The Digital Divide: Effects on Distribution of Wealth and Resources and Climate Change

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Abstract

The usage of digital technology is increasing rapidly among all countries around the world. Access and knowledge in how to use digital technology is however not equal, which create numerous problems in societies. Firstly, this paper will focus on how digital technology impacts the distribution of wealth and resources; secondly, how digital technology affects climate change; and thirdly, how the inequality created by the digital divide leads to further environmental degradation, while climate change leads to further inequality. The focus of this paper is how the usage of digital technology effects the distribution of wealth and resources and climate change within countries. A differentiation between developing and developed countries is made throughout the paper, and a comparison is made on how digital technology affect within country situations depending on whether the country considered to be developing or developed. Findings include that the current usage of digital technology increase unequal distribution of wealth and resources due to the digital divide, and further exacerbated climate change through increased natural resource extraction, increased energy usage, and electronic waste. In addition, findings include that inequality further exacerbate climate change, while climate change increase already existing inequalities. A literature review of the existing academic literature on the diverse topics covered in this paper is used as a methodology, with an analysis which draw these seemingly different subjects together.

Keywords: Climate Change; Digital Politics; Wealth Distribution; Environmental Degradation; Inequalities; Technology; Wealth; Resources.

1. Introduction

The usage of technology has increased substantially since the industrial revolution, which has been further aggravated by the rapid development of digital technology in the past decades (Tomory, 2016; Van Dijk, 2012). Technology is, to some degree affecting all human beings who are currently living in modern societies and playing an increasingly essential role in people's everyday lives (Fuchs & Horak, 2008). The increased usage of technology has created tremendous economic growth and raised the standard of living for people around the world (Jaumotte, Lall, & Papagergiou, 2013; Arocena & Senker, 2003). Since digital technology emerged on the world stage, a diverse set of opinions on how the digital technology would affect human societies developed (Fong, 2009; Bretschger, 2005; Fuchs & Horak, 2008; Van Dijk, 2012). The favourable presumptions of digital technologies predicted that it would improve social equality, increase social mobility, foster economic equality, promote e-democracy, and create further economic growth and innovations (Fong, 2009; Bretschger, 2005).

The rapid technological development of the industrial revolution spread worldwide without adequate knowledge of these new technologies affects the environment. Reckless usage of technology, accelerating abilities to extract natural resources, growing consumption, and increasing amounts of waste have had detrimental effects on the environment and led to further intensifying climate change. At the same time, as the emergence of digital technologies on the world market in the 1980s, the recognition of contemporary climate change was recognised as primarily a human-induced problem. Digital technologies have been speculated to be the solution to many of the environmental issues that earth and our societies are facing today, primarily through improved efficiency in a diverse set of aspects,

minimizing the need of using natural resources, less travel due to increasing interconnectedness through digital technologies, and more sustainable energy options (Bretschger, 2005; Hilty & Ruddy, 2010).

Since digital technologies started to emerge on the market, and until this day, two significant problems are still present. Unequal distribution of wealth and resources within countries are increasing, especially since the 1980s (Jaumotte et al., 2013; Cushing, Morello-Frosch, Wander & Pastor, 2015; Berthe and Elie, 2015). Environmental degradation and climate change have been exacerbating at a faster pace than ever before in modern history, exceeding previously predicted rates the past decades (Nasrollahi, Hashemi, Bameri & Taghvaee, 2018; Steffen, Grinevald, Crutzen & McNeill, 2011). Digital technologies have thus far been failing to live up to the expectations of increasing equality and solving the issues of climate change. Instead, since the emergence of digital technologies, both inequality and climate change are growing more rapidly than ever before in recorded human history.

Due to the rapid development of digital technologies and subsequent differential access to new technologies, a digital divide occurs between people who have access to technology and the people who do not (Fuchs & Horak, 2008). Since digital technologies started to spread around the world, and within countries, the digital divide was estimated to decrease (Fuchs & Horak, 2008). On the contrary, the digital divide is continuing to increase rapidly (Mubarak, 2015). Furthermore, the production of digital technologies requires a significant amount of metals and depletable natural resources (Chancerel et al., 2015), generating a vast amount of electronic waste (e-waste) (Krishnamoorthy, 2018), and the usage of digital technologies requires substantial volumes of energy (Belkhir & Elmeligi, 2018). The impact of the production, e-waste, and usage of digital technologies create many

adverse side effects such as increased climate change, pollution, environmental hazards, and environmental degradation.

The solutions to unequal distribution of wealth and increasing climate change are complex and need a vast array of interdisciplinary measures to be solved. Economic equality and climate change are affected by several factors, such as institutions, political and economic policies, laws, and regulations (Hamann et al., 2018). Digital technology is only a few decades old, and the research field of digital technology's impact on human societies and climate change is relatively new. Current solutions to both inequality and climate change, thus lack adequately considering digital technologies effect on these aspects (Zeira, 2007; Yu, Ndumu, Mon & Fan, 2018). The impact of not analysing all factors which affect social issues leads to inappropriate and inadequate solutions, severely undermining the pursuit of socially and environmentally sustainable societies. Due to the fast emergence of digital technology, it is crucial to understand how it affects different parts of our societies and emphasize interdisciplinary approaches that draw different fields of research together to find new solutions to the issue facing our societies.

Developing and developed country is broadly generalised through the paper, due to how the usage and implementation of digital technology differ so far, especially in regards to the distribution of wealth and resources. Based on the literature used, and the United Nations definition of developing versus developed country, the term 'developed' country refers to the developed regions as identified by the United Nations, while 'developing' country, refers to both the least developed countries and the emerging economies (United Nations, 2019). The generalisation of developing and developed countries are made to simplify the text, and

address different problems with digital technology depending on whether a country is considered to be ‘developed’ or ‘developing.’

This paper aims to expand on the existing literature on how digital technology has affected the distribution of wealth and resources, and how the usage of digital technology has affected the environment and climate change. Moreover, how inequality is affecting the environment, and how environmental degradation and climate change affects inequality will be investigated. A literature review of the existing research and academic literature on these topics is used as the methodology to achieve these aims. The argument made throughout this paper is divided into three major parts. Firstly, how the current usage of digital technology has created an unequal distribution of wealth and resources due to the digital divide which modern societies experience. Secondly, how digital technology further exacerbate climate change through increasing environmental degradation in the production phase, substantial amounts of energy usage when people use digital technology, and accelerating amounts of e-waste in the disposal phase of digital technologies. Thirdly, how inequality due to the digital divide further exacerbate climate change, while climate change increase already existing inequalities.

Section two consists of the key literature of relevant publications of the diverse set of topics. The third section explains the concept of the digital divide and how it affects our societies. Section four examines how the usage of digital technology has affected the distribution of wealth and resources. The fifth sections analyse digital technology’s effect on environmental degradation and climate change. The sixth section analyse how the distribution of wealth and resources, climate change, and the digital divide are interconnected and is further exacerbated by each other. The digital divide and the interconnectedness between the

unequal distribution of wealth and resources and climate change underpins the argument made throughout this article. The sixth section discusses and concludes. The research question this paper aims to answer is; how has the usage of technology affected the distribution of wealth and resources and climate change, and how are these consequences of digital technology affected by each other?

