CHAPTER 1

Introduction

The Promise and Pitfalls of Techno-solutionism

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1.1 INTRODUCTION

Rarely does a day pass without us being reminded of the social, economic, and environmental challenges we now face. During 2 years of living with a pandemic that seemed to never pass, a series of social and economic issues emerged. Businesses struggled with restrictions and citizens' cautiousness, while regulators struggled to balance economic and business needs against uncertain – but serious – public health considerations. People also experienced pandemic fatigue generated through the numerous minor respites followed by the next and potentially more threatening Greek letter variety of the coronavirus. During this period, the social ramifications of lockdown and restrictions became abundantly clear, and so did the recognition that people were unevenly affected by the pandemic. In addition to the effects on our local communities and states, the pandemic highlighted challenges related to radical inequalities with regard to, for example, capacities for producing and procuring vaccines, but also to use national resources to support and maintain citizens and businesses.

Simultaneously, we can no longer avoid being exposed to the reality of various environmental challenges threatening to drastically alter the trajectory of our future as a species. Climate change and the loss of biological diversity are two key issues, and while some are concerned for the natural world because they consider it to be valuable in itself, others are mainly concerned because these environmental changes are having major social and economic repercussions – for humans.

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Meanwhile, all these challenges are continually being assessed and attempted tackled by researchers, developers, and businesses. More often than not, technology is heralded as the cure for our ills. In the face of COVID-19, for example, vast amounts of research were conducted, and companies launched new AI- and Big Data-based solutions aimed at getting us out of the predicament. Apps for tracking infections, Big Data analysis for pandemic control, and not least AI-based solutions aimed at diagnosing and understanding COVID-19 in a variety of ways. As the tidal wave of research and solutions waned, we found ourselves with meager successes stemming from AI and Big Data (Chakravorti, 2022). The technology that enables vaccines, however, stood out as a very effective technological remedy for the most severe effects of the virus. But vaccines also amply demonstrate how technology relates to inequality. While developed nations with high coverage contemplated a third and fourth booster dose for their population, developing and least developed nations had hardly gotten started. Inequity aside, the unrestricted spread of the virus in some regions can also be a cause of ever-new strands of the virus which threaten to undermine the efforts of the developed and developing nations alike. These are issues where technology and sustainability interlink, and where we see that enabling universal, equitable, and fair access to technology on a global scale is often the only way toward effectively facing challenges (United Nations, 2015).

Climate change is a particularly interesting example of how technology relates to efforts to develop new modes of operation and new solutions which might allow us to escape the direst consequences of humanity's industrial activity. Some argue that the only true solution is to radically change our ways – consume less, produce less, and let go of the notion of growth as we take the notion of *limits* seriously (Farley & Smith, 2020; Latouche, 2009). Others, however, place their faith in *green growth* and human ingenuity (Jacobs, 2013). For the latter group, technology is essential, as it allows for the development of new products with reduced environmental impact, for finding substitutes for resources exploited beyond repair, and not least for manipulating – and even fixing and restoring – our environment (Cao, 2011). Geoengineering and technologies such as carbon capture and storage (CCS) are illustrative examples of the search for technological solutions for mitigating and adapting to climate change (Stuart et al., 2020). By developing new technologies and solutions, we can – or might – add to existing technologies to solve the challenges created by more primitive technologies. The result being a socio-technical system in which the technical elements are ever more complicated (Winner, 1977), and its effective operation is increasingly important for the future prospects of humankind, our environment, and all other species that happen to coinhabit this world of ours. This gives rise to questions regarding humanity's fundamental relationship with technology. Is it a curse, a cure, or even both (Müller, 2016)?

