

Radical Innovation

WHAT TO MAKE OF
TECHNOLOGICAL
INNOVATION IN THE
ENVIRONMENTAL
CRISIS

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**CLIMATE
CHANGE**

**TECHNO
LOGY**

THE ONLY
SUSTAINABLE
GROWTH IS
DEGROWTH

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What to make of technological innovation in the environmental crisis

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Introduction: What to make of technological innovation in the environmental crisis

Imagine living in a society where humans have been able to create incredible technologies that allow them to communicate through distance, make their labour more tolerable and produce food in abundance. Now imagine this same society finding out that the costs of its happiness are incredibly high: every comfort corresponds to significant sufferance, nearby or far away. Moreover, those same technologies that allowed these humans to discover the world, now show them the pain they have been causing. Panic spreads among some: they decide to renounce their comforts completely and start a campaign against those who refuse to. Others pretend nothing is happening. Some insist that they should not sacrifice themselves when others, those who profit the most out of all these technologies that cause sufferance, are not willing to change their ways. A small fraction takes in all these perspectives and begins wondering: “What can we make of this technological power, to finally steer its use towards the benefit of everyone?”.

The society depicted in this scenario would not be so different from the one we live in: with scientists reaching a consensus on the anthropogenic origins of climate change and its dangerous consequences (Oreskes 2004), addressing responsibilities and calling for action has become an absolute priority. But what is the role of technological innovation in this scenario? As argued extensively in the field of Responsible Research and Innovation, it is now time for everyone involved in the development of science and technology, to reflect not only on which impacts are not wanted from science but also on what it is desirable to obtain through its responsible use (Owen et al., 2012).

My investigation starts from the intersection of two points: while climate change calls for action, science and technology can have a positive impact both on the mitigation of its consequences and on the re-shaping of the system that has generated the crisis. Even so, to solely rely on technological innovation to “fix” the environmental crisis, would mean to forget the interconnectedness of the problem with what is called here the “human crisis”, meaning the globally diffused problem of social injustice, characterized by poverty, sufferance and discrimination.¹ Moreover, to believe that the advent of new technologies would be enough to

¹ I will often refer to environmental and human crises together, sometimes through the label “eco-social crisis”.

address the consequences of natural exploitation and pollution, would require the complete disregard of the role these same technologies have been playing in shaping this undesirable scenario.

With these intentions in mind, in my thesis I provide an analysis of different understandings of technological innovation and the role they play in tackling the environmental crisis, identifying two main directions in the narratives here presented, namely a “More Innovation Approach” and a “Radical Innovation Approach”. I analyse these different attitudes starting from their use of the concept of innovation. This concept, in fact, is prone to adopt different connotations that allow it to tell a different story. As highlighted by Benoît Godin, who has dedicated a lot of research to the ideological roots of the concept of innovation, conceptual frameworks in science, technology, and innovation policies are usually constructed in the form of a story or a narrative, very similar to paradigms, like the ones Thomas Kuhn’s found in science (Godin 2009, p. 20). In my analysis, the “More Innovation approach” will be identified in proposals that see technological development per se as the solution to the environmental crisis. The technofix (aka “more technologies will solve problems”) model, even when acknowledging technologies’ responsibility in the crisis, fails to recognize that as long as technologies take part in the market model that has created the problem, they will not be able to solve it. By proposing the creation of *more* innovations, these models generate a faulty association between innovation and social progress, economic growth, and well-being. On the contrary, I identify the “Radical Innovation approach” in proposals that argue for the detachment of technologies from the growth ideology and that focus on sufficiency and contentedness in proposing narratives that present innovation as something *radical*, transformative, and potentially resolute, meaning an approach that requires to limit production and ensure products’ durability and efficiency in the long term.

To address this topic and build my argument, I move from history to the contemporary, engaging, at times, with conceptual analysis, while at other times I give space to the interpretation of narratives through visuals obtained from historical and contemporary sources. Moreover, a large part of my investigation has revolved around regulatory and programmatic documents, necessary to understand what role is assigned to technologies in the current policy debate around the environmental and social crises. Therefore, the methodology employed in this research is highly

interdisciplinary. It needs to be since it would not be possible to address the interconnectedness of all the different phenomena presented here, without looking at how they are intended and dealt with by different stakeholders. For this reason, my research is not only interdisciplinary, but it also aims to include often forgotten and marginalized voices by looking at narratives built by non-academic actors.

In my thesis, I start with the facts related to the environmental crisis. Opening with an analysis of the latest IPCC report, in Chapter 1 I identify the environmental crisis as a human crisis, meaning as a crisis that impacts humans enormously. This allows for its understanding as a moral problem more than a purely scientific one. Environmental change and social injustice, in fact, appear strictly correlated. Not only the problem was created by a structure of power that also enabled a profoundly unjust distribution of wealth and resources, but the consequences of the problem seem to impact largely those who were already left disadvantaged by that same structure as well. In this process, technologies are not without blame: from the environmental impact of cement to the human exploitation caused by the harvesting of Coltan to the production of digital waste, technology has been playing a huge role in both environmental and human crises. I end the chapter acknowledging that climate change consequences feed into preexisting inequalities and that the design and ways of production of modern technologies are also responsible. What is the action that has been taken so far to address these problems?

In Chapter 2 I investigate the contributions of what I call the “More Innovation approach”. This approach starts from very similar assumptions to those of a radical approach but, as discussed in the case of the RRI (Responsible Research and Innovation) framework, aims at obtaining sustainable technologies in an unsustainable economy. In doing so, it risks promising the impossible. The same goes for the European Commission’s efforts that derive from the RRI approach: by not decoupling innovation from industrial overproduction, the strategic plans here analysed fail to capture the whole problem. All of this is not to underestimate the role of technology in bridging the gap between a polluted and a cleaner world or between an unequal and a fair world. On the contrary, I argue that technological development can impact the environmental and human crises enormously and potentially in an advantageous-for-all way. But to do so, it needs to be steered in a direction that disentangles it from growth-at-all-costs practices.

In Chapter 3 I look for “Radical Innovation approaches” that propose to steer technologies in a transformative direction, not subjecting them to the (over)productive need of the market. To do so, I inevitably deal with the degrowth approach, and I investigate narratives that understand the human-land relationship as one of reciprocity and care. Again, my aim is not to demonize innovation. On the contrary, I argue for the need to radicalize it, to make it so innovative that it gets to be transformative. I do not argue for a conservative approach towards technological development and human progress, but for one that puts human growth above economic growth. Drawing from the evidence obtained in Chapter 1, this section looks for narratives that show the possibility of the *prima facie* paradoxical, disentanglement of human growth from economic growth in practices that steer technological innovations towards sufficiency. In this chapter, I distance the concept of sufficiency from the one of sustainability, and I argue that the second one fosters narratives that grant for an approach towards technological innovation that allows for the creation of “bearable” technologies instead of properly fair ones that consider design and production in a long-term and global way.

In conclusion, I am well aware of the difficulties that come with an approach that focuses on sufficiency. To disentangle technological innovation from the needs of the mainstream market may look like a Herculean endeavour because it probably will be. It may seem easier to find the solution to the environmental and human crisis in progressively more sustainable technologies instead of sufficient ones. All I argue in this thesis is that this approach is not enough: the story it tells is not the one we need if we want to tackle both the environmental and human crises. For this reason, I argue in favour of an ethics of sufficiency that tells the story of a world where technological innovation helps to get to the often-dreamed-about point where humans and land live in joyful reciprocity as portrayed in Indigenous traditions (Escobar 1999) (Kimmerer 2013). Stories that do not cry for something allegedly missed in the past but give hope for something to be achieved in the future. An ethics of sufficiency built in this way promises to find in the need to limit production and reverse growth a reason for contentedness to be substituted to the fetishism of consumption typical of the liberal capitalist system. To give ethical relevance to sufficiency, in fact, will not help achieve anything without the help of conscious policy support able to steer tech innovation towards degrowth practices. With this thesis, I aim to add to the discussion on what we want and need from technology. I am confident an interdisciplinary and intercultural effort guided by this narrative could and will figure out the how.

Chapter 1: To frame the environmental crisis as a human crisis.

In this Chapter, I lay the ground for my analysis of the relationship between environmental crisis, technological innovation, and social injustice. I do so by starting from the facts. Who is impacted? What is the responsibility of technologies in this process? To answer these questions, I will engage in an analysis of the state of the environmental crisis, its connections to social injustice and global poverty, and the place that technologies hold in this debate. Therefore, I identify the environmental crisis as a human crisis, highlighting the connections between the consequences of crossing planetary boundaries and human suffering. In the sections of this chapter, I proceed by showing the inconsistency of arguments that dismiss the interconnectedness between these factors.

1.1. Myths to be busted: to save humans or to save the environment.

While in this thesis I propose to focus on humans, many examples like the ones I will provide to show the interconnectedness between climate change and human suffering could be used as efficiently to talk, for example, about animal suffering. Even so, I will only focus here on the environmental crisis as a moral problem for humans and about humans and not extend the reflection to all beings.

When I say that the environmental crisis is a human crisis what I mean is not only that it is created by humans (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 42), but also that it feeds into all the pre-existing crises that have been historically causing human suffering. Climate change, in fact, impacts greatly those who are already suffering in reason of other factors. As it has been in other cases, the concept of intersectionality comes in handy again when talking about climate change (Djoudi et al. 2016, p. 249). Intersectionality is the framework that reconceptualizes race, class, and gender as interlocking systems that, instead of working separately, are experienced together (with increasingly dramatic consequences) by those at their intersections (Costanza-Chock 2018, p. 3). To approach the problem of climate change from this perspective is inevitable and necessary. But let's proceed with order by starting with some facts about climate change by looking at the latest IPCC assessment. IPCC stands for Intergovernmental Panel on Climate Change, and it is the United Nations body for assessing the science related to climate change ("IPCC — Intergovernmental Panel on Climate Change,"). Here I refer to the Sixth

Assessment Report of 2023 (the latest at the moment I am writing) to report on what is known, so far, about human responsibilities in the climate crisis and its foreseeable consequences.

First of all, the report states that human activities, principally through the emission of greenhouse gases, have unequivocally caused global warming, with the global surface temperature reaching 1.1 °C above 1850-1900 in 2011-2020 (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 42). The observed warming comes from emissions of GHG (greenhouse gases, dominated by CO₂ and methane CH₄) coming from fossil fuel combustion and industrial processes, from land use, land-use change, forestry, and fluorinated gases (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 44). Importantly, while emissions have grown in most regions, they are distributed unevenly and that has been the case cumulatively since 1850 (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 45). The historical cumulative net of anthropogenic CO₂ emissions from 1850 to 2019, in fact, sees North America (23%) and Europe (16%) as the two major contributors (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 45).

The IPCC also states that climate change has already caused substantial and increasingly irreversible damages and losses, with hundreds of local losses of species and mass mortality events both on land and in the ocean (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 46). Moreover:

“Impacts on some ecosystems are approaching irreversibility such as the impacts of hydrological changes resulting from the retreat of glaciers, or the changes in some mountain (medium confidence) and Arctic ecosystems driven by permafrost thaw (high confidence). Impacts in ecosystems from slow-onset processes such as ocean acidification, sea level rise or regional decreases in precipitation have also been attributed to human-caused climate change (high confidence). Climate change has contributed to desertification and exacerbated land degradation, particularly in low lying coastal areas, river deltas, drylands and in permafrost areas (high confidence). Nearly 50% of coastal wetlands have been lost over the last 100 years, as a result of the combined effects of localised human pressures, sea level rise, warming and extreme climate events (high confidence)”.

(IPCC, 2023: Climate Change 2023: Synthesis Report, p. 46)

These factors are increasingly impacting the availability of food, since growth in agricultural productivity has slowed over the past 50 years globally, as well as the catch potential of fish (whose populations are already impacted by overfishing practices) (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 50). Even more, current levels of global warming are associated with increased dryland water scarcity that impacts roughly half of the world’s population, with “the largest impacts observed in many communities in Africa, Asia, Central and South America, LDCs², Small Islands and the Arctic, and for small-scale food producers, low-income households and Indigenous Peoples globally (high confidence)” (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 50).