2. Literature Review

The current literature has extensive contributions to how digital technology affects the distribution of wealth and resources. Even though new technologies generally raise the standard of living for people, the usage of digital technologies, and technologies, in general, has created a divide within different societies (Jaumotte et al., 2013; Fuchs & Horak, 2008). Yu et al. (2018), Riddlesden & Singleton (2014), Van Dijk (2006; 2014), Fuchs and Horak (2008), Serrano-Cinca, Muñoz‐Soro and Brusca (2018) explains how the access to digital technology is highly unequal in all societies, which further exacerbates within countries across the world. Jaumotte et al. (2013), Mirza, Richter, Nes, and Scheffer (2019), Asongu, Orim, and Nting (2019), Mukhopadhyay (2004), Zeira (2007), and Reenen (2011) demonstrate how economic inequality leads to unequal access to technology. Unequal access to technology, which creates inequalities and inequalities that create further unequal access to technology, indicates that these factors create a divide within societies which exacerbates income inequality and thus aggravates the unequal access to technology even further (Chetty, Aneja, Mishra, Gcora & Joise, 2018).

In regards to climate change, technology has a substantial part to play in reducing environmental degradation and mitigate and adapt to climate change (Pouri & Hilty, 2018). However, whether the current usage of digital technologies has been able to reduce climate

change is highly contested. Patrignani and Whitehouse (2014), Peterson (2008), Amjad & Mehmood (2016) display how digital technology is generating an increasing amount of emissions and e-waste. Furthermore, current usage and digital innovations have not been focusing on environmental sustainability. Instead, the focused has been on continuous economic growth, wealth accumulation, and new technological innovations that benefit humans in the short-term (Patrignani & Whitehouse, 2014; Bretschger, 2005). Digital technology has, therefore, not lived up to its potential, which is a reduction in environmental degradation and mitigating climate change. The impact of this has thus created further emissions and environmental degradation, attributing to increasing climate change.

3. Digital Divide

The focus of this paper is to examine the usage of digital technologies and how differential usage affects the distribution of wealth and resources and climate change. Digital technologies is therefore defined as the more common term information and communications technology, which includes major technologies such as mobile phones, smartphones, internet of things, big data, geographic information systems, and televisions, i.e. essentially every digital technology which either helps enable or provide information and/or communication (Tob-Ogu, Kumar & Cullen, 2018; Hilbert, 2010).

Technology gives considerable power to the people who have access, knowledge of how to use it, and the capability to use it. Digital technology allows for further wealth accumulation to the person that is possessing such technology and is using it towards their advantage (Fuchs & Horak, 2008). Unequal access, knowledge, and capabilities of digital technology have given rise to a digital divide within countries around the world, which has been further exacerbated by the fast development of digital technology (Yu et al., 2018). The

digital divide means that some people have access to technology, while some people do not, which creates inequalities within societies (Eisenman, 2018). Unequal distribution of wealth and resources links to digital technology based on who gains access to it, whether they use it or not, and how they use digital technology.

Yu et al. (2018) divides access to digital technology into four broad categories, which are the most apparent, these include;

- Material access, which refers to possessing a digital technological device, or the permission of using the device in certain situations.
- Cognitive access, which denotes the ability a person has to use the digital device effectively and efficiently towards personal, professional, or academic tasks.
- Motivational access, which describes the desire to learn, purchase, adopt, or use technology in specific circumstances.
- Social access, which applies to socially constructed conditions which are necessary for using the digital device for specific tasks.

Yu et al. (2018) four categories of access to digital technology are essential due to how they attest how simply acquiring new technology is not enough to diminish the digital divide, cognitive, motivational, and social aspects are crucial as well. Digital inequality is, therefore, highly problematic and needs to be addressed by several different academic disciplines to find adequate solutions to reduce the digital divide. When the term digital divide is used throughout this paper, it adheres to the four categories of access as defined by Yu et al. (2018).

An increasing amount of goods and services, employment opportunities, and the ability to connect to others are accessible through the internet and other digital technologies. The

amount of access a person has to digital technology affects their ability to advance their position in society (Van Dijk, 2006). Without digital technology, or with outdated digital technology, a person will miss the opportunities associated with new technological innovations. Digital exclusion and inequality can thus lead to social exclusion and inequality, which affects how wealth and resources are allocated in societies (Serrano-Cinca et al., 2018). The impact of this allows people with digital access to benefit more than individuals without digital access (Van Dijk, 2006; Bélanger & Carter, 2009). Similarly, people who fulfil the material, cognitive, motivational, and social access to digital technologies will be more successful than individuals who are not able to achieve all the types of digital access. The digital divide is thus far more complicated than solely owning a digital device, and people must have the ability and knowledge required for using it as well.

A study examining the digital divide in Spain and how it is used differently among citizens by Serrano-Cinca, Muñoz-Soro, and Brusca (2018) show that more advanced levels of education are associated with greater levels of internet usage. Similarly, people who earn less than 1.100 €/month use the internet less towards activities that can advance their status in society. Lower levels of income and education lead to exclusion from the benefits of digital technology, which increases the already existing inequalities in society between poor and wealthy individuals. Increasing existing inequalities within societies cause significant problems, including further exacerbation of environmental degradation due to desperate usage of the environment and lesser care of the environment due to other problems that are associated with income inequality, such as decreasing abilities to sustain one's livelihood.

Moreover, digital technologies develop at such a rapid speed that gaining access, and fulfilling Yu et al. (2018) four categories of digital access, is increasingly more challenging

(Maceviciute & Wilson, 2018). For example, Riddlesden & Singleton (2014) found that the speed of people's broadbands affects the performance of how people use the internet. Individuals and groups with faster internet can use it more efficient when working, studying, or creating networks with other people. The people with the latest and fastest digital technology are, therefore, able to gain benefits that people with outdated and slower technology forego. The differential access to broadband speed thus affects people's ability to advance their position in society. The impacts of differential access to digital technologies hence exacerbate already existing inequalities in society, which creates further polarization of the distribution of wealth and resources towards the already wealthy elite.

4. Digital Technology and the Distribution of Wealth and Resources

According to Fong (2009), the adoption of digital technologies such as information and communication technologies (ICT) have increased the average economic growth per capita in developing countries. Rural farmers, who are often the poorest people, have gained further access to ICT and other types of digital technology (Fong, 2009). The impact of this has improved poor rural farmers ability to access updated information, created better linking between buyers and sellers, reduced transaction costs, enabled precision farming, and further improved their ability to put different types of warning systems in place (Deichmann, Goyal, and Mishra, 2016). Furthermore, remote controlling through mobile phones has been implemented, which saves time, energy, and water (Deichmann et al., 2016). As a result, implementing these new technologies has created better opportunities for the inclusion of rural farmers in the economy and reduced transaction costs. Rural farmers are now able to improve the efficiency of their harvest, demand the right price for their product based on real market prices, and have access to a broader set of buyers that can compete for their harvest

(Deichmann et al., 2016). Such digital technological development is vital to a country's development, and great success in diminishing the digital divide within countries.