1.2 TECHNO-SOLUTIONISM AND HUMANITY'S SYMBIOTIC RELATIONSHIP WITH TECHNOLOGY

The subtitle of this book refers to *techno-solutionism*, which is in simple terms the idea that we can and should use technology to solve the challenges we happen to face. It relates to the notion that everything is a nail to a person with a hammer, as most problems can be fixed with

a more comprehensive application of technology for the most ardent techno-solutionists. The notion of technological "fixes" is another way to describe this attitude (Drengson, 1984). Morozov (2013) describes how *solutionism* entails a faith in technology, but also a tendency to fundamentally change how we perceive and analyze social phenomena. The notion of faith also suggests a tight link to a closely related term, namely, techno-*optimism*. While techno-optimism most obviously points toward an openness to the possibility that technology can provide a better world (Danaher, 2022), techno-solutionism is more comprehensive. It also entails the step that we can, but need not, act on such optimism in the active pursuit of an agenda in which we organize our societies in ways that make them amenable to the technological solutions we perceive. Exploring how technology changes both our approach to and understanding of fundamental sustainability-related challenges is the central objective of this book. Technology is not just a tool to be used instrumentally for human purposes, as it has profound effects on how we think, the solutions and opportunities we perceive, and even how we encounter and relate to each other (Müller, 2016).

A different concept related to the techno-solutionist approach, particularly as technology relates to our relationship with the environment, is *prometheanism* (Müller, 2016), which originates in the ancient Greek myth of the titan Prometheus. For example, Farley and Smith (2020) argue that the belief that technology can ultimately replace natural ecosystem services suggests a *promethean* perspective, and the terms prometheanism and techno-optimism are widely used in environmental ethics and environmentalism. Popular targets of criticism by the prometheans are the skeptics that have been proven wrong, and few are mentioned more often than Thomas Malthus. In 1798, he released *An Essay on the Principle of Population* (Malthus, 1798), in which he argued that the earth's limitations would inevitably also limit the human population. Long after Malthus, the Club of Rome released *The Limits to Growth* (Meadows et al., 1972), in which they similarly argued that we were running into hard limits that would eventually limit human development. Malthus was certainly proven wrong by technological developments in, for example, agriculture, and most now also seem to argue that technological development has revealed clear limitations in the modeling which is the basis of *The Limits to Growth*.

Prometheus was a titan who stole fire from the Gods and gave it to the mortals, much to Zeus' and the other God's frustration. This fire is usually interpreted as *techne* – rationality, art, and knowledge – which is the cause of human development in terms of increased technological power and capabilities for domesticating and harnessing the natural world (Aeschylus, 2012; Müller, 2016). The price Prometheus paid for this theft was twofold: He was bound and eternally tormented by an eagle eating his ever-regenerating liver, but he was also left concerned with whether he improved or worsened the situation of the mortals. The story is timeless, and the story of the garden of Eden and the tree of knowledge is an early example, while there are countless more recent stories related to the challenges caused by taking our technologies too far. One particularly famous example is Mary Shelley's (2012) *Frankenstein*, aptly subtitled "The Modern Prometheus".

Techno-solutionism is often referred to as prometheanism because it entails a faith in the notion that we can control and take charge of the world in which we live, and that we have sufficient knowledge and technology to do this in a way that will *improve* our

situation. This book examines whether such an approach is well founded, and in particular whether it can help us face and effectively solve the challenges related to environmental, social, and economic sustainability.

Technological change is at the core of all major disruptions in human history, and revolutions, wars, and general development are often connected to and explained by some sort of technological change (Barley, 2020). When I say revolutions, I mainly refer to the industrial kind, which are inextricably linked to the emergence of both new technologies and, more importantly, socio-technical systems. By emphasizing the latter, I allude to a recurring topic in the following chapters, namely that focusing on technologies in isolation will rarely allow us to grasp the full potential or all of the pitfalls that accompany them.

Engineers, developers, and analysts of technology arguably tend to focus on how a particular technology can be used to achieve certain beneficial effects – how it allows us to solve a specific challenge. However, developing and applying technology entails consequences far beyond those intended by their progenitors, and any approach not factoring in such consequences is referred to as an *isolationist* approach to technology and technological change (Barley, 2020).