Big cities are not spared either, with the intensification of heatwaves, air pollution, and the compromising of urban infrastructures like transportation, water, sanitation, and energy systems that, again, impact majorly those already vulnerable in reason of their gender, ethnicity, low-income, or a combination of those. (IPCC, 2023: Climate Change 2023: Synthesis Report, pp. 50-51). The report clearly states:

“Approximately 3.3 to 3.6 billion people live in contexts that are highly vulnerable to climate change (high confidence). Between 2010 and 2020, human mortality from floods, droughts and storms was 15 times higher in highly vulnerable regions, compared to regions with very low vulnerability (high confidence). In the Arctic and in some high mountain regions, negative impacts of cryosphere change have been especially felt among Indigenous Peoples (high confidence). **Human and ecosystem vulnerability are interdependent³** (high confidence). **Vulnerability of ecosystems and people to climate change differs substantially among and within regions** (very high confidence), **driven by patterns of intersecting socio-economic development, unsustainable ocean and land use, inequity, marginalisation, historical and**

² Stands for Least Developed Countries.

³ The text is bold for my choice, and it will be in every instance from now on unless communicated differently.

ongoing patterns of inequity such as colonialism, and governance (high confidence).”

(IPCC, 2023: Climate Change 2023: Synthesis Report, p. 51)

As seen in the passages presented, the latest IPCC report clearly communicates that climate change hugely impacts human life and that it impacts some people more because of what has been identified in this thesis as the intersectional nature of injustice (Costanza-Chock 2018, p. 3). Moreover, the report provides a justification for the framing of the environmental crisis as a human crisis, highlighting how human and ecosystem vulnerability are interdependent.

In this scenario, many technologies play an important role in both the environmental and human crises impacting ecosystems and communities, often negatively. Think, for example, about cement and concrete. They are everywhere. In reason of their abundant resources, durability, and versatility, they are the most widely used construction materials, even if in 2019 the estimated CO₂ emission related to their use, transport, production, and demolition represented approximately 10% of global energy-related CO₂ emissions. (Belaïd 2022, p.1). Cement production, at this point an integral part of our landscape, emits every year as much carbon dioxide into the atmosphere as 300 million European cars (Belaïd 2022, p. 2). Infamously, plastic has an even worse impact: every single piece of plastic we have ever touched is, in fact, still on Earth (Kantai 2020, p. 1). Impossible not to think of the images of the Great Pacific Garbage Patch that covers now an estimated surface of 1.6 million square kilometres.⁴ Plastic, derived from the process of refining oil and gas, is basically eternal and it cannot even be destroyed since its small particles survive and spread everywhere. In a study commissioned by WWF in 2019, plastic particles were detected in water and food, leading to an estimation of five grams of plastic consumed by every human every week (Kantai 2020, p. 2).

It must be said that these examples may not coincide with what “technology” represents in the imagination, usually populated by futuristic high-tech impressive tools. This seems to be the

⁴ <https://theoceancleanup.com/great-pacific-garbage-patch/> accessed 30/05/2024.

case online as well: when searching the term “technology” on Google Images collages of microchips, computers, holograms and graphics representing neural networks appear, all in “cyberpunkian”⁵ blue and purple shades. Moreover, the search engine suggests going further with the research looking at words like “computer”, “future”, and “digital”.⁶ These are the same references I found when I asked, for example, the latest version of OpenAI’s generative model DALL-E 3, which creates images from textual descriptions, to generate an image of “technology” (figure 1). The AI seems to share the same understanding of what technologies are, describing the picture provided as an “image depicting modern technology with a blend of futuristic and contemporary elements. It includes high-tech gadgets, holograms, robots, AI symbols, digital networks, and a smart city background, all intertwined to emphasize the interconnectedness of technology”.⁷



Figure 1. "Technology" created with DALL-E 3 on ChatGPT on 04/07/2024.

In this setting, cement and plastic may appear in our imagination as “old” and “bad” technologies, to be substituted by better and newer innovations. In this sense, the “digital” world plays a huge role in the promise of delivering a cleaner and better society. The idea that digital technologies, compared to “old” ones like plastic, are different and “safe” is unfortunately easily debunkable in a debate that involves social and environmental justice. For example, how much impact did I have on the environment by

⁵ I am referring to the cyberpunk narrative genre, which represents hypothetical future scenarios where technologies have gone out of control, leading to the extreme reshaping of human life and societies.

⁶ Google, “Google Images”, accessed on 04/07/2024. <https://images.google.com/>.

⁷ OpenAI, “ChatGPT”, accessed on 04/07/2024. <https://www.openai.com/chatgpt>. The AI provided the description together with the image when asked to generate one for the word “technology”.

asking ChatGPT to produce the image above (figure 1)? Even if specific numbers are not easy to calculate, since the carbon footprint of ChatGPT is not public information, we have all the reasons to assume the impact must be relevant if we consider that, for example, the training of a large AI model like GPT-3 has required an amount of water in the order of millions of litres (Li et al. 2023) and consumed 1,287 megawatt hours of electricity, generating 552 tons of carbon dioxide, the equivalent of 123 gasoline-powered passenger vehicles driven for one year (Patterson et al. 2021). These examples refer only to the training of a model, but what happens when millions of people use them every day? Moreover, AI systems need constant training in order to remain relevant and updated and need enormous amounts of water to cool their processors (Crawford 2024). In her book *Atlas of AI*, the leading scholar on artificial intelligence's impacts Kate Crawford reflects on the, often dismissed, negative consequences of Artificial Intelligence on people and the environment and provides a great deal of examples.

When thinking about AI the immediate incorrect image that comes to mind is the one of an almost ethereal cloud and not the more accurate one of, for example, the e-waste dumping grounds in places like Ghana and Pakistan (Crawford 2021, p. 32). In this sense, the digital sector is the perfect example of the intersectional nature of human and environmental crises, with a plethora of cases in which underprivileged communities are subjected to exploitation as much as the land they inhabit. Think, for example, about the extraction of Coltan in the Democratic Republic of Congo, where more than 30% of the world's supply is extracted (Nathan and Sarkar 2010, p. 22). While Coltan (or columbite-tantalite) is essential for the storage and virtually instantaneous release of electric charge with a minimal loss of power in our mobile phones and computers, its extraction is not at all bringing any kind of benefits to the miners (mostly women and children) in Congo (Nathan and Sarkar 2010, p. 22). On the contrary, Coltan has been fueling a horrible conflict between the armies of central African governments and private militias in the region, a conflict in which rape of women serves as an instrument of control⁸ and that reminds us of the connections between technology production and social injustice.

Global computation and commerce rely on batteries, which rely on minerals that need to be mined, with costs that involve environmental damages, illness and death of miners, and loss of communities. (Crawford 2021, pp. 26-30). All for the production of technologies destined to be

⁸ https://press.un.org/en/2010/100209_wallstrom.doc.htm, accessed 30/05/2024.

considered obsolescent in a ridiculously small timespan: the Consumer Technology Association notes that the average smartphone life span is a mere 4.7 years. And I don't even touch here on the exploitation of labour required for the assemblage of the different parts of these technologies, nor on the environmental cost of their transportation or many other factors.

All these examples confirm the suspicion that climate change and global poverty are closely connected. In the book *Mobilizing Hope*, philosopher Darrel Moellendorf analyses this connection further, specifically investigating the discourse about emissions (Moellendorf 2022). Moellendorf addresses the objections of those who argue that tackling global poverty is more urgent than mitigating climate change (Moellendorf 2022, p. 23). These objections are usually accompanied by a call for the use of all the resources needed to resolve disparities, including those that have an impact on the environment if necessary. This call is not easy to dismiss, especially when it comes from communities and countries that have been historically prevented from the achievement of their economic goals, with the consequent distress of their population. The sustainers of that call argue that if we were to stop emissions immediately, the development of these countries may stop as well (Moellendorf 2022, p. 62). While this is a complicated point of contention against the sustainable transition, it should be noted that emissions and well-being do not necessarily go together. As seen in the IPCC, for example, North America has been leading the historical cumulative net of anthropogenic CO₂ emissions (IPCC, 2023: Climate Change 2023: Synthesis Report, p.45), but the official poverty rate in the country in 2022 was 11.5%, with 37.9 million people in poverty.⁹

While fossil fuel and technological advancements have certainly increased the levels of productivity and prosperity, the same cannot be said for the fair distribution of their gains. This is a crucial passage: so far, I have talked about the environmental crisis and shown the connections with human crises disseminated around the world, stressing the responsibilities of technologies in this scenario. Now it is also essential to identify what I argue is the common denominator behind these intertwined processes: the overproductive machinery fueled by the economic growth agenda. Not only is this attitude damaging the environment by exploiting resources and polluting, but it also plays a huge role in other sectors of the eco-social crisis¹⁰. Argumentations that identify

⁹ <https://www.census.gov/library/publications/2023/demo/p60-280.html>, accessed 20/05/2024.

¹⁰ A reminder that, in this thesis, this is just another way of referring to environmental and human crises together.

productivity, industrialization and capitalism as the roots of the increased well-being of what is normally defined as the “Global North” often forget the impact of colonialism (with the consequential exploitation of people and resources), and working-class struggles in the creation of wealth. The famous prosperity brought by industrialization and capitalism is hardly fairly distributed, on the contrary, it tends to accumulate in billionaires’ pockets: as calculated by Oxfam, in 2018 the 26 richest billionaires owned as much wealth as the poorest half of the world’s population (3.8 billion people), and this disparity has been increasing year after year (Hägel 2020).

There is a specific reason why I introduce these problematic aspects of industrialization and capitalism here. While a lot of reflections on climate change and social injustice recognize the interconnectedness of these problems, in fact, less attention has been paid to their common roots. It is crucial to support calls for a just distribution of responsibility for climate change mitigation, focusing on countries historically contributing more and able to afford mitigation costs and it is also necessary to emphasise the role of sustainability transitions. However, it's unrealistic to envision a sustainable world in which economies continue relying on overproduction. Newer technologies, as seen in the case of digital technologies, are not a guarantee of human and environmental sustainability, and neither would they be, as I will argue both in Chapters 2 and 3, in case of a successful transition to sustainable materials and renewable energies, since the need for overproduction and consumption capitalism relies on would still require an immense amount of resources and generate lots of waste. Therefore, while the energy transition is urgent, limiting production is equally critical. But let’s proceed with order and look at the problematic argument that envisions the solution of global poverty in an acceleration of economic growth.

1.2. Myths to be busted: economic growth = wellbeing.

This section starts with an assessment of the promises and failures of the capitalistic system in addressing human needs within the context of the environmental crisis. As introduced in the previous section, while overproduction has a significant impact on the environment and, consequently, on people, its gains are not distributed equally. But how does overproduction come to be in the first place in an economic theory premised on the law of supply and demand? The whole logic of supply and demand capitalism relies on seems to be very flawed (Park 2015). First of all, the law assumes the ability of a consumer to evaluate a purchase using a cost-benefit

analysis, choosing to buy something only if its benefits outweigh the costs. (Park 2015, p. 191). But which and whose benefits are at the centre of this analysis? Will the buyer consider, for example, the environmental costs of the product? Will the consumer adopt an intergenerational justice perspective and consider the costs the production of the object of their desire will have on the next generation? Moreover, will the buyer think of the costs required in terms of labour by the people who are producing the object?

The law of supply and demand seems too limited in understanding these complexities. In the context of the environmental and human crisis indicated previously, cost-benefit analyses need to be practised differently. As observed by the economist Ackerman and the environmental law specialist Heinzerling, to operate a cost-benefit analysis we need to know the (artificial) price for all the relevant health and environmental impacts, like the monetary value of preventing the extinction of species, preserving ecosystems, and saving human lives (Ackerman and Heinzerling 2002, pp. 1563-1564). Moreover, cost-benefit analysis, relying on estimates of individual preferences as consumers, fails to address the collective choice presented by public health and environmental problems to society (Ackerman and Heinzerling 2002, p. 1566). Economic growth and environmental sustainability are at irreconcilable odds: as long as the economic reward of sustainability endeavours must outweigh the cost, it is not foreseeable how we will be capable of preventing or avoiding the catastrophic consequences of climate change in the future (Park 2015, p. 195). I do not argue that the neoliberal capitalist system is pure evil in itself, it is simply broken. According to the theory, economic growth should translate into social prosperity, because products would be produced in response to an existing demand, but in reality, thanks to multibillion-dollar advertisement campaigns, demand is artificially generated, converting our finite natural resources into wealth for those who are already overly wealthy (Park 2015, p. 196).