Even though digital technologies are becoming increasingly accessible in developing nations, income inequality is still increasing (Jaumotte et al., 2013; Freeman, 2011; Lam & Liu, 2011). Even though the inequality rates have been fluctuating at different times in different countries, the top one percent receive, on average, eight percent more of the global income since the 1980s. Furthermore, the richest 10 percent receive 40 percent of the global income, while the poorest 10 percent are earning approximately two to seven percent. In developing countries, poverty increased by 11 percent between the 1980s until 2016 (UNDP, 2019). The digital divide has not decreased either; instead, it is growing at a rapid pace in developing countries, and the vast majority of other countries (Fuchs & Horak, 2008).

Furthermore, if not counting with China, extreme poverty has increased by over 30 percent in developing countries between 1981 and 2004 (Chen & Ravallion, 2010). Income inequality, poverty, and the digital divide are increasing simultaneously in developing, showcasing how these seemingly different aspects of socio-economic lives are affecting and further exacerbating each other. The rapid development of digital technology makes it hard for poor rural farmers in developing countries to keep up with the pace of digital development. The spread of digital technologies to rural and poor communities is slower compared to how fast the wealthy elite in developing countries are adopting these new technologies (Fuchs & Horak, 2008). Individuals with ample education and skills, high income, and influential social relationships are, therefore, far more likely to have access to advanced digital technology. The wealthy people within a developing society are thus able to

gain better material, cognitive, motivational, and social access to digital technologies, while poor people are not able to keep up with the process.

The digital divide, therefore, allows the wealthy elite in developing countries to use technology to accumulate further wealth for themselves, which explains why the average economic growth and income inequality is increasing simultaneously in the majority of developing countries. The average economic growth which developing countries are experiencing can therefore be explained by the accumulation of wealth by a smaller elite, which raises the average economic growth rate in the country, while at the same time increasing unequal distribution of wealth and resources (Jaumotte et al., 2013; Mirza et al., 2019; Mukhopadhyay, 2004). The full access to all of Yu et al. (2018) categories by the wealthy elite, therefore, allows the smaller wealthy part of a population to create increasing amounts of wealth for themselves, while poorer people, with less access, are left behind in the technological process.

If technology choices vary among the people who control and use natural capital, the distribution of wealth and resources is affected (Barret et al., 2011). The effects digital technology choices have on the ability to accumulate wealth and resources, therefore, affects whether inequality increase or decrease. If access to digital technology is inequal, then inequality will increase due to how people with better technology will be able to accumulate more capital than people with lesser technology. In developing countries, extracting natural resources is a crucial part of many people's livelihoods and poor people's resilience (Mirza et al., 2019). Even though poor people in developing countries are gaining further access to digital technology (Deichmann et al., 2016), the digital divide is increasing within developing countries (Fuchs & Horak, 2008). The wealthy elite in these countries can extract a much

larger part of the natural resources due to their better access to digital technology. The increased wealth accumulation by the wealthy elite is often used to buy even better technology, which can extract an even more significant amount of resources. The poorest part of the population, on the other hand, will only gain access to digital technology after it becomes affordable for them, often when said technology is outdated compared to the new technological innovations available on the market. The digital divide thus creates unequal access to natural resources through differential access to technology.

The mining industry is central in the digital transformation, where automation of mines, digital workers, improved analytical capabilities, and autonomous operation is increasing the rate of natural resource extraction with fewer workers (Sganzeria, Seixas & Conti, 2016). A study by Loayza and Rigolini (2016) showed that mining communities increase inequalities, capital generated from mining do not spill over to the mining community or nearby districts. Individual landowners and communities do not own the minerals and metals, and are therefore not compensated for the damage done to their local livelihoods and communities. In Peru, as in many developing countries, laws and regimes are often unfair to the poorer population. Local landowners are forced to accept the prices which mining companies determine as fair market value for the lands (Ponce & McClintock, 2014). Furthermore, due to the digital transformation, the workforce needed for these mining operations are highly skilled workers, often from urban areas. Digital technology thus allows mining companies to extract more natural resources, which is threatening the livelihoods of local communities, while highly skilled workers are gaining employment, which the mining industry offers.

Moreover, in regards to natural resources which are depletable or finite on a human time scale, increasing amounts of extraction by the wealthy elite affects the ability of poorer

people to access the natural resources the poorer people need to sustain their livelihoods. The impact of this creates a circle of wealth accumulation which benefit the wealthy elite in developing nations, while poorer people with less capital and hence less access to digital technology are only able to extract the same amount of resources, or even less (Mirza et al., 2019; Mukhopadhyay, 2004). The inability of poorer people to access high technology, which limits their ability to generate an income increase already existing unequal access to wealth and resources. The impact of the digital divide, and the subsequent unequal ability to extract natural resources between wealthy and poor people, thus further exacerbates already existing inequalities in developing societies.

In developed countries, access to digital technology is more widespread, which makes rapid technological development highly prevalent (Bélanger & Carter, 2009). Even though a significant part of the population uses digital technology, the digital divide is still increasing (Mubarak, 2015). The development of digital technology is rapid, and technologies are getting better for each day, which causes a large population to be unable to keep up with the pace of innovation and implementation of new digital technology (Yu et al., 2018; Mubarak, 2015; Patrignani & Whitehouse, 2014). A large part of the population is therefore left behind in technological development, creating a more substantial digital divide compared to when the pace of technological development was slower.

Matuzeviciute, Butkus, and Karaliute (2017) examine the current literature on whether technological innovations affect unemployment in European countries, finding that it does not increase unemployment and in some cases, foster further employment through technological innovation. However, the measurement used does not adequately measure total unemployment rate, or the long-run effects of technological innovations, or how the

technologies affect societies after the technological innovation phase is over, and the technology is implemented. Furthermore, even though employment stays relatively the same, inequality can still increase.

In the workplace, workers increasingly need a higher and more advanced set of skills to compete (Acemoglu, 2002). The people who have material, cognitive, motivational, and social access to digital technology can learn these new skills quicker than those who do not possess such access. A few people are acquiring all the definitions of access to digital technology, while a large part of the population is falling behind the digital process. The digital divide, therefore, is further exacerbating already existing inequalities which affect the possibility of a person to achieve the skills needed to be employable. Skill-biased technological changes are, thus, the main drivers of why digital technology is increasing inequalities within developed countries. Santos, Sequeira, and Ferreira-Lopes (2017) show that cell phones, internet, and TV contribute to increasing rates of inequality, especially in developed countries. Where technological usage is more extensive, inequality follows the same trend. Digital technological usage is larger in developed countries, which explains the increasing rates of inequality. If developing countries' usage of digital technologies will mimic the usage of developing countries, they will most likely experience the same trend.