To really understand the implications of new technology, this book advocates for a broader approach to the analysis of techno-solutionism – one that takes account of the interdependence of different technologies and processes in what Barley (2020) refers to as *stacks*, and also the indirect ripple effects technology has across different social, economic, and environmental domains (Farley & Smith, 2020; Sætra, 2022b). The notion of unintended effects is a well-known term for parts of what must be accounted for in such an approach, but even more so is the notion that technologies are interlinked in complex socio-technical systems (Winner, 1977). In such systems, changes in particular technologies entail changes in the system as a whole. Of crucial importance is the realization that individuals and our societies are integral parts of these systems and thus are also affected by and in a position to influence technological change (Morozov, 2013).

1.3 SUSTAINABILITY AND TECHNOLOGY

Technology is also linked to how humans interact, what sort of traits lead to success for both individuals and groups, and what sort of political arrangements make sense. Technology is arguably what has allowed humans to develop into what we are today (Müller, 2016); our use of various primitive and advanced tools, constructing buildings as shelters, ways of farming land, and medicines and science are crucial components of what make life as we know it possible. Saying that all technology is bad is consequently close to absurd. However, this book is premised on the idea that not all *development* is beneficial (Næss, 1999). While technology has fueled great innovations and rapid development, the notion of sustainable development has now gained prominence because we experience great social, economic, and environmental challenges due to the very growth technology has enabled.

Sustainability is often equated with the notion of sustainable *development*, with its mainstream definition originating with the UN report *Our Common Future* written by the Brundtland commission (Brundtland et al., 1987). The commission emphasized how *sustainability* encompasses more than just the environmental dimension, and that in order to

solve environmental challenges we must also focus on social challenges such as inequality and poverty, and economic issues related to, for example, innovation and inclusive economic growth.

As the evidence of environmental threats continues to amass, the use of the term sustainability has proliferated and become close to ubiquitous (Farley & Smith, 2020). The need to face these threats is perceived as increasingly obvious, and politicians and businesses alike scramble to find the best path toward sustainable development. Everyone agrees that we need to change our ways, and everyone agrees on ambitious targets for the future, with a particular focus on the years 2030 and 2050 (Guterres, 2020; UNFCCC, 2022). But far fewer agree on what actually needs to be done. And all the while, emissions are still rising, biological diversity is reduced, and our oceans are filled with plastics; humanity faces a number of health-related challenges we do not fully understand, but which we assume to be associated with, for example, biological diversity, our use of chemicals, and the food we eat (IPBES, 2022). In short, the world community's ambitions are high, but we are arguably not yet on a path to solving our problems.

These ambitions have been codified in a number of international frameworks, which will be explored in more detail in the next chapter. The most important framework today is arguably the UN's Sustainable Development Goals (SDGs) (United Nations, 2015), which consist of 17 goals and 169 targets, which constitute the *Agenda 2030*. These goals relate to social, economic, and environmental sustainability, and examples of goals are the elimination of poverty, improved health, ending discrimination, reducing inequality, decent work and economic growth, and combatting climate change.

As the SDGs have become the *lingua franca* of political and corporate sustainability, they will also be given extended attention throughout this book. Both because they are widely used and consequently important in the public discourse and because we will argue that reducing sustainability to the SDGs entails real dangers of not achieving the kinds of changes really needed. First, the set of goals does not cover all important aspects related to sustainability, and as such the framework must be complemented by other approaches (Sætra, 2022b). Second, the goals themselves are interrelated and even partially contradictory (Farley & Smith, 2020), and this necessitates a deeper analysis of the nature of such contradictions and how to prioritize our goals. Third, the SDGs and even the original concept of sustainable development are based on certain foundational assumptions that are potentially deeply problematic. These relate to whether or not there are meaningful limits to growth, and whether, for example, *strong* "green growth" might allow us to simultaneously achieve economic growth and improved environmental conditions (Jacobs, 2013). Connected to this is the core assumption questioned in this book, namely that technology can be used to solve and overcome all these challenges, which also makes technology an integral component of green growth.