This is how the discourse on technological innovation enters the debate. It is undeniable that consumerism is one of the causes of the climate emergency and, while producing (technological) goods without limits is simply not sustainable, we keep seeing it happen. Also, the distribution of these goods, as seen, is unequal among humans, and the same can be said for the sacrifices required for their production. As long as technological innovation remains synonymous with economic growth and the production of goods, it seems impossible to shed a positive light on the overcoming of the environmental crisis and the resolution of social injustice. Humankind needs to be put at the

centre and not economic growth. By putting humans at the centre, the preservation of nature and climate crisis mitigation automatically become essentials, in reason of humans' dependency on it. This passage may appear tricky. Was it not the act of putting humans' desire at the centre that caused the emergence of the “Anthropocene”? There is a difference between putting the needs of humanity at the centre and aspiring to economic growth at all costs, especially since economic growth does not necessarily benefit all humans but, rather, a few. This is the reason why some have started a critique of the concept of Anthropocene, rightfully sustaining that it subtly blames all humanity for something that the majority of humans had no power over, meaning the rise of the Capitalocene (Moore 2016). While the Anthropocene identifies the damage done to the biosphere as the result of “human activities”, the Capitalocene portrays the “age of capital” and blames the capitalist system of production for the environmental crisis (Federau 2023). If we consider that the capitalist system of (over) production also feeds into inequalities and human sufferance, we can see why it is possible to most definitely identify it as one of the main actors in the systematic mutual shaping of social injustice and environmental crisis. For this reason, industry and the interests of a few should not be the main stakeholders in the design and production of technologies. In this framework, prioritizing the adaptation claims of the poor could finally coincide with sustainable development.

Even so, this framework cannot be realized if it cannot be imagined. The problem of the environmental crisis is not only scientific but also moral and epistemological. It brings back the need for an analysis of our relationship with the land and others, as well as of our understanding of innovations, specifically of what we expect and need from them. The value system brought by the rise of capitalism and modern science, as observed by the environmental ethicist Dale Jamieson, evolved in a low-population-density and low-technology society very different from the contemporary one (Jamieson 1992, p. 148). For this reason, we need to develop new values and concepts that reflect the image of what our societies should be like and, in this sense, the environmental crisis comes at the best possible moment, as an opportunity to make a decision. Different narratives and concepts can guide that decision, and for this reason, we need a “re-story-

ation” of the environmental problem and its solution (Kalita 2023).¹¹ Creating a sense of “environmentality”, as observed by eco-criticist Kalita, is difficult because different people have different experiences of the environment and because the environment and the climate crisis have been framed as scientific and political problems and not also as cultural ones (Kalita 2023, p. 153). This is a complicated problem to solve and building a story that includes different perspectives should be the task of an intercultural and interdisciplinary group effort. What is sure, though, is that when it comes to technological innovation a different story is very much needed. As seen in this chapter, technological innovations, in reason of their dependency on the needs of the market, play a role both in environmental and human crises. For this reason, narratives about technological innovation need to be disentangled from the economic growth paradigm and addressed towards the needs of humans and the environment. To contribute to the reflection on the shaping power of the concept of technological innovation in narratives about environmental and human crises, I will start, in the next chapter, with an investigation of “innovation”. I will then look at how this concept shapes the narrative of the relationship between technology and the environment in the European Commission's programmatic effort to tackle the environmental crisis.

Chapter 2: The More Innovation Approach.

In this chapter, I identify what I call the “More Innovation approach”, meaning the approach (opposed to the Radical Innovation approach discussed in Chapter 3) that proposes the creation of more technologies to tackle the problem of the environmental crisis. I start with the analysis of the most fundamental concept: Innovation. In doing so, I look at the historical use of the concept and compare it with the contemporary one. In the second part of the chapter, I investigate the use of the concept in some of the European Commission documents that address the problem of the eco-social crisis. Moreover, I engage in the debate about Responsible Research and Innovation (RRI) and evaluate its contributions. In doing so, I identify the European Commission approach,

¹¹ This term is also widely used by scholars who stress the centrality of Indigenous wisdom and practices in tackling the crisis.

informed by RRI, as a more-innovation approach, discovering an attitude towards the sustainable transition that acknowledges the importance of sustainable design in the realizations of new products but does not account for their (ir)responsible (over)production. I conclude the chapter with an analysis of the recent inclusion of degrowth perspectives and circular economy evaluations in the EU framework, which shows a promising interest in shifting from a more-innovation approach to a radical one.

2.1. Innovation, please!

When talking about innovation, different pictures can come to mind. An innovation can be a new thing, fresh out of the mind of its creator. Something brings innovation when it brings change. Innovation sounds like something that is good, it means progress, it means taking out something that existed and making a new one, or modifying it to perfect it, more and more. Innovation can imply striving for an ideal perfect. The innovator acts the act, the creation, gifting its genius to the contemporaries and, even more, the people of the future. To innovate, in this sense, is a commitment to the future. All these meanings are certainly contained in the significance of the word “innovation”. As shown in the deep analysis of the intellectual history of innovation by Benoît Godin, discourses on innovation have historically presented it as a factor of change in society, as progress, as much as a breaking point, leading to a dichotomy between tradition and innovation (Godin 2008, p.6). In this sense, “innovation” hints more at an attitude than at anything else.

“Innovation”, in general, can be used to refer to even more different things: It could be a new way of doing art, a new religious movement, or a politically motivated uprising. These meanings can persist in the imagination, but, notably,



Figure 2. Part of advertisement poster “Did you hesitate before replacing this... with this?” / Millipore. Source: Wellcome Collection.

in the contemporary discourse *innovation is technological*, and *technology is innovative*. While a use-based history of technology has been proposed as an alternative to innovation-centric accounts (Edgerton 2007), the fascinating power of innovation is undeniable in the discourse about technologies and “progress”, as well as it is in the discussion about the environmental crisis (as I will show in the second part of this Chapter). Almost any study related to innovation seems to self-evidently presuppose the concept of innovation in terms of technological innovation (von Schomberg and Blok 2021, p. 311). This is how new tech products are advertised: they are the result of the finest research, they are the valid substitution of what’s obsolete (figure 2), and they always promise to be the starting point of a new era (figure 3), revealing needs that we did not even know had to be fulfilled. Not always the association new-good is welcomed by all societal members and technological

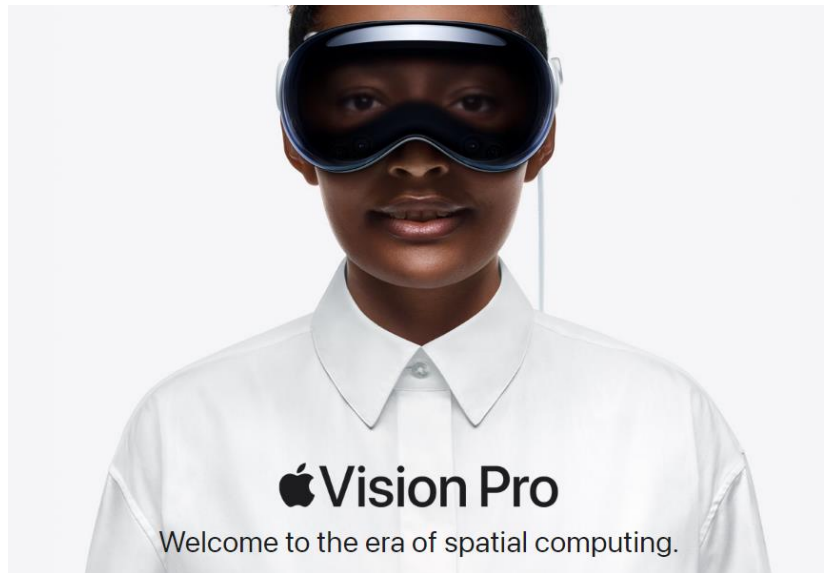


Figure 3. Advertisement for VR technology- Apple, 2024. Source: Apple among some of society’s

stakeholders, like in the case of the apparent resistance towards AI systems, sometimes in reason of their untrustworthy and faulty aspects (Chakravorti 2024), sometimes because of fear, alimeted exactly by the recognition of technologies’ transformative power. Philosophers and ethicists of technology have been investigating this transformative power and often identified a reciprocal shaping relationship between morality and technology. This phenomenon is what philosopher Swierstra calls “technomoral change”, characterised by the ability of morals to influence



Figure 4. From the Netflix show "Black Mirror" (2011). In this episode (Season 3, Episode 6), a police detective investigates mysterious deaths linked to social media and the development of a new technology.

technological development while, at the same time, co-evolving together with the technologies they are supposed to guide (Swierstra 2015, p.11).

The non-academic world is not extraneous to this concept either: sci-fi novels and movies have been imagining the increasingly complex future of this relationship for decades. More recently, for example, a series

produced by Netflix investigated the relationship between new technologies and society, not without spicing things up with horror and gory shades (figure 4).

Even if we decided to take into consideration both the careful and the enthusiastic attitudes towards technological innovation, the argument that sees innovation as progress and technological innovation as the main character of this story would still find space. This is, at least, true in the case of the European Union where EIC, the European Innovation Council, is Europe's biggest deep-tech investor.¹² In general, if we take a look at the upwind of scientific disciplines in the twenty-first century, we

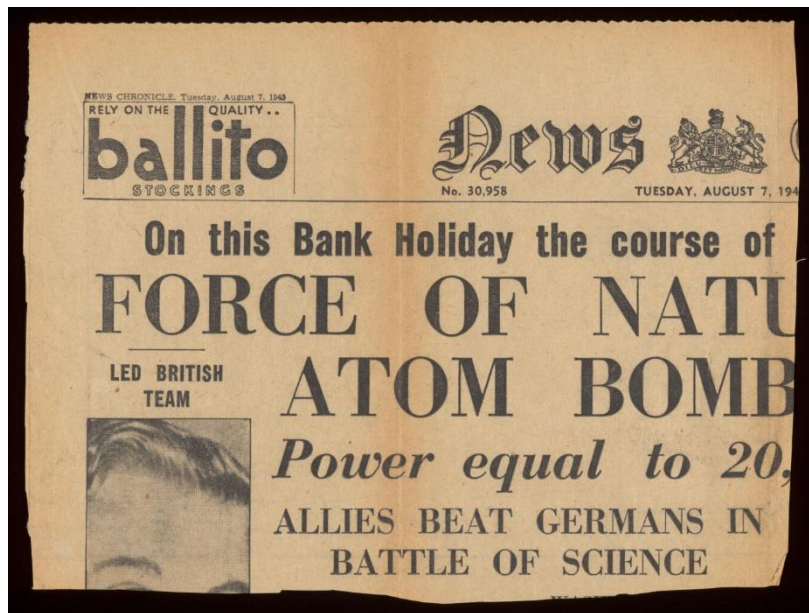


Figure 5. Here he comes, Boys! / Vicky. Source: Wellcome Collection.

can observe that science policy has been funding scientific research, with technological innovations as the expected output (Godin 2008, p. 41). This attitude has been present since (quite) recent historical events as well, where the scientific effort has devolved to technological war applications, becoming a tool to contrast enemies in a bunch of different narratives: during the

¹² https://eic.ec.europa.eu/index_en. Accessed on 04/07/2024.

Second World War, different technological symbols were portrayed in propaganda because they helped, in one narrative, defeat the nazis (infamous is the case of the Atomic Bomb, see figure 5) and, in the other, realizing the industrialized fascist empire (see figure 6).



Figure 6. Fascist propaganda poster, Todeschini Piero, 1936/37. Source: Museo Nazionale Collezione Salce.

After World War II, the concept of innovation was adopted and appropriated by various groups that put it at the centre of their own propaganda: from governments to engineers and academics, innovation was shaped in different forms but all related to technology (Godin 2016, p.529). In this way, over time technological and commercialized innovation got tied together in representations, in reason of the development of the capitalistic system and its reliance on the continuous production of goods, which called for industrial development through technology, together with the study of technology in the academic setting, that created the conceptual framework for the same policies that allowed for more innovations (Godin 2008, p.8). In all of this, as highlighted by Shiela Jasonoff, an authority in the field of science and technologies studies, and historian and sociologist

Sang-Hyun Kim, the domain that connects creativity and innovation in science and technology with social order and justice and the production of power has remained empty of theoretical guidelines (Jasonoff and Kim 2015, p.10). Moreover, the result of this process can be observed, as very clearly argued by Godin, in the wedding between the concept of innovation and an economic ideology, the capitalistic one (Godin 2016, p. 527). In so doing, in the public discourse, research is recognized for its utility if and only if it shows its usefulness to society through the marketplace (Godin 2016, p. 530). This procedure characterized what is called the “linear model of innovation”, which suggests that innovation follows a rather linear sequence, going from basic research to applied research and, finally, to development(Godin 2009, p.5). By acquiring this very practical meaning and function, technological innovation becomes the feather in the cap of powerful and “advanced” Nations, that qualify as advanced, developed, and modern exactly in reason of their

technologically innovative power. So much that when, at the end of the 1960s, the OECD (Organization for Economic Cooperation and Development) addressed the importance of innovation for industrial competitiveness and conducted a study on the technological gaps between countries, the ones found in Europe were interpreted as signals of a generally bad performance (Godin 2009, p. 9). Governments make technological innovation an instrument for industrial competitiveness and leadership, as well as the European Commission does, in always putting the latest hottest technological field at the centre of its goals (like it does now with digital technologies).¹³

What is the problem though? Technologies make our lives easier, cheaper, and longer. Technological innovation is often associated with progress and, therefore, with the promise of a better world for everyone. In this ideal progressive world, technologies bring humans together in prosperity. As observed by ethicist and philosopher Jeroen van den Hoven, it may seem obvious to argue in favour of innovation when it promises to lead to moral progress, but this also requires taking into account ethical considerations and moral values in terms of requirements in design, research and development at an early stage, with value discourses operationalized rather than left at the abstract level (van den Hoven 2017, p. 75). The importance of actively integrating values in the design of new technologies takes up a lot of space in the debate about design justice and value-sensitive design (Costanza-Chock 2018) (Hendry, Friedman, and Ballard 2021). Even so, when technological innovation becomes synonymous with goods, the mechanisms of their production become as important as their ideation and design. In this sense, it is not enough to focus solely on the inclusiveness of technology design, it is also essential to evaluate the impact of their production on both the environment and people. It is crucial to cease the participation of technological innovation in the overproductive machinery of the mainstream market.