The past decades have seen machines take over routine tasks quicker than any period before in human history (Mnif, 2016; Tomory, 2016). Digital technologies are increasingly able to do the work which was previously only able to be done by humans (Mubarak, 2015). Empirical analyses conducted by the research department at the international monetary fund found that digital technology has a dominant role to play in the increasing rates of inequality. The need for middle-skilled labour is decreasing, while automation and offshoring through

digital technologies are becoming more widespread, which displace middle-skilled workers to occupations offering lower-wages (Dao, Das, Koczan & Lian, 2017). The demand for lower-skilled workers is thus decreasing due to the way machines can replace them, while the demand for highly skilled workers is increasing (Michaels, Natraj & Van Reenen, 2014). The jobs which are replaced by technology do, therefore, create downward pressure on the wages of the lower-skilled workers, while the higher-skilled worker's wages are increasing (Pi & Zhang, 2018). Simultaneously differential digital access and ability in how to use the internet allows already wealthy individuals to accumulate further capital for themselves through increasing digital technological capabilities (Helsper & van Deursen, 2017; Kondor et al., 2014). The impact of decreasing wages for middle-skilled and lower-skilled labour, changes in occupation from middle-skilled to lower-skilled jobs, and increasing wealth towards rich individuals there suggests digital technology is leading to increasing income inequalities.

A large part of the people who are unable to learn the new skills needed due to technological changes either become unemployed or have to move to occupations which pay less, thus creating further inequalities. Increasing inequalities lead to accelerating the digital divide due to how increasing inequalities limit full access to technology (Asongu et al., 2019). The impact of this creates further inequality among societies, where the poor starts to get even further behind the technological and societal development, which affects how wealth and resources are distributed. On the other hand, the people who gain full access to new digital technologies are able to accumulate further wealth, thus increasing the difference in wealth between rich and poor people.

5. Digital Technology and Climate Change

Modern digital technology, such as digital technologies, has been given much praise due to the potential they bring in regards to creating a more sustainable natural environment (Hilty & Ruddy, 2010). As of yet, digital technologies have not fulfilled these expectations due to the lack of focus on environmentally sustainable technologies (Patrignani & Whitehouse, 2014; Nasrollahi et al., 2018). In developing countries, digital technologies, and unequal access to digital technologies have allowed for further resource extraction and pressure on the environment (Nasrollahi et al., 2018). The distribution of digital technology is unequal, which leaves a vast number of people in developing countries with inefficient and outdated technology (Fuchs et al., 2008). Efficient digital technology is accessible to already wealthy individuals who can afford higher technology, while poorer people are getting further and further behind technological development. In addition, even if people have material access, many people lack cognitive, motivational, and social access to new technology (Yu et al., 2018). Lack of full access to technology causes a substantial problem regarding both inequality and environmental degradation. Inefficient technologies and inefficient usage of technologies in developing countries cause substantial environmental damage (Li, Hu & Xia, 2016; Nasrollahi et al., 2018).

In developing countries, where large parts of the population depend on natural resource extraction and agriculture usage to sustain their livelihoods, the lack of access to efficient digital technology limits their ability to extract resources in efficient ways. The digital technology allows poorer people to extract more, but without access to sustainable, more expensive digital technology, the extraction will larger without being more efficient. Furthermore, the lack of all four categories of Yu et al. (2018) access to digital technology leads to a decreasing ability to use the technologies inefficient and environmentally friendly ways. In cases with access to technology, which might cause more efficient extraction of

natural resources and agricultural production, the lack of full access to digital technology limits the ability of sustainable environmental usage.

Moreover, the usage of digital technology in both developed and developing countries allows the country's economy to grow. An increase in economic growth in a country is associated with increased pressure on the environment due to larger consumption, which leads to increased extraction of natural resources, and subsequent emissions and pollution (Amjad & Mehmood, 2016; Patrignani & Whitehouse, 2014; Nasrollahi et al., 2018; Peterson, 2008). Increased extraction of non-renewable natural resources affects the natural system in adverse ways, often resulting in eventually depleting or diminishing the non-renewable natural resource. The depletion of a natural resource creates changes in the natural environment, which have detrimental effects (Mirza et al., 2019). The economic growth associated with digital technology thus increases environmental degradation due to larger consumption patterns, which depletes non-renewable natural resources quicker. Moreover, the impact of depletion leads to biodiversity loss, soil degradation, loss of ecosystem services, and different types of pollution, which is further exacerbated by increased electronic waste and energy usage (Hamann et al., 2018; Lennerfors et al., 2015).

Digital technology, which does not focus on extracting natural resources, produces a large amount of environmental degradation and emissions as well (Patrignani & Whitehouse, 2014). A large amount of digital technology causes increasing energy usage and electronic waste (Lennerfors, Fors & Rooijen, 2015). Digital technology generates toxic hazards and requires a large amount of energy from its production, consumption, and disposal. The impact of this creates further environmental degradation, and dangerous toxins are spread (Wang, Zhang & Guan, 2016).

Electricity consumption is the largest cause of global greenhouse gas emissions. New digital technology attributes to increasing levels of climate change through the power needed to operate digital technology, which doubles every five years (Uddin & Rahman, 2010). The more widespread the usage of digital technologies become, the more energy is needed for manufacturing and powering these devices. The usage of digital technology amounts to upwards of 8 percent of the total worldwide energy consumption, not including smartphones or the manufacturing process of digital technologies. The largest contributor to the vast energy consumption are data centers, representing approximately 45 percent, and communication networks, representing approximately 24 percent of energy consumed (Belkhir & Elmeligi, 2018). Even though modern technology can bring many sustainable and environmentally friendly solutions which are desperately needed (Hilty & Ruddy, 2010), the current usage of digital technology to this day has mainly caused an increasing amount of emissions and environmental degradation, which are increasing the rate of climate change (Patrignani & Whitehouse, 2014).

Digital technologies have an average lifetime of 2-5 years, thus depending on continuous manufacturing processes, which results in even further energy consumption due to the manufacturing of digital technologies. Furthermore, the manufacturing of digital technologies requires a substantial amount of precious and critical metals, deriving from mining activities. Electronics accounts for the usage of 90 percent of the precious metals in the industry (Ding et al., 2019). Due to the complexity of digital technologies, they contain the larger part of these precious and critical metals (Chancerel et al., 2015). There are numerous amounts of critical and precious metals, including gold, silver, and palladium. In 2015, the global

demand within the field of electronics for gold, silver, and palladium was 254 tonnes, 12.816 tonnes, and 40.18 tonnes, respectively (Ding et al., 2019).

