instruments, not end up being a form of exclusive localism defined by intra-species conflicts? This is a central question for the future enquiries into technology and degrowth, where it would be worthwhile to maintain the locus of attention on exploring the *practice of releasement*.

5. Conclusions

It is interesting, and possibly ironic, that humans have survived precisely because they have adapted their environment by means of technological practice instead of simply becoming adapted to it, but now it is observable that the transformation of the non-human world humans have brought about is jeopardising human survival.

This paper asked what technology is and how apt technology is to prompt degrowth. Technology was defined as Enframing, a mode of being, which manifests in the technological practice of different degrees. Rather than strictly saying 'yes' or 'no' to technology, the question concerning technological practice for degrowth seems to largely be a question of degree. Are there not too many non-human objects being transformed into human-made ones in the technological practice with too many technological instruments? As ecosystems collapse around us, there is a wealth of empirical evidence to support the view that the human species has gone too far in terms of transforming the environment. To reach degrowth in terms of decreased matter/energy throughput, practices must be geared away from the technological frame of thought to a considerable extent.

This study reached the conclusion that technological practice does not support the transition to degrowth as it directs its agents towards the continuous transformation of non-human-made objects into human-made objects. In a manner problematic to the quest of ecologically sensible change, which requires degrowth, the transformation of objects (undertaken in the technological practice) signifies an increase in cumulative throughput. The more technological the practice, the fewer things are released for use. Even the transformation of existing man-made objects into new objects (recycling) needs matter/energy and contributes to the overall metabolic load on the Earth. Hence, contrary to ideas about ecological modernisation, the paper suggests that an increase in the degree of technological practice signifies an increase in matter/energy throughput. Therefore, the study strongly challenges the dominant position of modern technology as a means for ecological change, and calls for refraining from technological practice by means of the new ethos: *releasement*.

Acknowledgements

An earlier version of this paper was co-authored with Jenny Rinkinen and presented at two international colloquia: (1) the Peaceful Coexistence held at the UN-mandated University for Peace in April 2015 and (2) the European Group for Organizational Studies (EGOS), sub-theme 'Materiality, Human Agency and Practice' in June 2015. I wish to express my humblest gratitude to Dr. Rinkinen for her invaluable help, as well as want to thank the organisers and participants of these scholarly events for their insightful remarks. A special thanks goes to Prof. Lucas Introna for his encouragement. I also wish to acknowledge the support of the colleagues at the Sustainability Research Institute (SRI), where I presented the new version of the paper. Lastly, I would like to express my deepest appreciation to the editorial team and the four anonymous reviewers of the journal for their critical yet

very constructive remarks.

Funding

The research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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