In a system like the capitalistic one, as investigated in Chapter 1, production becomes overproduction, with all the environmental and social unfortunate consequences of the phenomenon. If we believe that economic growth, in nature of its environmental and social costs, does not coincide with everyone's well-being, then the overproduction of goods in the name of innovation and growth cannot be justified. At least not in a perspective that wants to be called

¹³ https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future_en. Consulted on 28.05.2024.

responsible or sustainable. Sustainability, in fact, does not have to travel alongside growth. Actually, the idea of sustainability has historically evolved through the centuries as a notion in contraposition to the one of progress (Du Pisani 2006, p. 83). As already anticipated in this section and in Chapter 1, by being linked to economic growth and material advancement, ideas of progress have been enabling the diffusion of the idea that it is not only acceptable but also necessary to exploit the natural landscape (Du Pisani 2006, p. 84). And we did it greatly, leading to an amount of growth in production and consumption that does not seem to be destined to diminish. Even so, humans have always been aware of the sustainability problem. Long periods of famine and dryness have habituated the European population to the scarcity of natural resources, populating the imagination with dreamy landscapes of abundance and luxury that could only be thought of.

So, what changed? Technology did. As observed by historian Du Pisani, mainstream economists from the neoclassical orthodox school knew of the limitations of the massive consumption of resources but assumed that the problem would have been overcome by new technologies. This is the foundation of what I call the “More Innovation approach”, meaning the idea that we only need to trust in technology and in the power of engineering and that better technologies will come and will save us.



Figure 7. “March of Intellect”, coloured etching by William Heath, ca. May 1829. Source: Wellcome Collection. The figure represents a futuristic vision of the advantages of technology. The sentence on the top of the figure recites: “Lord how this world improves as we grow older”

We do not live in the Garden of Eden, that is true, but we can build it. This has been the promise of technological innovation for a very long time now (figure 7). Not only does this vision require a lot of faith, but it builds on a narrative that is incredibly Euro-centric: in modernity and liberalism we trust, meaning in the Western

way of doing things we believe. In human geographers Richard Peet and Elaine Hartwick's words: "development meant assuming the mental models of the West (rationalization), the institutions of the West (the market), the goals of the West (high mass consumption), and the culture of the West (worship of the commodity)." (Peet and Hartwick 1999, pp. 85-86). Only by the late 1960s and early 1970s, according to Du Pisani, did the path of sustainable development start to be considered: after two global wars, the downside of scientific and technological development could not be ignored any longer (Du Pisani 2006, p. 89).

"Thus, by the 1970s the existing notions of 'progress', 'growth' and 'development' were being challenged. During the 1960s the mood had been optimistic and it had been assumed that the development problems of the underdeveloped world would be solved quickly as a result of world-wide economic growth, but in the 1970s the optimism faded. **Economic growth did not prove to be the hoped-for solution to global inequalities.** This realization necessitated a paradigm shift to a new notion of development."

(Du Pisani 2006, p. 91).

Here the mention of a paradigm shift appears again. As stated in the introduction through the words of Godin, innovation policies are usually constructed in the form of stories or narratives, very similar in this sense to paradigms, like the ones Thomas Kuhn found in science (Godin 2009, p. 20). So, how did this "paradigm shift" from constant progress/growth to sustainable development happen? It did not. Du Pisani observes that in the declaration of the United Nations Conference on the Human Environment, held in Stockholm in 1972, humans' well-being dependency not only on economic and social matters but also on the sustainable handling of natural resources was recognized (Du Pisani 2006, pp. 91-92). Even so, specific criteria of sustainability were never formulated "thus leaving the back door open to advocates of economic growth and progressive secular materialism to hijack the concept of sustainable development for their purposes." (Du Pisani 2006, p. 93).

Has this attitude changed? To reply to this question, it is now my intention to look into the strategies and programs fostered by the European Commission to observe: how they portray

innovation, if and how they acknowledge the link between technological innovation and overproduction of goods, and how they address environmental and societal concerns. The goal here is to see if from the analysis of the documents, implemented with perspectives from the RRI field, will emerge a more-innovation attitude towards technological development. Notably, I will only focus on the European Commission's documents and, in general, refer to the EU framework even if, as emerged from the analysis of the latest IPCC, the problem is global. The reason beyond this choice is partially contingent: my interest in the topic started from the analysis of the RRI framework, and the relevant role this field has been playing in shaping EU policies has directed my research in this sense. Moreover, and more importantly, the stress the RRI field puts on the responsibility to actively evaluate and include societal needs in the field of innovation, a responsibility embraced by the EU policies, gives me an opportunity to open a critical discussion on the ability of these same policies to steer innovation in a way that truly enables positive impacts for everyone. To achieve that goal, at least in my argument, it is necessary for these policies to lose their more-innovation approach that, even if not unique to the European context, very much influences the narratives that revolve around the innovation discourse. That said, a similar investigation devolved to the analysis of documents from other countries (specifically other major pollutant countries) would surely inform the discussion greatly, but it does not find space in my current research. Finally, a major justification for the choice of the sources here presented relies on the fact that the EU is investing enormously in innovation: with a budget of €93.5 billion for 2021-27, Horizon Europe (here investigated) is the world's largest research and innovation programme.¹⁴

2.2. Mother Europe, Mother Earth: towards Responsible Innovation policies.

The previous section on the history of innovation framed the context in which I am going to delve now. To approach the strategic plans on innovation proposed by the European Commission without proposing a framework for the use of the concept of “innovation” itself would have been, in my opinion, incomplete. As a matter of fact, the history of the development of the concept of “innovation” shows the same connection with progress, consumerism, economic growth, and

¹⁴ https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/horizon-europe_en. Accessed on 04/07/2024.

industrial competitiveness that it is possible to find (spoiler alert) in the EU Commission plans. To portray this reality, I will now comment on a few different things. First of all, I will look back at the latest IPCC report to see how those in charge of the report evaluate the mitigation policies introduced so far. Then I will move on with an analysis of the strategic plans proposed by the European Commission on matters related to climate change and innovation. In doing so, I will trace back the values and concepts at the roots of their approach and criticize the inability of the European Commission to acknowledge the need to reduce production and re-design innovation from a degrowth perspective. This will, of course, introduce the next chapter in which degrowth practices and concepts like sufficiency and contentedness will be investigated in more depth.

Paragraph 2.2 of the latest IPCC report, starts on a positive note with its analysis of the responses to address climate change undertaken so far:

“International climate agreements, rising national ambitions for climate action, along with rising public awareness are accelerating efforts to address climate change at multiple levels of governance. **Mitigation policies have contributed to a decrease in global energy and carbon intensity, with several countries achieving GHG emission reductions for over a decade.**¹⁵ Low-emission technologies are becoming more affordable, with many low or zero-emission options now available for energy, buildings, transport, and industry. Adaptation planning and implementation progress has generated multiple benefits, with effective adaptation options having the potential to reduce climate risks and contribute to sustainable development. Global tracked finance for mitigation and adaptation has seen an upward trend since AR5, but falls short of needs. (high confidence).”

(“IPCC, 2023: Climate Change 2023: Synthesis Report, p.52)

The report praises the positive results obtained through mitigation policies and assigns a positive role to the diffusion of low-emission technologies. Even so, in section 2.3. and in 2.3.2. the report

¹⁵ Just a reminder that bold text is always my choice unless stated otherwise.

clarifies that it is not time to take a break and, on the contrary, it is necessary to do more and to do better, in fact:

“Despite progress, adaptation gaps exist between current levels of adaptation and levels needed to respond to impacts and reduce climate risks¹⁶ (high confidence). While progress in adaptation implementation is observed across all sectors and regions (very high confidence), many adaptation initiatives prioritise immediate and near-term climate risk reduction, e.g., through hard flood protection, which reduces the opportunity for transformational adaptation (high confidence). Most observed adaptation is fragmented, small in scale, incremental, sector-specific, and focused more on planning rather than implementation (high confidence).”

(“IPCC, 2023: Climate Change 2023: Synthesis Report, p.61).

Not only does the report acknowledge the modesty of the results achieved through the policies implemented so far, but it also observes that they are not taking action with long-term efficient goals in mind. In the analysis of the current regulatory setting, the IPCC also recognizes the different roles different individuals have in contributing to emissions, and it does so by accentuating the disproportionality of emissions among individuals from different socio-economic classes (“IPCC, 2023: Climate Change 2023: Synthesis Report, p.102). This is, as I have been stressing in Chapter 1, not a minor factor: as much as wealth and well-being, blame is not distributed equally. While individuals with high socio-economic status are the ones majorly contributing to climate change, those who live in poor conditions are experiencing its consequences the most (IPCC, 2023: Climate Change 2023: Synthesis Report, p. 51). This tendency can be reversed: redistributing the gains obtained through the exploitation of resources, would allow for the mitigation of global poverty. Importantly, the IPCC confirms the falsity of the myth that sees social crisis and environmental crisis as irreconcilables and confirms that tackling global poverty is not what is going to cause the extinction of our species, arguing, instead, that to eradicate extreme poverty, energy poverty, and providing decent living standards to all can be

achieved without significant global emissions growth (“IPCC, 2023: Climate Change 2023: Synthesis Report, p.102). This consideration is of the utmost importance for my argument as well because it shifts the focus from low-emission technologies to consumption.

How would it be possible to eradicate poverty without worsening global emissions growth if not by reducing the consumption of the aforementioned individuals with high socioeconomic status and engaging in the redistribution of their wealth? This hypothetical redistribution of consumption and wealth appears to me as the only way to fix the equation. This is how the IPCC positions itself on this matter:

“Finance, international cooperation and technology are critical enablers for accelerated climate action. If climate goals are to be achieved, both adaptation and mitigation financing would have to increase many-fold. There is sufficient global capital to close the global investment gaps but there are barriers to redirect capital to climate action. **Barriers include institutional, regulatory and market access barriers, which can be reduced to address the needs and opportunities, economic vulnerability and indebtedness in many developing countries.** Enhancing international cooperation is possible through multiple channels. Enhancing technology innovation systems is key to accelerate the widespread adoption of technologies and practices. (high confidence).”

(“IPCC, 2023: Climate Change 2023: Synthesis Report, p. 111).

This passage highlights the need to address technological innovation practices in what are called “developing” countries through the re-evaluation of barriers that prevent them from actively engaging with the market. It must be noted that the whole concept of developing countries vs developed countries proposed in this passage is, again, very much based on the economic growth paradigm. As seen in the first section of this Chapter, the idea is that Nations qualify as advanced, developed, and modern in reason of their market-driven technologically innovative power. When that power is not enabled, countries suffer. I am not going to elaborate on the implications of this narrative here, but it appears clearly to me that this approach centralizes the importance of

economic growth above re-distribution. Even so, the selected passage recognizes that, when it comes to climate goals, there is already enough global capital to address mitigation and adaptation. This argument is reiterated:

There is sufficient global capital and liquidity to close global investment gaps, given the size of the global financial system, but there are barriers to redirect capital to climate action both within and outside the global financial sector and in the context of economic vulnerabilities and indebtedness facing many developing countries (high confidence). (“IPCC, 2023: Climate Change 2023: Synthesis Report, p.112)

It then continues specifically addressing the role of private finance and the need to make climate investments more appealing to investors:

For shifts in private finance, options include better assessment of climate-related risks and investment opportunities within the financial system, reducing sectoral and regional mismatches between available capital and investment needs, improving the risk-return profiles of climate investments, and developing institutional capacities and local capital markets. Macroeconomic barriers include, amongst others, indebtedness and economic vulnerability of developing regions. (high confidence)

(“IPCC, 2023: Climate Change 2023: Synthesis Report, p.112)

As seen here, even if the report incessantly stresses the need to develop low-emission technological innovations to tackle the crisis (whose role I will never deny), it interestingly addresses the role of finance too. To talk about global finance serves, I believe, exactly the scope of addressing climate change mitigation and adaptation to those who have the power and the responsibility to tackle it. Even more, the report more explicitly refers to consumption when it suggests the use of taxes, subsidies, prices, and consumption-based approaches as instruments to reduce high-emissions consumption while improving equity and societal well-being (“IPCC, 2023:

Climate Change 2023: Synthesis Report, p.102). All of this said, it appears clearly from the analysis of the IPCC that: what has been done so far (policy-wise) will not be enough to resolve the climate change crisis; that the development of low-emission technologies, while being of great importance, will not make up for the disproportionality of emissions if global capital and liquidity is not redirected to close global investments gaps; and that over-consumption plays a huge role in the crisis.