The mining and continuous usage of the metals that digital technologies require for the manufacturing phase depletes natural resources, while many of the metals which digital technologies rely on are on the verge of diminishing. The short lifetime of digital technologies and the rapid innovation of new digital technologies create further demand for such metals and thus require increasing rates of mining activities. The increasing demand causes further natural resource extraction, pollution, and subsequent emissions due to the mining activities, which accelerates current climate change. Digital technologies are decreasing in size, which could be beneficial regarding the amount of raw material that needs to be used to manufacture new technologies. However, more complex digital technologies create further complex manufacturing processes. The more complex the manufacturing process becomes, the more substantial the number of materials is needed to manufacture the more complex product (Røpke, 2012). As a result, and the amount of indirect material consumption to create the product grows substantially.

The increasing demand of modern digital technology, the rapid innovation process, and the short lifetime of digital technologies creates a substantial amount of electronic waste (e-waste) (Lennerfors et al., 2015). The e-waste contains large quantities of toxic hazards, which is a growing problem around the world due to the environmental degradation it causes and subsequent climate change (Hilty et al., 2006; Wang et al., 2016). In 2016, the global amount of e-waste was 44.7 million tonnes (Krishnamoorthy, 2018). Current data does not specify how a large percentage of each technological advice represents the current amount of e-waste. However, in the European Union, IT and telecommunication equipment represent 16

percent of total e-waste (Holgersson et al., 2018). While in Indonesia, cell phones alone generate over 9500 tonnes of e-waste every year (Panambunan-Ferse & Breiter, 2013). These figures are growing rapidly and gives an impression of how vast the problem of e-waste is and thus how large the effect it has on the environment. The lack of adequate recycling of e-waste substantial amounts of dangerous toxins to spread, creating increasing environmental degradation, at the same time as the precious metals are foregone. Mining new critical and precious metals are the preferred options instead of recycling the current large amount of e-waste. The impact of increased mining, and the spread of dangerous toxins, thus create further environmental degradation due to pollution, emissions, and subsequent climate change

6. Digital Technology, Inequality, and Climate Change

Increasing emissions, pollution, and other forms of environmental degradation have adverse effects on human societies, leading to an acceleration of adverse weather events such as sea-level rise, wildfires, droughts, flooding, and storms. The impacts of such changes in weather severely threaten the livelihood of people across the world, especially for poor people with less supporting mechanisms (Hamann et al., 2018). Poor people in developing countries, who often depend on natural resources and agricultural activities to support their livelihoods, are especially subject to the increasing pressure on the environment (Barret et al., 2011). Increasing rates of climate change and its subsequent effects create substantial problems for poorer people in developing countries due to flooding and droughts, which cause crop failures, and the depletion of natural resources. The richer part of the population can mitigate more effectively to the changing climate, and might even be able to profit from

it. The impact of worse conditions for the poor, while the rich can adapt in time, creates increasing inequalities.

Changes in the natural environment led to changes in human societies, which further exacerbate inequalities (Hamann et al., 2018). Increasing inequalities within societies create a further digital divide due to less full access to digital technologies by the poorer part of the population, which in turn further exacerbates unsustainable usage of the environment resulting in environmental degradation. Simultaneously, the wealthy elite can achieve full access to digital technology due to their abundance of wealth. The impact of increased access to higher technology by the wealthy elite leads to further resource extraction and homogenous wealth accumulation (Mirza et al., 2019). A negative circle of inequality, environmental degradation, and digital technology is therefore created. Digital technology creates increasing environmental degradation and inequality, while inequality accelerates both the digital divide and causes further environmental degradation due to unsustainable usage of the environment and homogenous wealth accumulation.

Furthermore, more substantial resource depletion due to digital technology cause increasing resource depletion, due to the ability of digital technologies to extract more natural resources (Mirza et al., 2019), and the usage of precious and critical metals to create the digital technologies. According to Boyce (1994), richer people have less interest in preserving the environment. The homogenous wealth accumulation by the richer part of the population, therefore, increases both inequalities and environmental degradation. The poorer part of the population, face larger resource scarcity due to the increase in environmental degradation and inequality, which limits their ability to support themselves. The impact of resource depletion and increasing inequalities create a poverty trap in developing countries

where the poor people are unable to get out of poverty due to a lack of resources to sustain their livelihoods and build capital for themselves.

The inequalities, environmental hazards, and depletion of natural resources are forcing more and more people in developing countries to move, especially the poorer part of the population (Cushing et al., 2015; Berthe & Elie, 2015; Barret et al., 2011). People who are already poor, therefore, lose their homes, their jobs, and essential parts of their identity, creating further inequalities. Homelessness and poverty among the already poor population create a further digital divide, whereas the digital divide creates accelerating inequalities. Poverty and inequalities cause the poorer people to use natural resources in unsustainable ways, due to desperation of survival and lack of care because of more persistent issues.

Poverty and inequality exacerbate environmental degradation through unsustainable and desperate usage of natural resources, where poorer people use natural resources in unsustainable ways due to the desperation of survival. The impact of the new digital technology, which creates further economic growth, increased efficiency in resource extraction, electronic waste, and increased energy usage, thus degrades the environment to a greater extent, which is causing irreversible damage to the natural environment, and further exacerbates climate change. The digital divide is creating severe problems through exacerbation of already existing inequalities and through increasing the problems associated with unequal access to wealth and resources. Furthermore, the degradation of the natural environment and climate change causes deterioration in human conditions, especially in developing countries. These impacts primarily affect the already poor population in developing countries, which further exacerbates already existing inequalities.

The impact of climate change on poor people is prevalent in developed countries as well (McNamara, Bronen, Fernando & Klepp, 2017). In developed countries, just as in developing countries, the poorest people in society are the ones who suffer the most significant consequences of climate change (Lake et al., 2012). The digital divide creates a more considerable wealth accumulation for the wealthy people who have material, cognitive, motivational, and social access to new technologies, while poor people do not reap these benefits. Poorer people have a lesser ability to move to a different location due to the inequality in wages, which has caused economic strain on the livelihoods, which has been further exacerbated by the digital divide. Displacement due to climate change occurs in developed countries as well (Ghimire, Ferreira & Dorfman, 2015). The impact of climate change does, therefore, force people in developed countries do be displaced just like in developing countries, which increases inequalities within countries and therefore leads to a large digital divide.

According to Wilkinson and Pickett (2010), inequality plays a critical role in shaping the way people behave towards the environment. Inequality further reinforces the importance of social status, which exacerbates individualism and consumerism (Wilkinson & Pickett, 2010). Inequality causes a few wealthy people to consume more due to an abundance of wealth while setting a standard that is displayed in societies of a desirable amount of consumption (Cushing et al., 2015). Due to the availability of credits, which has been made further accessible due to digital technology (Staab, 2017), even poorer people are able to consume to a higher degree, in attempts of living up to the standard set by the upper class. Environmentally friendly behaviour, which reduces access to different goods and services that can improve a person's social status is thus less likely to be supported.