A key question asked by the contributors is whether technology can be used to fix the very problems caused by technology, as the various chapters examine different aspects related to how technology has brought us where we are today, and whether technology helps or hinders us in our efforts to solve the challenges we currently face. We do take seriously the fact that technological change has played a vital role in allowing us to, for

example, be more numerous, live longer, and be healthier. Some even say that we are at the historical peak of humanity's development, at least according to a large number of metrics (Pinker, 2011). However, this book emphasizes that these successes are also accompanied by a number of fundamental challenges related to social and environmental integrity.

The better part of this volume consists of cases where technology is used to overcome sustainability-related challenges. The cases are different, and so are the theories used and the technologies discussed. In unison, however, they provide the foundation for answering the core question asked: Does technology provide us with the means to solve sustainable development? As will become clear, the answer to this question is far more complicated than it might at first appear to be. This is partly because we show that technology can be both an enabler and inhibitor of sustainable development and the SDGs. However, it is also because the notion of sustainability must be analyzed in some detail before an answer is sought, and I thus support Farley and Smith (2020), who argue that mainstream understandings of sustainability are deeply flawed and in need of a corrective. This is partly because of the numerous assumptions often encompassed in people's use of the term, and to strengthen the shaky theoretical foundations of sustainability as a concept this book will at times return to a more fundamental question: What are the core values we seek to reach through sustainable development and the use of technology? By returning to the technology of philosophy of, for example, Winner (1977), combined with Næss's (1999) deep ecological critique of technology, this book provides a more nuanced conclusion on the proper role of technology in reaching sustainable development.

1.4 WHO IS THIS BOOK FOR?

Anyone interested in both the general and more specific implications of technology should find this book a valuable resource. It will allow engineers of all kinds, including developers and computer scientists, to better account for the impacts of what they develop, which is seen as increasingly important as various ethics of technology gain prominence (Dotan, 2021; Sætra & Danaher, 2022).

It will also be an important resource for managers and others involved in building technology-related businesses. As sustainability is gaining traction in financial markets, where it is often referred to as Environment, Social, Governance (ESG), investors, regulators, and business partners are increasingly interested in learning about the sustainability-related impacts of and on all businesses (Sætra, 2021, 2022a). Without a proper understanding of how technology is related to sustainable development and the SDGs, reporting on mandatory and voluntary frameworks will be exceedingly difficult. It is already evident that poor understanding of and reporting on such implications are punished in the market, and this book can help generate a fundamental understanding of the key relationships between technology and sustainable development.

Another primary audience for this book is politicians and regulators. Controlling technology is notoriously difficult (Collingridge, 1980), and what is referred to as the *pacing problem* describes how technology tends to outpace regulation and regulatory frameworks (Downes, 2009), something that might easily lead to situations in which technosolutionism is allowed to shape our societies in ways unrooted in democratic processes

and democratic will. A fundamental understanding of how technology enables or prevents sustainable development is essential for regulators to effectively shape technological development in the interest of our societies and pre-empt undesirable consequences as much as possible.

Penultimately, anyone working on promoting the UN's SDGs, or sustainable development in general, will find this book's specific focus on this framework useful for understanding both the potential and limitations of using technological fixes for sustainability-related challenges. It will also challenge often unstated assumptions related to the desirability of growth and the absence of hard limits to our societies' – or economies' – growth. Regardless of what position the reader ends up taking, it will be based on a consideration of a varied set of arguments and thus stronger.