Now, the passage from the IPCC report to the strategic plans proposed by the EU commission is an easy one to make: not only the EU, through Horizon Europe, is among the top funders of the evidence base underpinning the IPCC reports, but it also promises to take its recommendations at heart, setting the target of a climate-neutral European Union by 2050.¹⁷ To solidify the connection between the IPCC and the European Commission policies of my interest, I will now sketch a brief picture of the organs involved and their contributions. The European Commission¹⁸ assigns to the Directorate-General for Research and Innovation (DG RTD) the responsibility to oversee “Horizon Europe”, the major object of my analysis and the EU’s primary funding program for research and innovation for 2021-2027 (with a budget of €95.5 billion).¹⁹ The DG RTD department is the one, within the EU Commission, responsible for EU policy on research, science, and innovation, and coordinates the funding of these programs.²⁰ For this reason, it is essential for the scope of my thesis to look into its plans: it will, in fact, show if the tendency inside the Commission is to provide funds for more-innovation solutions or for radical-innovation ones. More specifically, in this section I will look into “Horizon 2020” for 2014-2020, the “Horizon Europe” work programme for 2023-2025, the strategic plan for 2021-2024, and the DG RTD strategic plan for 2020-2024 to see if the policies (to be) implemented actually cope with the need to reduce the environmental impact produced by technologies by addressing overconsumption (radical innovation approach) or simply suggest to design “better” sustainable technologies (more innovation approach).

In this scenario, the field of Responsible Research and Innovation acts both as a monitoring and informant since the very beginning of the Horizon project. In May 2011, in fact, delegates

¹⁷ [Intergovernmental Panel on Climate Change \(IPCC\) - European Commission \(europa.eu\)](#), last accessed on 11/06/2024.

¹⁸ [About the European Commission - European Commission \(europa.eu\)](#), last accessed on 11/06/2024.

¹⁹ [Horizon Europe \(HORIZON\) | EU Funding & Tenders Portal \(europa.eu\)](#), last accessed on 04/07/2024.

²⁰ [Research and Innovation - European Commission \(europa.eu\)](#), last accessed on 11/06/2024.

from across Europe joined the staff from the European Commission for a workshop on “Responsible research and innovation” hosted by the DG RTD, with the scope to find a definition for this movement (Owen, von Schomberg, and Macnaghten 2021, p. 217). By the end of the workshop, they agreed on a definition of “responsible” as “a moral imperative: environmentally protective, answering social needs, demonstrating shared European values and beneficial to the widest range of actors” (de Saille 2015, p. 157). This resulted in the communication to the public of a new field of research that promised “a smarter, greener economy, where our prosperity will come from research and innovation ... [which] must respond to the needs and ambitions of society, reflect its values and be responsible” (de Saille 2015, p. 157).

In the words of Sebastian Pfotenhauer and Joakim Juhl, both STS scholars interested in Innovation Research, RRI aimed to challenge the vision of innovation that had been dominating policy since, as seen, the Second World War, which saw the state as a facilitator of innovation conceptually external to the innovation process itself (Pfotenhauer and Juhl 2017, p. 69). In so doing, RRI challenges the vision of innovation as an apolitical and conflict-free space between science and technology and the market, without consideration for other state responsibilities like democratic representation and distributive justice (Pfotenhauer and Juhl 2017, p. 69). Following this approach, RRI established itself as predominant in the EU Framework Programme for Research and Innovation “Horizon 2020”, proposing a “challenge-based approach” whose ambitions were “to gather resources and knowledge across different fields, technologies and disciplines, including social sciences and the humanities, to answer major policy priorities and societal concerns of the European Union, such as health, food security, clean energy, green transport, social inclusion, freedom and security” (Arnaldi and Bianchi 2016, p. 5). Moreover, Horizon needed to be accompanied by an action plan called “Science with and for Society” with the specific assignment to “develop the governance for the advancement of responsible research and innovation by all stakeholders (researchers, public authorities, industry, and civil society organisations), which is sensitive to society needs and demands, and promote an ethics framework for research and innovation” (Arnaldi and Bianchi 2016, p. 5). In conclusion, Horizon 2020 proposed to bring together private, public, and civil society stakeholders to address challenges through research and innovation, as has been argued by Owen, von Schomberg, and Macnaghten (2021, p. 221), all working at the intersections between innovation governance and science and technology studies. Von Schomberg, in particular, collaborated intensively with the European

Commission in the period of Horizon 2020, producing a copious amount of publications to correctly frame the desirable impacts for science and technology policy. As seen so far, the RRI approach acknowledged the mutual shaping of science and society and addressed the importance of disentangling technology from the mainstream market (Owen, von Schomberg, and Macnaghten 2021, p. 221-222). Even so, in 2011 Von Schomberg identified as normative anchor points for a legitimate basis for defining the “right” impacts of research and innovation the ones indicated in the graph (Von Schomberg 2011, p.4):

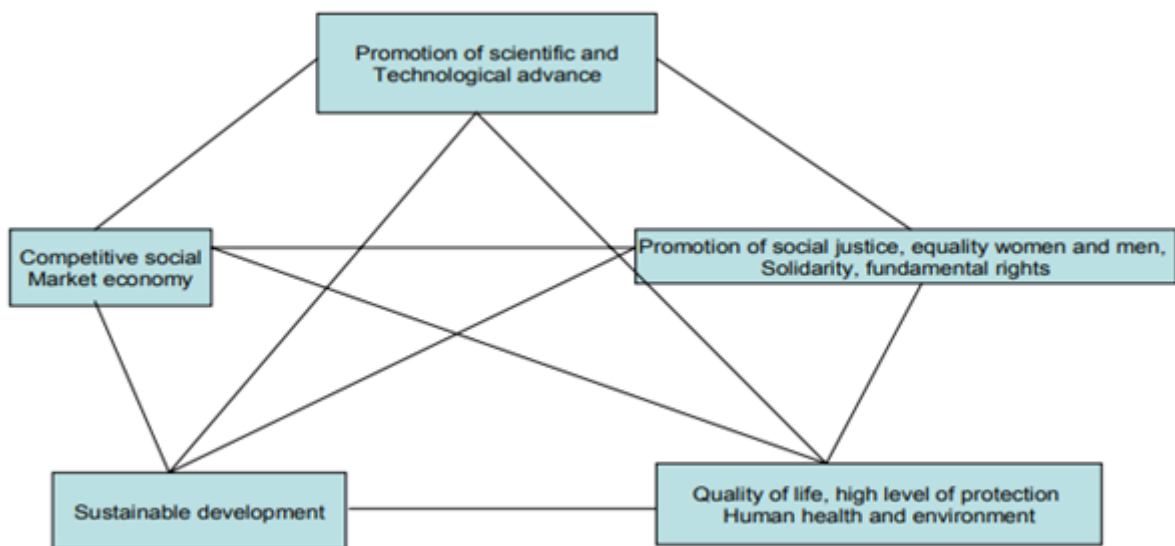


Figure 8. From Von Schomberg 2011

Interestingly, a competitive “social” market economy is identified as a normative anchor point. The reason behind this choice can be found in the words of the Treaty on the European Union from 2010, where the sustainable development of Europe was based on the balance of “economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment.”, all while promoting social justice (Von Schomberg 2011, p.3). Notably, we

observe the use of the pairing progress- economic growth again, now accompanied by the promises of technological development through the use of RRI. Von Schomberg justifies this choice by arguing:

“It has to be noted that a systematic inclusion of these anchor points in product development and evaluation, would clearly go beyond simple market profitability, although the latter could be a precondition for the products' viability in market competitive economies. However, it would be consistent with the EU treaty to promote such product development through financing RTD actions. In other words, at this point, Responsible Research and Innovation would not need any new policy guidelines, but simply would require a consistent application of the EU's fundamentals to the research and innovation process reflected in the Treaty on the European Union. Perhaps it has been wrongly assumed that these values could not considered in the context of research and innovation.”

(Von Schomberg 2011, pp. 10-11)

I find this passage a bit obscure and I am not sure of what to make of the last sentence. Which values were wrongly assumed to be incompatible with the needs of research and innovation? It seems to me that the author is stating that promoting product development through funding research and technological development (RTD) actions aligns with the EU treaty, and this is consistent with RRI values, even when the goal is market profitability. This, I believe, is a tricky choice: as seen in paragraph 1.2., by tying technology to mainstream economy and productivity, we risk falling into the trap of over-productivity and overconsumption, with their environmental and social consequences. Not only: as observed by philosophers of technology Blok and Lemmens, **as a consequence of this economic paradigm of technological innovation, alternative forms of innovation** like systems innovations (ex. agro-ecological innovations) or attitudinal innovations (ex. prevention or lifestyle interventions) **receive less attention because it is difficult to develop a business model on their basis** (Blok and Lemmens 2015, p. 29).

In a different paper, Owen, Macnaghten, and Stilgoe interpret von Schomberg's words finding them to be aligned with a specifically European pragmatic view: since we cannot aspire to the abstract ideals of the Aristotelian "good life" we can intend the "right impacts" as those aligned with the European Constitution, such as competitive social market economy, sustainable development and quality of life (Owen, Macnaghten, and Stilgoe 2012, pp.754). Even so, in the same paper, the group of philosophers questions if it is possible to argue for a "responsible" innovation when it is aligned with values that "support and compound an increasingly dysfunctional, and unsustainable Capitalistic socio-economic world order" (Owen, Macnaghten, and Stilgoe 2012, pp.754-755). I wonder the same exact thing but, contrary to the authors, I don't think this question should be used, as they argue to be doing, only as a provocation to illustrate that RRI cannot be decoupled from its political context (Owen, Macnaghten, and Stilgoe 2012, p.754). The discourse around responsible innovation, in fact, exactly in reason of its inevitable pairing with the political discourse, needs to be de-centred from the unsustainable Capitalist socio-economic world order. Again, as already stated in the first section of this chapter, the lack of a specific definition of sustainability and of the desirable impact of innovation risk to leave space to the goals of the industry at the expense of the people, by putting economic growth above actual sustainability. (Du Pisani 2006, p. 93).

I am not saying that that is the deliberate intention of the people who have helped compile the plans for Horizon 2020 or Horizon Europe, but I argue that the lack of acknowledgement of the huge role of overproduction in the climate crisis is shockingly downplayed in these reports. The Strategic Plan 2021-2024 for Horizon Europe presents four key strategic orientations to identify the higher-level objectives where research and innovation investments are expected to make a difference (Horizon Europe - Strategic Plan 2021-2024, p. 7). These four keys are: A. Promoting an open strategic autonomy by leading the development of key digital, enabling, and emerging technologies, sectors, and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations; B. Europe's ecosystems and biodiversity, and managing sustainably natural resources to ensure food security and a clean and healthy environment; C. Making Europe the first digitally-enabled circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems; D. creating a more resilient, inclusive and democratic European society, prepared and responsive to threats and disasters, addressing inequalities and providing high-quality

healthcare, and empowering all citizens to act in the green and digital transitions (Horizon Europe - Strategic Plan 2021-2024, p. 7).

These points seem to take at heart the necessity to take action against the climate crisis. Even so, it is difficult to find in the documents concrete plans to actualize them. In particular, point C fails to recognize how this “digitally enabled circular, climate-neutral and sustainable economy” should be built, especially considering the problematic and unsustainable aspects that digitalization brings with itself. The relevance of digitalization is stressed directly multiple times:

“Cluster 4 (Digital, Industry and Space) will support the development and mastery of digital and key enabling technologies of the future. **This will increase adaptability and resilience to improve production response, recovery and preparedness to deliver on a green, digital and fair transformation and give EU industries across all sectors the competitive edge they need for leadership in global markets.** Investments under this cluster will support the EU to seize opportunities in key parts of the digital supply chain, to consolidate EU assets (e.g. embedded systems, telecom, industrial technologies) and develop missing segments in key strategic value chains, including secure, sustainable, responsibly sourced supply of raw and critical raw materials.”