Furthermore, working hours are increasing in developed societies (Bowles & Park, 2005), which has increasingly become mandatory to support high consumption lifestyles (Wisman, 2011). Hayden and Shandra (2009) present how long work hours are correlated with a larger ecological footprint on a national level. When work hours increase, the pressure on the environment is further exacerbated as well, due to increased overall economic production and changes in the behaviour to the environment (Cushing et al., 2015). The impact of increased economic production, growth, and environmental degradation further exacerbates the rate of climate change. Whereas climate change leads to increasing inequalities within societies.

7. Conclusion

The potential of digital technologies is significant, with possibilities of decreasing inequalities and mitigating climate change. This paper has, however, argued for how the current usage of digital technologies increase the unequal distribution of wealth and resources and increases the rate of climate change. The digital divide within countries further exacerbates already existing inequalities, which has adverse effects on how societies around the world are developing. Depending on the material, cognitive, motivational, and social access to digital technology, a person's ability to advance their position in society is severely affected. The impact of this further reinforces existing inequalities, which further increase the digital divide due to a lack of capital to acquire new digital technologies. Through comparing the usage of digital technologies, and its effects on the distribution of wealth and resources, this paper has argued for how both developing and developed countries are suffering from inequalities due to the digital divide.

Moreover, digital technologies increase the amount of electronic waste and energy usage due to lack of adequate recycling initiatives, short life-span of digital technologies, and rapid

innovation, which leads to the desire to buy the latest digital technology available. The impact of increasing e-waste and energy consumption cause more significant environmental degradation and emissions, leading to subsequent increasing climate change. Climate change and associated adverse effects increase inequalities, whereas inequalities further increase the rate of climate change.

The usage of digital technology has thus far led to increases in inequality, environmental degradation, and climate change. All these factors accelerate each other, causing severe problems to humans and societies around the world, especially prevalent in developing countries where the poorest part of the world's population lives. Without adequate regulations, laws, and policies in regards to digital technologies, the richer will likely get richer, and the poor will get poorer, while climate change will be further exacerbated. With the right regulations, laws, and policies, digital technology does have tremendous potential, depending on how it is used.

8. Limitations of Research

Due to the lack of available statistics and empirical evidence that examines the effects of digital technology on both the distribution of wealth and resources and climate change, this paper is largely theoretical in nature. Future research should focus on collecting empirical evidence which supports the claims made throughout this article. Moreover, the vast array of different variables that affect digital inequality, economic inequality, and climate change and how they affect each other should be acknowledged before any conclusion can be made. This paper has focused on how the usage and access to digital technology and generalised between developing and developed nations. Differential access exists within countries, and differential usage as well. Future research should focus on comparing countries in accordance with the

variables used for this research and examine to what extent differential usage of technology affects societies, including the role of different policies, regulations, laws, and institutions.

Bibliography

Acemoglu, D. (2002). Technical Change, Inequality, and the Labor Market. *Journal of Economic Literature, 40*(1), 7-72. Retrieved from https://www.jstor.org/stable/2698593

Amjad, F., & Mehmood, B. (2016). Dynamics of FDI, Technological Transformation and Environmental Degradation in Developing Countries: A Panel Analysis. *Romanian Economic Journal, 19*(59), 3-24. Retrieved from https://doaj.org/article/2aad58eda6d64f8192f4ac80a5f431c9

Asongu, S. A., Orim, S-M. I., & Nting, R. T. (2019). Inequality, Information Technology and Inclusive Education in Sub-Saharan Africa. *Technological Forecasting & Social Change, 146*, 380-289. doi:10.1016/j.techfore.2019.06.006

Armeanu, D. S., Vintilă, G., & Ghergina, S. C. (2017). Does Renewable Energy Drive Sustainable Economic Growth? Multivariate Panel Data Evidence for EU-28 Countries. *Energies, 10*(3), 1-21. doi:10.3390/en10030381

Arocena, R., & Senker, P. (2003). Technology, Inequality, and Underdevelopment: The Case of Latin America. *Science, Technology, & Human Values, 28*(1), 15-33. Retrieved from https://www.jstor.org/stable/1558020.

Barret, C. B., Travis, A. J., & Dasgupta, P. (2011). On biodiversity conservation and poverty traps. *Proceedings of the National Academy of Sciences of the United States of America, 108*(34), 12907-13912. doi:10.1073/pnas.1011521108

Bélanger, F. & Carter, L. (2009). The impact of the digital divide on e-government use. *Communications of the ACM, 52*(4), 132-135. doi:10.1145/1498765.1498801

Belkhir, L., & Elmeligi, A. (2018). Assessing ICT global emissions footprint: Trends to 2040 & recommendations. *Journal of Cleaner Production, 177*, 448-463. doi:10.1016/j.jclepro.2017.12.239

Berthe, A., & Elie, L. (2015). Mechanisms explaining the impact of economic inequality on environmental deterioration. *Ecological Economics, 116*, 191-200. doi:10.1016/j.ecolecon.2015.04.026

Boyce, J. K. (1994). Inequality as a cause of environmental degradation. *Ecological Economics, 11*(3), 169-178. doi:10.1016/0921-8009(94)90198-8

Bowles, S., & Park, Y. (2005). Emulation, inequality, and work hours: was Thorsten Veblen right? *The Economic Journal, 115*(507), 397–412. doi:10.1111/j.1468-0297.2005.01042.x

Bretschger, L. (2005). Economic of Technological Change and the Natural Environment: How Effective are Innovations as a Remedy for Resource Scarcity? *Ecological Economics, 54*(2), 148-163. doi:10.1016/j.ecolecon.2004.12.026

Chancerel, P., Marwede, M., Nissen, F. N., & Lang, K-D. (2015). Estimating the quantities of critical metals embedded in ICT and consumer equipment. *Resources, conservation and recycling, 98*, 9-18. doi:10.1016/j.resconrec.2015.03.003

Chen, S., & Ravallion, M. (2010). The developing world is poorer than we thought, but no less successful in the fight against poverty. *The Quarterly Journal of Economics, 125*(4), 1577–1625. doi:10.1162/qjec.2010.125.4.1577

Chetty, K., Aneja, U., Mishra, V., Gcora, N., & Josie, J. (2018). Bridging the digital divide in the G20: skills for the new age. *Economics, 12*(24), 1-21. doi:10.5018/economics-ejoumal.ja.2018-24

Clark, B., Auerbach, D., & Longo, S. B. (2018). The Bottom Line: Capital's Production of Social Inequalities and Environmental Degradation. *Journal of Environmental Studies and Sciences, 8*(4), 562-569. doi:10.1007/s13412-018-0505-6

Cushing, L., Morello-Frosch, R., Wander, M., & Pastor, M. (2015). The Haves, the Have-Nots, and the Health of Everyone: The Relationship Between Social Inequality and Environmental Quality. *Annual Review of Public Health, 36*, 193-209. doi:10.1146/annurev-publhealth-031914-122646.