Finally, students of any stripe, at all levels, will find something useful in this book. Regardless of what discipline one studies, technology is of some relevance, and it is arguably becoming increasingly important – or at least attracting more attention. Likewise, tomorrow's and today's students will most certainly have to continue the quest for solutions to the sustainability-related challenges generated through generations, and this will require all students to have some knowledge of what sustainability is and how technology relates to it.

1.5 STRUCTURE OF THIS BOOK

In this book, the reader will find a wide array of approaches to the question of how technology relates to sustainable development. To establish the basis on which to build, it begins with an exploration of the key concepts and the theoretical backdrop required to answer the core questions posed in this introduction. The UN's SDGs are actively used throughout this book, both to examine how these goals capture or overlook central elements of sustainable development, and to facilitate and create a common framework for engagement between the chapters. These goals are presented in Chapter 2 alongside other key concepts, with a particular emphasis on sustainability, sustainable development, technology, and technological change. Following this are chapters dealing with specific cases and examples of how technology hinders or helps the achievement of various areas related to sustainable development.

First, two chapters focusing on environmental sustainability follow. In Chapter 3, Benedetta Brevini discusses artificial intelligence and artificial solutions – focusing on the materiality of technology and how AI relates to the climate emergency. Marianna Capasso and Steven Umbrello then discuss the potential and limitations of geoengineering and technologies of planetary control in Chapter 4.

Next are five chapters dealing with social sustainability. In Chapter 5, I and Jo Ese discuss how trans people are using social media filtering to create a less hostile online environment. Then, Neil Selwyn establishes the key aspects to consider regarding the use of technology in education in Chapter 6. Anders Dechsling and Anders Nordahl-Hansen's Chapter 7 proceeds to focus on the specific case of how virtual reality technology is used in Autism Spectrum Disorder interventions. Issues of inequality are discussed in both Chapters 6 and 7, and Erlend Ingridsønn Nordrum drills down on inequality and the digital divide

in Chapter 8. This is followed by Marisa Tschopp and Hanan Salam's Chapter 9, which focuses on SDG 5 and the question of gender inequality in – and within – AI.

Moving on to the economic, political, and legal aspects of technology and sustainable development, Eduard Fosch-Villaronga, Hadassah Drukarch, and Marco Giraudo present a legal sustainability approach to digital innovation in Chapter 10. This is followed up in Chapter 11, where Lilja Mosedottir and Ivar Jonsson explore issues of governance toward sustainable development. Politics is also central as Harald Borgebund proceeds to analyze the relationships between capitalism, sustainability, and democracy in Chapter 12. How politics is effected is also the topic of Chapter 13, where Stuart Mills and Richard Whittle deal with how nudges can be understood as ideational technologies – emphasizing *green* nudges.

The importance of politics is also stressed by Imad Antoine Ibrahim in Chapter 14, as he discusses what he refers to as the "fallacy of disruptive technologies". Proceeding to provide a possible answer to the question of why politics is seen as so important for understanding the potential of technology, Faridun Sattarov discusses how technology relates to the distribution of power in Chapter 15. Knowledge is power, and one might consequently argue that so is data. Proper governance of data is thus a vital issue, dealt with by Petter Kvalvik, Sánchez-Gordón, and Ricardo Colomo-Palacios in Chapter 16.

The final part of this book moves into the domain of radical approaches to sustainable development, starting with Ivar Jonsson and Lilja Mosedottir's Chapter 17 on Techno-solutionism facing post-liberal oligarcy. In Chapter 18, I discuss the role of technology in the radical approach to a more sustainable future, drawing on the work of, amongst others, Arne Næss.

In sum, this book provides a novel combination of traditional theories that are explored through different case studies, providing the ground for a better understanding of how and when technology can – and cannot – be the enabler of sustainable development. In the concluding Chapter 19, the overall findings presented by the different contributors are synthetized, with a particular focus on identifying the generally valid takeaways regarding the positive potential for using technology to achieve sustainable development, but also the pitfalls to avoid if such development is to be realized.

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