(Horizon Europe - Strategic Plan 2021-2024, p. 9)

To put together green transformation and digital transformation without addressing the impact of digital technologies on the environment is problematic. Moreover, it needs to be justified how to maintain a competitive market in a sustainable setting, especially if the market, and therefore the ability to dominate it, is based on the creation of new products. How is it possible to sustainably and responsibly obtain raw materials if the amount of them needed to maintain production and consumption is above the Earth's limits?

It seems to me that the plans Horizon Europe promises to actuate to mitigate the environmental crisis fail to acknowledge the need to limit production. Even so, the need to re-

evaluate the production model is not completely dismissed. In the passage dedicated to the goal of a clean economy in the Work Programme for 2023-2025, it is possible to read:

“As a considerable contribution to regenerative, circular and clean economy, this work programme will advance research and innovation on climate neutral, circular and digitised production and support the European Partnerships Made in Europe, Processes4Planet and Clean Steel, which will demonstrate EU leadership in the transformation of the manufacturing and energy-intensive industries into circular and carbon-neutral sectors. This work programme will also pave the way to the development of chemicals and materials fit for the twin digital and green transition through the Safe and Sustainable by Design approach. Finally, efforts include a project to create one hundred circular model households, which will pilot efforts aimed at making European households sustainable through inclusive circular practices.”

(Horizon Europe - Work Programme 2023-2025 General Introduction- European Commission, p.11.)

The mention of a circular economy, which I will elaborate on in a moment, is an important one. Unfortunately, though, it seems to me that these documents very often avoid specifically addressing how to maintain a “competitive” position in the market and rely on a circular economy at the same time. To look for further answers to this problem, I take the mention of the European Partnership “Made in Europe”, among others, to look at the strategies promoted by the European Commission to address and reshape the role of the industry sector in the sustainable transition.

2.3. Is there hope? Manufacturing Innovation in a Circular Economy.

The desire to maintain leadership in the manufacturing sector while addressing the need to reduce emissions is expressed in the manufacturing partnership “Made in Europe” (mentioned in the last extract from Horizon Europe as well). Made in Europe is the result of “Factories of the Future”, the European Union’s €1.15 billion public-private partnership (under Horizon 2020) for advanced

manufacturing research and innovation.²¹ The partnership aims to generate growth by strengthening the technological base of European manufacturing. In the Made in Europe document compiled by the European Commission and EFFRA (the European Factories of the Future Research Association), the manufacturing industry is recognized as the backbone of the European economy, with Europe being the world's biggest exporter of manufactured goods (Made in Europe – Guidance document, p.6). The document acknowledges the necessity of the transformation to climate neutrality and a sustainable circular economy (Made in Europe – Guidance document, p.6). Nonetheless, when looking at the section that elaborates on this specific objective, no mention of limiting production is to be found. Instead, Made in Europe aims at developing advanced materials, digital technologies and manufacturing technologies with less emissions through the increasing recycling and re-use of materials and customized products (Made in Europe – Guidance document, pp.14-15). Since the concept of “circular economy” has appeared multiple times already, it is necessary now to go further into the understanding of this model as provided by the European Commission and see if it aligns with the scope to reduce production. To do so, I will look directly into the “Circular Economy Action Plan: For a cleaner and more competitive Europe” completed in 2020.

In this approach, not mentioned as often in Horizon 2020 and Horizon Europe, the European Commission takes a step towards a very much-needed de-growth approach. The document, in fact, acknowledges that the linear pattern of “take-make-use-dispose” does not provide producers with sufficient incentives to make their products more circular, meaning that many products (too many) break down too quickly and are not designed to be repaired or reused (Circular economy action plan, 2020, p. 6). Finally, this document establishes some sustainability principles to guide the design process of new products (acknowledged as the moment in which environmental impacts are determined) and comments on the importance of improving product durability and reparability and restricting single-use and premature obsolescence (Circular economy action plan, 2020, p. 6). This is, partially, what I was hoping to find in my analysis of the EU documents. Even if the role of overproduction is not directly mentioned nor re-discussed, and the use of digital technologies is amply proposed as a green solution, the concept of the circular economy moves towards a perspective that focuses on sufficiency. Does it make the EU strategies move from a more-

²¹ [The FoF Partnership – EFFRA.](#)

innovation approach to a radical one? I don't think so. As stated at the beginning of this thesis (and as I will proceed to elaborate on in the next chapter), a radical approach uses technologies as a tool to radically re-shape the system that generated the environmental crisis, instead of proposing a model based on the production of new technologies to fix the problem.

Even so, the references to a circular economy allow me to conclude this analysis of the selected EU Commission's documents with a certain level of hope. In fact, the current linear economy model is at the root of the approach that allows for the over-exploitation of natural resources in order to meet the requirements of mass production. This model is very well summarized in an infographic presented by the Stockholm Environment Institute in 2019, which portrays the linear economy model as the process that goes from resource extraction, moves to production, distribution, and consumption and finally resolves into disposal (Stockholm Environment Institute 2019). The circular economy model, on the contrary, does not stop at the disposal, but adds the reuse of waste as raw material, "circling back" to the beginning of the chain. The model values the conservation of the, previously extracted and processed, resources over the continuous extraction of the linear model. Even so, I do not believe the circular model is the definite solution: even when raw materials are not continuously extracted (with less environmental cost), the collection and requalification of processed materials require energy (with environmental cost). I am not playing the devil's advocate here. I am highlighting why limiting production is considered so necessary in my argumentation. If we think again, for example, of plastic pollution and its impact on the environment, we see that recycling plastic is not the only answer (even if, certainly, part of the solution). As observed in a recent article in *Scientific American*, most plastic sent for recycling (when it is collected!) is downcycled and even in case new technologies will improve this, to expect the system to be perfected in a way that would allow for a perfect circular use of plastic is very idealistic.²²

That said, this is a step towards a better conceptualization of technological innovation. It is, at the very least, an approach that at least takes into account the finiteness of resources. Therefore, it is better than approaches taken in the past: in the case of plastic, again, iconic is the approach taken at a Society of the Plastics Industry conference in 1956 by Lloyd Stouffer, editor of the US magazine *Modern Packaging* who declared that "The future of plastic is in the trash can... It [is]

²² <https://www.scientificamerican.com/article/why-recycling-isnt-the-answer-to-the-plastic-pollution-problem/>.

time for the plastics industry to stop thinking about ‘reuse’ packages and concentrate on single use. For the package that is used once and thrown away, like a tin can or a paper carton, represents not a one-shot market for a few thousand units, but an everyday recurring market measured by the billions of units”(Stouffer 1963, p. 1). This approach, as observed by the environmental scientists and feminist and anti-colonial researcher Liboiron, not only was responsible for a huge environmental impact, with packaging being the single largest category of plastic production, but it also generated a whole narrative about the use of resources that has a lot to do with coloniality and capitalism (Liboiron 2021). Unfortunately, this discussion cannot take place in the limited space and scope of this thesis, but some of its elements are recurrent in the argument I have been proposing so far: technological innovation in the image of “better” technologies to fix the environmental crisis is not enough, a whole radical reconceptualization of innovation is needed and should include the detachment from the goal of the mainstream market (in the form of economic growth) while addressing the interconnectedness of the eco-social crisis.

The analysis of Horizon 2020 and Horizon Europe has not satisfied the requirements to be categorized as taking a radical approach towards innovation. Instead, the primary role assigned to the competitiveness of the European Union in the global market (stressed again in the “Made in Europe” plan) has foreshadowed the importance of an approach to technological innovation based on sufficiency. The circular economy action model does not move completely in the other direction: again, it focuses mainly on the “sustainability” of the product in terms of how it is produced, instead of engaging in a discussion about the need to limit production. Even so, the European Circular Economy Action Plan provides a definition of sustainability that aligns with the goals of a sufficient approach toward innovation, meaning an approach that requires products’ durability and efficiency.

Development, innovation, and sustainability are nothing more than normative concepts that respond to a given society’s social, economic, cultural, and political constraints (Bera and Rahut 2024): if society changes, they should change with it. By maintaining their alliance with the market, “development”, “innovation”, and “sustainability” do not call for images about human development and wellbeing. These terms seem, for this reason, to be refused in the degrowth movement, which I now proceed to investigate in the next chapter.

Chapter 3: The Radical Innovation Approach

In the previous chapter, I analysed some relevant documents concerning the European Commission's approach to the role of innovation in the environmental and social crises. As seen, the approach taken can be identified as a more-innovation approach. The strategic plans the EU aims to implement acknowledge the environmental and human crises and the interconnections between them, while not completely diminishing the importance of a reevaluation of the norms the mainstream market is based on (as seen in the steps taken towards a circular economy). Even so, the incredible amount of documentation produced never directly addresses the problematic nature of the values of the European economy, based on overproduction and consumerism. Moving to a circular economy would definitely help rethink the values to take into consideration in the design of new products and would allow for an approach that puts reusability and efficiency at the centre. Nonetheless, this movement towards a fairer economy needs to be accompanied by a new ethos that puts sufficiency and contentedness at the centre of the moral discourse about innovation. This is what a radical-innovation approach can do: it can help build a new conceptualization of technological development so innovative that it gets to be transformative.

Technological innovation can help shape a fair and sustainable future in which technologies are designed to help us all fulfil our needs with less exploitation of natural resources. To get there, though, they need to be shaped around a narrative that revolves around sufficiency and contentedness. As seen throughout this thesis, the one about the environmental crisis and technological innovation is a moral question as much as a scientific one. In this chapter, I will finally engage with the concepts of sufficiency and contentedness while observing which suggestions we can take from approaches that can be identified as radical, such as the degrowth one.

3.1. Finding contentedness in less: the Degrowth Movement.

While ideas about degrowth have been part of the philosophical debate for centuries (Demaria et al. 2013, p. 195), the degrowth movement finds its origins at the beginning of the 21st century as a

project of voluntary societal shrinking of production and consumption, with the goal of implementing social and ecological sustainability (Demaria et al. 2013, pp.192-195). Interestingly, the degrowth framework has not developed as an alternative to sustainable development in the political debate, not aiming at entering the European Commission’s discourses or the United Nations ones (Demaria et al. 2013, p.192). This is, in my opinion, a pity. For this reason, I try to integrate the degrowth approach in my thesis, hoping instead to find elements that can be introduced in the regulatory discourse.

In my understanding of these two different approaches, the sustainable one can be understood as a movement that aims at growth but looks for methods to make it “bearable”, while the degrowth one refuses the premises of the growth ideology and looks for radical alternatives. Degrowth is, in this sense, a critique of the “development” hegemony (Rist 2002): not just an economic concept, but a frame that includes different concerns, goals, and strategies (Demaria et al. 2013, p. 193).



Figure 9. Greenpeace activists standing on a BMW car; Tobias Schwarz. Source: GETTY IMAGES

It is also a social movement, providing a framework for lots of activists (Demaria et al. 2013, p. 193), like the members of the anti-car movement (see figure 9) and anti-advertising activists (see figure 10).

In this sense, the degrowth movement refuses to compromise with the growth ideology and does not even attempt to find a space in the public debate. Instead, it takes itself out of it and adopts a polemic stand towards it. *Décroissance* became an activist slogan first in France in 2001, then in Italy in 2004 (as *Decrescita*), and finally in Catalonia and Spain in 2006 (as *Decreixement* and *Decrecimiento*), while the English term was eventually introduced at the first Degrowth conference in Paris in 2008 (Demaria et al. 2013, p. 195). The Degrowth Declaration in Paris in 2008 defines the degrowth project as a “voluntary transition towards a just,

participatory, and ecologically sustainable society”, starting in wealthy countries which are required to adjust their production-consumption levels and then maintain them in the form of “steady state” economies (Chiengkul 2018, p. 83). In the same year, the financial crisis was destabilising the system and, while central bankers and politicians sought to find an agreement that would let them out of economic recession and back to growth, others used the crisis to think about the devotion to growth critically (Whitehead 2013, p. 141). In all its shapes and forms, degrowth is predicated on two principles: economic activity should not exceed what the biosphere can carry, and economic activity should focus on enhancing human well-being instead of the accumulation of wealth (Whitehead 2013, p. 142). In this sense, degrowth necessarily positions itself next to the limitarian doctrine, which finds morally objectionable the existence of very rich people and argues for the need to put a threshold to the accumulation of wealth (Robeyns 2023).