Dao, M. C., Das, M., Koczan, Z., & Weicheng, L. (2017). Why Is Labor Receiving a Smaller Share of Global Income? Theory and Empirical Evidence. *International Monetary Fund*. Retrieved from https://www.imf.org/en/Publications/WP/Issues/2017/07/24/Why-Is-Labor-Receiving-a-Smaller-Share-of-Global-Income-Theory-and-Empirical-Evidence-45102

Deichmann, U., Goyal, A., & Mishra, D. (2016). Will digital technologies transform agriculture in developing countries? *Agricultural Economics, 47*(1), 21-33. doi:10.1111/agec.12300

Ding, Y., Zhang, S., Liu, B., Zheng, H., Chang, C., & Ekberg, C. (2019). Recovery of precious metals from electronic waste and spent catalysts: A review. *Resources, conservation and recycling, 141*, 284-298. doi:10.1016/j.resconrec.2018.10.041

Eisenman, R. (2018). Reducing the Digital Divide. *Journal of Information Ethics, 27*(1), 12-13. Retrieved from https://www.questia.com/library/journal/1P4-2064892110/reducing-the-digital-divide

Fong, M. W. L. (2009). Digital divide: the case of developing countries. Issues in Informing Science & Information Technology, 6, 471-478. doi:10.28945/1074

Freeman, C. (2011). Technology, Inequality and Economic Growth. *Innovation and Development, 1*(1), 11-24. doi:10.1080/2157930X.2010.551062

Fuchs, C., & Horak, E. (2008). Africa and the Digital Divide. *Telematics and Informatics, 25*(2), 99-116. doi:10.1016/j.tele.2006.06.004

Ghimire, R., Ferreira, S., & Dorfman, J. H. (2015). Flood-Induced Displacement and Civil Conflict. *World Development, 66*, 614-628. doi:10.1016/j.worlddev.2014.09.021

Hamann, M., Berry, K., Chaigneau, T., Curry, T., Heilmayr, R., Henriksson, P. J. G., Hentati-Sundberg, J., Jina, A., Lindkvist, E., Lopez-Maldonado, Y., Nieminen, E., Piaggio, M., Qiu, J., Rocha, J. C., Schill, C., Shepon, A., Tilman, A. R., van den Bijgaart, I., Wu, T. (2018). Inequality and the Biopshere. *Annual Review of Environment and Resources, 43*, 61-83. doi:10.1146/annurev-environ-102017-025949

Hayden, A., & Shandra, J. M. (2009). Hours of work and the ecological footprint of nations: an exploratory analysis. Local Environment, 14(6), 575–600. doi:10.1080/13549830902904185

Helsper, E. J., van Deursen, A. J. A. M. (2017). Do the rich get digitally richer? : Quantity and quality of support for digital engagement. *Communication Science, Faculty of Behavioural, Management and Social Sciences, 20*(5), 700-714. doi:10.1080/1369118x.2016.1203454

Hilbert, M. (2010). When is Cheap, Cheap Enough to Bridge the Digital Divide? Modeling Income Related Structural Challenges of Technology Diffusion in Latin America. *World Development, 38*(5), 756-770. doi:10.1016/j.worlddev.2009.11.019

Hilty, L. M., Arnfalk, P., Erdmann, L., Goodman, J., Lehmann, M., & Wäger, P. A. (2006). The Relevance of Information and Communication Technologies for Environmental Sustainability – A Prospective Simulation Study. *Environmental Modelling & Software : With Environment Data News, 21*(11), 1618-1629. doi:10.1016/j.envsoft.2006.05.007.

Hilty, L.M. and Ruddy, T.F. (2010), Sustainable development and ICT interpreted in a natural science context. Information, *Communication & Society, 13*(1), 7-22. doi:10.1080/13691180903322805./

Holgersson, S., Steenari, B-M., Björkman, M., & Cullbrand, K. (2018). Analysis of the metal content of small-size Waste Electric and Electronic Equipment (WEEE) printed circuit-boards part 1: Internet routers, mobile phones and smartphones. Resources, conservation and recycling, 133, 300-308. doi:10.1016/j.resconrec.2017.02.011

Li, L. B., Hu, J. L., & Xia, N. C. (2016). Industrial energy–pollution performance of regions in China based on a unified framework combining static and dynamic indexes. *Journal of Cleaner Production, 131*, 341–350. doi:10.1016/j.jclepro.2016.05.025

Jaumotte, F., Lall, S., & Papagergiou, S. (2013). Rising Income Inequality: Technology, or Trade and Financial Globalization? *IMF Economic Review, 61*(2), 271-309. Retrieved from https://www.jstor.org/stable/43302166.

Kondor, D., Posfai, M., Csabai, I., & Vattay, G. (2014). Do the Rich Get Richer? An Empirical Analysis of the Bitcoin Transaction Network. *PLoS ONE, 9*(2), 1-10. doi:10.1371/journal.pone.0086197

Krishnamoorthy, Y., Vijayageetha, M., Sakthivel, M., & Sarveswaran. (2018). Emerging public health threat of e-waste management: global and Indian perspective. *Reviews on Environmental Health, 33*(4), 321-329. doi:10.1515/reveh-2018-0021

Lake, O. R., Hooper, L., Abdelhamid, A., Bentham, G., Boxall, A. B. A., Draper, A., Fairweather-Tait, S., Hulme, M., Hunter, P. R. Nichols, G., & Waldron, K. W. (2012). Climate Change and Food Security: Health Impacts in Developed Countries. *Environmental Health Perspectives, 120*(11), 1520-1526. doi:10.1289/ehp.1104424

Lam, K. C., & Liu, P. W. (2011). Increasing dispersion of skills and rising earnings inequality. *Journal of Comparative Economics, 39*(1), 82-91. doi:10.1016/j.jce.2010.05.002

Lennerfors, T. T., Fors, P., & Rooijen, J. (2015). ICT and Environmental Sustainability in a Changing Society. *Information Technology & People, 28*(4), 758-774. doi:10.1108/ITP-09-2014-0219

Loayza, N., & Rigolini, J. (2016). The Local Impact of Mining on Poverty and Inequality: Evidence from the Commodity Boom in Peru. *World Development, 84*, 219-234. doi:10.1016/j.worlddev.2016.03.005

Maceviciute, E., & Wilson, T. D. (2018). Digital Means for Reducing Digital Inequality: Literature Review. Informing Science: *The International Journal of an Emerging Transdiscipline, 21*, 269-287. doi:10.28945/4117

Matuzeviciute, K., Butkus, M., Karaliute, A. (2017). Do Technological Innovations Affect Unemployment? Some Empirical Evidence from European Countries. *Economies, 5*(4), 2-19. doi:10.3390/economies5040048