Figure 10. Anti-AD campaign in Glasgow, Source, Instagram: @adhackglasgow

Even so, degrowth is unique in antagonising growth, considering the socio-ecological consequences it produces (Whitehead 2013, p. 142). While doing so, degrowth criticizes both development and utilitarianism, addressing the problematics of putting the modes of consumption, production, and technological development of the so-called Global North at the centre, opposing the idea that sustainability and development can actually go together (Demaria et al. 2013, p. 196). With the degrowth movement spreading around the world, more actors are starting to wonder how this perspective could be included in a programmatic effort to tackle the social and environmental crises.

In an article that appeared in *Nature* in December 2022, a group of philosophers, sociologists, environmental scientists, and economists captained by Jason Hickel argued that to tackle the social crisis, characterized by injustice, poverty, and natural disasters’ vulnerability without increasing

emissions is possible if economic growth is abandoned as an objective (Hickel et al. 2022). The connection between the eco-social crisis and the economic system is not new: the RRI field, as shown in the previous chapter, already recognised the dependency of innovation projects (and their impact) on a technoeconomic paradigm (von Schomberg and Blok 2021). Even so, while in the case of RRI this dependency is accepted, the degrowth approach argues against it. And this is how we move from a more-innovation approach to a radical-innovation approach.

Degrowth premises can help build a scenario in which the social and environmental crises are tackled together, in reason of the critique of their dependency on the market, responsible for the unsustainable growth paradigm. Policies that support the degrowth strategy include the improvement of public services, the introduction of a green jobs guarantee, the reduction of working time, enabling sustainability for low or middle-income countries by cancelling unfair debts, and (finally!) the reduction of “less-necessary production” (Hickel et al. 2022, p. 401). The last point is for obvious reasons particularly important in the setting built in my thesis: it is, in fact, meant as the “scaling down [of] destructive sectors such as fossil fuels, mass-produced meat and dairy, fast fashion, advertising, cars and aviation, including private jets” that also addresses “the need to end the planned obsolescence of products, lengthen the lifespans and reduce the purchasing power of the rich” (Hickel et al. 2022, p. 401).

It is easy to see how this approach earns here the radical-innovation-approach label. The RRI position has been able to show the interconnectedness and dependency of technological innovations, the market, and political power but has not been able to openly argue for the distancing of innovation from economic growth. The inclusion of positions from the circular economy ideology in the European Commission’s strategic plans allows to address not only the problem of the sustainability of materials and modes of production but also the unsustainable nature of the linear economy model. Finally, the degrowth approach directly addresses **the need to scale down production, redistribute resources and centralize (all) humans’ well-being.**

While this kind of ideology is a long way from being commonly embraced in government action, where mainstream neoclassical economics are still on a pedestal, the political space is moving in slowly opening the door to this approach (Hickel et al. 2022, p. 401). In May 2023, the European Parliament hosted the conference “Beyond Growth: Pathways Towards Sustainable Prosperity in the EU” where degrowth ideas held a prominent place within a European institution

for the first time.²³ The follow-up conference of December 2023 started with the evaluation of the measures adopted by the European Commission in the sustainable transition and criticized the inability to address the interlinks between the ecological crisis and the reduction of socio-economic inequalities. Namely:

“Three main challenges and limitations are generally put forward by critics. First, the European Green Deal relies on a green growth-centered approach which **unrealistically assumes that it is possible to simultaneously sustain economic growth while improving environmental sustainability and social justice**. Second, its ‘just transition’ perspective is too narrowly defined, marked by a social investment focus, with insufficient financial volume available for support. As such, it rests on a corrective logic designed to compensate for the effects of the green transition, does not challenge industrial labour relations, and risks reproducing or renewing social inequalities within the EU and with the rest of the world. Third, **its industrial agenda remains centred on cost-competitiveness** and its ‘Better Regulation’ agenda, fails to make EU funding conditional on social, environmental and financial requirements, and to promote the creation of quality jobs, fair working conditions and collective bargaining.²⁴

Moreover, in the context of the conference, a study presents a reflection on how to move beyond growth in EU policies (Widuto, Spinaci, and Evroux 2023) The document addresses, as I have done in this thesis, the myth according to which growth and well-being move together. Moreover, it puts this discussion in the context of European policies by contesting the role of the GDP (Gross domestic product) in calculating the wealth of citizens. The GDP indicator, in fact, tracks the total value of goods and services produced and is commonly used as an indicator of living standards and development, but it does not reflect social and environmental costs of growth, nor captures social and regional inequalities while instead promoting a growth model based on

²³ <https://www.commonsnetwork.org/2023/05/08/discussing-post-growth-politics-within-the-european-parliament/>.

²⁴ <https://www.beyond-growth-2023.eu/>.

increasing production and consumption, leading to materialism, consumerism and wastefulness (Widuto, Spinaci, and Evroux 2023, p. 4)

The growth ideology is further opposed by Generation Climate Europe (GCE), the youth-led coalition of networks on climate and environmental issues at the European level.²⁵ Here, again, the overcoming of the eco-social crisis is recognised in the abandonment of the capitalist economic system and what is called its “obsession” with the endless pursuit of growth and profit, recognised as being at odds with planetary boundaries and human well-being²⁶. The same attitude can be observed online in debates about climate change and social injustice, where degrowth perspectives are taken again and again, especially in light of what could be called the #AntiCapitalism trend,



Figure 11. “Humans of late capitalism”, 2024.

which sees lots of young people making fun of the ironies of consumerism (figure 11) while discussing with (less or more) irony the consequences of the crises on their lives, while often calling for the need of a new economic paradigm. The trend sees young people from all over the world denouncing the exploitative nature of the contemporary economy and complaining about the institutionalised prioritisation of productivity over well-being. Jeff Guenther, therapist and influencer, for

²⁵ <https://gceurope.org/manifesto-for-an-intergenerationally-just-post-growth-european-economy/>.

²⁶ Ibidem.

example, has argued that “under capitalism, you derive value by doing something, not just by being human”.



Figure 12. "Automatizzato comunismo memetico", 2024. "ERROR. You tried to separate mental distress from the society that generates it"

Others, openly denounce the problematic nature of the romanticisation of work (figure 14) exposing its consequences on mental health (figure 12) or expressing disillusionment with the myth of merit (figure 14).



Figure 13. "Puppers against capitalism", 2023



Figure 14. "MadonnaFreeeda", 2022: "Of unicorns, mermaids, waking up well rested, ethical capitalism, work that makes man noble and other inexistent things".

Others use their platforms to call out inequalities (figure 13) or to address the responsibilities of rich people in the



Figure 15 "Jet dei ricchi", 2024.

environmental crisis, for example by calculating the estimated emissions of those who travel short distances with private jets (figure 15).

The revelation that, as observed by the Marxist philosopher Kohei Saito, the Promethean dream of realizing freedom through technical progress has not been realised (Saito 2023, p. 136), is spreading across countries and cultures. On the contrary, it appears clearly now that technical “progress” exhibits an uncontrollable destructive power over the planet (Saito 2023, p. 136). The elements to predict this phenomenon were all already there: Saito observes that Marx repeatedly warned that the development of forces of production in the capitalist model undermines and destroys the environment (Saito 2023, p.158). Marx’s last vision of post-capitalism as degrowth communism, as interpreted by Saito, offers a narrative about the relationship between production, humans and the land that may be useful in building a new conceptualisation of technological innovation. In fact, Marx’s call for a “return” to a non-capitalist society does not include any advocacy of a “return to the countryside” obtained by a rejection of all technologies: on the contrary, it requires the assimilation of the positive fruits of capitalist development (Saito 2023, p. 208). This would allow, in Saito’s reading of Marx, for the finding of a non-consumerist abundance of social and natural wealth:

“According to Marx, scarcity has two aspects, social and natural. Natural scarcity cannot be entirely overcome, no matter how much technology may advance. By contrast, social scarcity increases in capitalism in the face of unlimited capital expansion. [...] The more capital develops for the sake of overcoming self-imposed

scarcity, the more destructive the entire system becomes, but the abundance it generates can never eliminate the artificial scarcity created by capital itself. This is the fundamental paradox of wealth in capitalism.”

(Saito 2023, p. 230).

In this reading of the problem of the lack of natural resources (to, potentially, become even worse in the future in reason of climate change), the solution is found in a switch in the economic system. Basically, the idea can be summarized as follows: the problem is not that there is not enough for everyone (remember the discussion in Chapter 1 about economic growth and well-being?), natural resources are finite, but this sense of scarcity is artificial because the problem is in their distribution. In Saito’s words: abundance is not a technological threshold, but a social relationship (Saito 2023, p. 232). This is a point very similar to the one made by the economic anthropologist Jason Hickel: abandoned the pressures of artificial scarcity, the compulsion for people to compete for ever-increasing productivity would finally go away, together with ecological destruction. The economy would produce less, but we would need less! (Hickel 2019, p. 66). It should be easy now to see how degrowth is different from ideas about sustainable development since its proponents stress the need for the global economy to “relocalise and de-accelerate” (Boonstra and Joosse 2013, p. 174). Moreover, the abundance of common wealth, achieved through the abolishment of artificial scarcity of the commodity and money and by sharing the social and natural wealth with others (Saito 2023, p. 236)., allows for a re-elaboration of the morality behind the definition of a happy, fulfilling life and a sense of contentedness. As Saito perfectly puts it:

“Post-capitalism needs to invent wholly different value-standards and social behaviours, and **a new sense of sufficiency and well-being needs to replace the widespread aspiration to become upper-middle class.** [...] [it] does not mean austerity and poverty because it simultaneously aims to enrich various non-commercial activities that are not necessarily reflected in the gross domestic product (GDP). People will have different wants. Instead of wanting destructive, extravagant and wasteful

products, **people will desire healthier, more solidaristic and democratic ways of living.** In this way, degrowth communism expands the ‘realm of freedom’ without depending on an increase in productivity and even by downscaling production.”

(Saito 2023, pp. 235-236).

Saito’s reflection on people’s desires makes even more sense if we think about the fact that a lot of needs are actually fabricated through the impressive work of marketing experts. Through the creative elaboration of inputs from psychology (Liheng 2024), advertisement campaigns speak to a target audience about their need to buy things they may have not even known existed before that moment. From the huge billboards in Times Square to the unboxing of free goods on influencers’ social media accounts, we are bombarded with the fascinating promise of new, and therefore assumingly better, products. This discourse goes beyond the actual usefulness of different products: even when we talk about an, arguably, useful one like a phone or a laptop, the problem is not in having the need to have one (a need that can be factual or pushed by societal pressure), but the fact that we are incentivized to always have the *newest* one. In some cases, it may be needed: some people work every day with these tools and need them to be performant to succeed. In others, products are marketed as new even when some minimal components are changed (in the external design for example). Even worse, some could keep working for longer if they were not designed to become obsolescent after a few years.

In my understanding of how the de-growth movement can inform the technological innovation discourse, these factors are addressed. I am not arguing for a world without technologies, nor for the selection of “useful” technologies and “not useful” ones (who should make that decision, anyway?). What I am arguing for is an approach towards technology production that values the durability and indispensability of the product instead of its marketable aspects, to achieve its efficiency and sufficiency in the interest of the environment and humans. This approach is the opposite of the one taken by the already cited Lloyd Stouffer in 1958 when he argued that “the future of plastic is in the garbage can” (Stouffer 1963, p. 1). What he meant was not that plastic should have been abandoned in favour of a different and better technology, but that plastic should have become a one-time-use kind of technology so that plastic companies could profit more and more from it. This became a trend in the production of new technologies and this is what enabled me to propose the dichotomy between more innovation and radical innovation.

Since the tech one is for sure a very profitable market, we cannot expect companies to autoregulate: this problem needs to be addressed by policies that limit the possibility of companies always coming up with the newest product that is not in any way better than the previous one. Even in the case of “sustainable” technologies. Think, for example, about reusable water bottles. They are marketed as sustainable because they reduce the consumption of one-use plastic. Even so, the variability in designs and materials is as impressive as the market strategies that, by proposing it as a sustainable solution, ask the consumer to buy more and more of them (how is this sustainable?).

Even when they are, allegedly, made of sustainable materials, “trending” products inevitably feed into the consumerism mechanism and, in so doing, have an impact on the environment. This is the reason why proponents of degrowth do not argue for a more-innovation approach that sees technological innovation as the fix for the environmental and social crises and, instead, recognise that technological fixes paradoxically increase the levels of consumption (Boonstra and Jousse 2013, p. 175). Anyone with a social media account has seen trend-over-trend piling up on their phones with the associated unmissable product, sometimes labelled as sustainable, sometimes as affordable, others as simply necessary: from Stanley cups in every shape and colour to boxes full of Shein’s clothes, to menstrual cups and even ADHD supplements. And I am not even going to dive into the algorithmic unprecedented ability to target the right audience for the right products, with the result of enhancing marketing results and consumption at the maximum (as proven also by the fact that the examples I have provided are definitely carefully tailored on what it is expected from my cis-white-educated-woman internet persona to like).