McNamara, E. K., Bronen, R., Fernando, N., & Klepp, S. (2017). The complex decision-making of climate-induced relocation: adaptation and loss and damage. *Climate Policy, 18*(1), 111-117. doi:10.1080/14693062.2016.1248886

Michaels, G., Natraj, A., & Van Reenen, J. (2014). Has ICT Polarized Skill Demand? Evidence from Eleven Countries over Twenty-Five Years. *Review of Economics and Statistics, 96*(1), 60-77. doi:10.1162/REST_a_00366

Mirza, M. U., Richter, A., Nes, E. H., Scheffer, M. (2019). Technology driven inequality leads to poverty and resource depletion. *Ecological Economics, 160*, 215-226. doi:10.1016/j.ecolecon.2019.02.015

Mnif, A. (2016). Bilateral Relationship between Technological Changes and Income Inequality in Developing Countries. *Atlantic Review of Economics, 1*, 1-15. Retrieved from https://ideas.repec.org/a/eac/articl/04-15.html

Mubarak, F. (2015). Towards a renewed understanding of the complex nerves of the digital divide. *Journal of Social Inclusion, 6*(1), 71-103. doi:10.36251/josi.93

Mukhopadhyay, L. (2004). Inequality, differential technology for resource extraction and voluntary collective action in commons. *Ecological Economics, 49*(2), 215-230. doi:10.1016/j.ecolecon.2004.03.020.

Nasrollahi, Z., Hashemi, M-S., Bameri, S., & Taghvaee, V. M. (2018). Environmental pollution, economic growth, population, industrialization, and technology in weak and strong sustainability: using STIRPAT model. *Environment, Development and Sustainability*, 1-18. doi:10.1007/s10668-018-0237-5

Panambunan-Ferse, M., & Breiter, A. (2013). Assessing the side-effects of ICT development: E-waste production and management. *Technology in Society, 35*(3), 223-231. doi:10.1016/j.techsoc.2013.04.002

Patrignani, N. & Whitehouse, D. (2014). Slow Tech: a quest for good, clean and fair ICT. *Journal of Information, Communication and Ethics in Society, 12*(2), 78-92. doi:10.1108/JICES-11-2013-0051

Peterson, S. (2008). Greenhouse gas mitigation in developing countries through technology transfer?: a survey of empirical evidence. *Mitigation and Adaptation Strategies for Global Change, 13*(3), 283-308. doi:10.1007/s11027-007-9111-8

Pi, J., & Zhang, P. (2018). Skill-biased technological change and wage inequality in developing countries. *International review of economics & finance, 56*, 347-362. doi:10.1016/j.iref.2017.11.004

Ponce, A. F., & McClintock, C. (2014). The Explosive Combination of Inefficient Local Bureaucracies and Mining Production: Evidence from Localized Societal Protests in Peru. *Latin American Politics and Society, 56*(3), 118-140. Retrieved from https://www.jstor.org/stable/43284916

Pouri, M. J., & Hilty, L. M. (2018). Conceptualizing the Digital Sharing Economy in the Context of Sustainability. *Sustainability, 10*(12). doi:10.3390/su10124453

Riddlesden, D., & Singleton, A. D. (2014). Broadband speed equity: A new digital divide? *Applied Geography, 52*, 25-33. doi:10.1016/j.apgeog.2014.04.008

Røpke, I. (2012). The unsustainable directionality of innovation – The example of the broadband transition. *Research Policy, 41*(9), 1631-1642. doi:10.1016/j.respol.2012.04.002

Serrano-Cinca, C., Muñoz‐Soro, J. F., & Brusca, I. (2018). A Multivariate Study of Internet Use and the Digital Divide. *Social Science Quarterly, 99*(4), 1409-1425. doi:10.1111/ssqu.12504

Sganzeria, C., Seixas, C., & Conti, A. (2016). Disruptive Innovation in Digital Mining. *Procedia Engineering, 138*, 64-71. doi:10.1016/j.proeng.2016.02.057

Staab, P. (2017). The consumption dilemma of digital capitalism. *Transfer, 23*(3), 281-294. doi:10.1177/1024258917702830

Steffen, W., Grinevald, J., Crutzen, P., McNeill, J. (2011). The Anthropocene: conceptual and historical perspectives. *Philosophical Transactions of the Royal Society, 369*(1938), 842-867. doi: 10.1098/rsta.2010.0327

Tob-Ogu, A., Kumar, N., & Cullen, J. (2018). ICT adoption in road freight transport in Nigeria – A case study of the petroleum downstream sector. *Technological forecasting & social change, 313*, 240-252. doi:10.1016/j.techfore.2017.09.021

Tomory, L. (2016). Technology in the British Industrial Revolution. *History Compass, 14*(4), 365-384. doi:10.1111/hic3.12306

Uddin, M., & Rahman, A. A. (2010). Server consolidation: an approach to make data centers energy efficient & green. *International Journal of Scientific & Engineering Research, 1*(1), 1-7. doi:10.14299/ijser.2010.01.002

UNDP (2019). Goal 10: Reduced Inequalities. Retrieved from https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-10-reduced-inequalities.html

United Nations. (2019). Methodology: Standard country or area codes for statistical use (M49). Retrieved from https://unstats.un.org/unsd/methodology/m49/

Van Dijk, J. (2006). *The Network Society. Social Aspects of New Media* (2nd ed.). London: SAGE.

Van Dijk, J. A. (2012). The Evolution of the Digital Divide—The Digital Divide Turns to Inequality of Skills and Usage. In J. Bus, M. Crompton, M Hildebrandt & G. Metakides (Eds.). *Digital Enlightenment Yearbook 2012* (pp. 57-78). Amsterdam: IOS Press.

Van Reenen, J. V. (2011). Wage Inequality, Technology and Trade: 21st Century Evidence. *Labour Economics, 18*(6), 730-741. doi:10.1016/j.labeco.2011.05.006

Vona, F., & Patriarca, F. (2011). Income inequality and the development of environmental technologies. *Ecological Economics, 70*(11), 2201-2213. doi:10.1016/j.ecolecon.2011.06.027

Wang, Z., Zhang, B., & Guan, D. (2016). Take responsibility for electronic-waste disposal: international cooperation is needed to stop developed nations simply offloading defunct electronics on developing countries. *Nature, 536*(7614), 23-25. doi:10.1038/536023a

Wilkinson, R., & Pickett, K. (2010). *The Spirit Level: Why Equality is Better for Everyone*. London: Penguin Books.

Wisman, J. D. (2011). Inequality, social respectability, political power, and environmental devastation. *Journal of Economic Issues, 45*(4), 877–900. doi:10.2753/JEI0021-3624450407

Yu, B., Ndumu, A., Mon, L. M., & Fan, Z. (2018). E-inclusion or digital divide: an integrated model of digital inequality. *Journal of Documentation*, *74*(3), 552-574. Retrieved from https://www.emerald.com/insight/content/doi/10.1108/JD-10-2017-0148/full/html

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