Of course, some people would find this critique convincing but would doubt the possibility that people would renounce voluntarily the comforts offered by the growth model. It should be noted that only the people who benefit from it could actually complain, and it should be expected for the majority of those who do not that they would find rather appealing the prospect of not having to struggle to survive in their everyday lives. This could be considered questionable as well: the illusion of the achievability of wealth is as much marketed as make-up products and Netflix’s series. Also, the myth of the interdependency of wealth and merit is very much alive. Even so, proponents of degrowth do not expect the transition to be sudden and violent: the ecological economist Giorgos Kallis, for example, has argued that the process would take place starting from

small, but accumulating actions that would lead to a new cultural story that would generate a social movement of thought and practice (Kallis 2011, p.878). As observed by rural sociologist Boonstra and human geographer Joosse, the idea that social transformations can occur from bottom-up social practices has been proven to be right more than once, and also groups of people that make up these movements not only produce an alternative set of knowledge and skills that allow for a (temporal) “escape” from capitalism, but they also facilitate changes in time of crisis (Boonstra and Joosse 2013, p. 176). This is how a radical-innovation approach, such as the degrowth one, gets to be transformative.

The same idea about the impact of bottom-up political transformations is argued for by the environmental educator, scholar, and activist Samuel Alexander in his analysis of the Voluntary Simplicity movement (Alexander 2013). As argued by Alexander, a post-consumerist ethics of sufficiency needs to be embraced at the cultural level in order to be able to impact the legal, political and economic one (Alexander 2013, p.287). If we put this argument together with mine about the need for policies that limit the production of new unnecessary technological innovation, we obtain a framework that sees forces from “up” and “down” collaborating in scaling down production and consumption. I think it is necessary to stress the role of policies and institutions in this process, together with the importance of an ethical re-interpretation of human needs and well-being. This is because solely relying on ethical decision-making at the individual level of the consumer may not be enough and, more importantly, would unjustly put the responsibility on the shoulders of the consumer instead of the producer that, again, relies on several strategies to manipulate the consumer into “over-consuming”. Even so, an ethical shift towards sufficiency is very much needed in order to give back a sense of autonomy to the individual and to avoid the risk of making the (addicted to consuming) privileged population feel robbed by authorities at the institutional level. To elaborate further on this important point, I will dedicate the next and last section to a reflection on the ethics of sufficiency. Before going into that, though, I want to advise my reader to not misinterpret my aims: an ethics of sufficiency should be adopted by those who can afford to. This is the reason why I have not proposed a hierarchy of good and bad technologies. Discourses on sustainability have often, at least in the public discourse, been giving priority to the goals of the transition over sustainable materials over the needs of those who cannot always afford them. Plastic, for example, is essential in the care of some people with disabilities. Cheap unsustainable clothes are often the only option in certain communities. These examples, though,

do not hinder the discussion on the ethics of sufficiency, since it should be always tailored to the individual needs and capabilities.

3.2. For an ethics of sufficiency.

In a different work from the one already cited, Alexander explains the need for a re-thinking of the economic growth paradigm from an ethical perspective in an effective way when he says that the confused position of consumer capitalism today, with its fetish for economic growth, fails to answer the question of what that growth is supposed to be *for*²⁷ (Alexander 2012, p.1). From this recognition comes his proposal for a “sufficient economy”, typically identified, in the economic literature, in the case of “developing countries” where the economies are interested in meeting mostly local needs with mostly local resources and here re-thought in the context of “highly developed” regions (Alexander 2012, p.1). So defined, the sufficiency economy aims for “a world in which everyone’s basic needs are modestly but sufficiently met, in an ecologically sustainable, highly localised, and socially equitable manner” (Alexander 2012, p.2). In this sense, degrowth should be accompanied by redistribution. This would solve the problem of global poverty in a way that does not require more economic growth, as some have sustained (see Chapter 2) in arguments against the urgency to mitigate the climate crisis.

If my argument has been supported by sufficient proof, it should be clear right now that the problem of global poverty is not caused by the lack of enough growth and capital, but rather by the (technological) mechanisms that enable the accumulation of capital and wealth for some at the expenses of others. As it has been argued in a passage of the IPCC already cited, the problem is not the lack of enough global capital, but the distribution of it (IPCC, 2023: Climate Change 2023: Synthesis Report, p.112). A redistribution of resources of this sort will require a reflection on well-being that goes above the usual materialist forms of it and involves a re-evaluation of communitarian values, human-land relationships, and creative, meaningful and solidary actions instead. It is not casual that a lot of scholars interested in this re-shaping of ethics have been looking at indigenous traditions. Not only that, the role of indigenous and local knowledge has been gradually more and more recognised by the scientific community for its ability to provide useful

²⁷ Cursive from the original source.

climate change information, observations and solutions (Mustonen et al. 2022, p. 2713). Indigenous knowledge and local knowledge are, by now, considered crucial to address environmental impacts, but also to inspire ethics, specifically thanks to their ability to stress concepts of responsibility through intergenerational equity (Mustonen et al. 2022, p. 2713) and the connections between humans and land.

I want to propose here a passage offered by Indigenous botanist Robin Wall Kimmerer in her book “Braiding Sweetgrass” that offers an example of what the author calls “Indigenous wisdom”. In this passage, the author recollects her time spent doing ecological research in the Andes and, in particular, tells the story of one dream she had, inspired by the memories of the market day in the local village she frequently visited. In the dream, the owner of a stall, Edita, refused to let her pay for her groceries, since everything was a gift (Kimmerer 2013, p.29). What is interesting to me about this story is not, of course, the author’s recollection of a situation that only happened in a dream, but the reflection that follows:

“I looked in my basket: two zucchinis, an onion, tomatoes, bread, and a bunch of cilantro. It was still half empty, but it felt full. I had everything I needed. I glanced over at the cheese stall, thinking to get some, but knowing it would be given, not sold, I decided I could do without. It’s funny: **Had all the things in the market merely been a very low price, I probably would have scooped up as much as I could. But when everything became a gift, I felt self-restraint. I didn’t want to take too much.** And I began thinking of what small presents I might bring to the vendors tomorrow. The dream faded, of course, but the feelings first of euphoria and then of self-restraint remain. I’ve thought of it often and recognize now that I was a witness there to the conversion of a market economy to a gift economy, from private goods to common wealth. And in that transformation the relationships became as nourishing as the food I was getting. Across the market stalls and blankets, warmth and compassion were changing hands. **There was a shared celebration of abundance for all we’d been given. And since every market basket contained a meal, there was justice.**”

(Kimmerer 2013, p.29).

Again, this is only a dream. It is also an idea, but it is not idealistic. To argue that it is, would mean to negate the experiences of all those who are exposed to the perks of a communitarian approach to wealth, where, especially in situations of “poverty”, resources are distributed. I do not want to offer a fetishisation of poverty: inequalities build upon inequalities, injustice generates injustice and, even more, trauma generates trauma. Nonetheless, an ethics of sufficiency that revolves around contentedness and self-restraint, could be an alternative to the narcissistic trauma that the fetishism of consumption feeds in. Again, to sustain this bottom-up approach towards an economy of sufficiency without expecting any policy intervention would, in my opinion, put too much pressure on the individual citizen and not enough on the major actors in the eco-social crisis. Even so, I decided to introduce this prospect to argue that degrowth does not have to be understood necessarily as some kind of violent movement that requires and force restraint: it can, instead, be expected to be embraced in an ethics of contentedness that takes joy from the act of self-restraint.

But we cannot expect that to happen in the absence of a framework that enables that self-restraint to be fruitful. As some objectors could, rightfully, argue: “Why should we, modest citizens of modest means, sacrifice our desires when others thrive in their luxuries and unregulated abundance?”. This critique is not at all one to dismiss: an ethics of sufficiency and contentedness need to be accompanied by a conscious political effort towards the limiting of production and wealth re-distribution. This is because, at least in recent political philosophy, at least four distinct principles play a role in explaining what makes one distribution preferable to another (Casal 2024, p.73). There is *Utility*, which requires to do whatever increases the aggregate sum of benefits; there is *Priority* which values the benefiting of individuals who are worse off above others; there is *Equality*, which tries to reduce the gap between these individuals and, finally, there is *Sufficiency* that “requires us to aid the stranger who is further from having enough, since our claims weaken as we approach the satiation point. While equality is always comparative and priority has comparative variants, [...] Sufficiency, is always noncomparative” (Casal 2024, p.73).

What does this imply? The focus on equality that can be found in policies towards the mitigation of poverty (and the environmental crisis!), at least those analysed in this work, assumes that there is a well-being standard that those in a situation of poverty need to reach.

Being this standard, the European-centred one, being built on economic growth and technological innovation, it is assumed we need more of it. While, in reality, we need the opposite to fix disparities. In this sense, does the more-innovation approach have anything to do with colonialism and social injustice? It has everything to do with it: to assume that we would be able to tackle the eco-social crisis by *producing* more *technology* displays an attitude towards disparities and injustice that puts the experience of the European (assumed) individual at the centre in an un-historical faulty perspective that revolves around the idea of “progress” and dismiss the question “at the expenses of whom?” Framed in this way, sufficiency becomes a moral imperative. Not only does it appear to be something necessary, but also desirable. For this reason, it most definitely must be supported by a political framework, that needs to put at the centre a radical approach towards innovation that allows for the creation of sufficient and efficient technologies, designed and produced to meet actual needs and not to bust growth.

Conclusion: On utopian dreams.

If we intend the term “sufficiency”, as suggested by its roots in the Latin word “sufficere” (Schneidewind and Zahrnt 2014, p. 30), as “being enough”, we can see how the proposed ethics of sufficiency relates to an approach towards innovation that is antithetical to the more-innovation one. The More Innovation Approach, as investigated in Chapter 2 through the analysis of the European Commission's documents, promises to fulfil the dream of a fair and sustainable world through the development of innovations designed to tackle the environmental crisis with the use of different materials, ways of production or extractions, but forgets to address the importance to detangle innovation from economic growth. Not doing so, as seen, it also fails in acknowledging the interconnectedness between environmental crisis, global poverty, the unfair distribution of wealth and resources and the need to build a political framework that allows for the flourishing of an ethics of sufficiency. On the contrary, an ethics of sufficiency based on the joy of making More with Less, to rephrase the title of Hickel’s excellent book (Hickel 2021), can freely spread in a degrowth

economy and relieve some humans from the burden of consumerism while liberating others from the slavery of poverty.

To conceive innovation from a degrowth perspective does not mean to deny the power of technological innovation in alleviating humanity from suffering. On the contrary, it means to argue in favour of its reconceptualization in this sense, pushing it away from the idealistic goals of the growth economy and its industrialized setting, as well as from the luxurious offices of design marketers and out of politicians' well-crafted speech. It means finally designing technological innovations in a way that would be beneficial to those who have been historically sacrificing a lot in honour of “progress”. In this scenario, everyone has what they need, thanks to the (limited) production of durable and useful efficient technologies that alleviate the burden of labour and enhance human capabilities. Technologies to cherish as the incredible tools they are. In this, for many utopic, scenario resource allocation is carefully evaluated, and production is limited to the actual needs of the population, in a fair way that takes into consideration the needs of different individuals and societies, preventing some from accumulating in excess and, in so doing, guaranteeing the necessary to everyone.

How would it be possible to make governments from all over the world agree on this subject? How to break the illusion of everyone’s achievability of (non-generational) wealth? How to adapt overproduction to a good-for-all limited production? In a world where the need to not cross planetary boundaries is only as urgent as that to address inequalities and sufferance, these questions need to find a quick answer, and proposals that go in this direction should be integrated rather than labelled as mere “utopian dreams”. A degrowth approach aligned to an ethics of sufficiency, as presented here, meets the requirements of a “Radical Innovation Approach”, bearing the promise to be transformative and have a desirable impact on the eco-social crisis. Perspectives that too eagerly dismiss the importance of re-evaluating completely the role of innovation in the environmental and human crises, addressing the responsibilities of the over-productive linear economy model and criticizing the accumulation of wealth in the pockets of few, appear to be more idealistic, or even nonsensical in light of the crises we all are called to intervene on. As long as perspectives that call for an intervention in the malfunctioning structure of the capitalistic society are not taken seriously, in the name of some made-up naturalistic understanding of its origins and

functioning, it will never really be possible to address the problem of the over-exploitation of natural resources and human inequalities.

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