The Effect of Misinformation on the Delay of Climate Legislation; Economic and Environmental Solutions to Make Environmental Progress in the Absence of Political Support

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Sophomore Independent Research
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Abstract

The scientific community has come to a consensus that climate change is anthropogenic yet the American public is lagging in understanding and acceptance. While the scientific community has tried to spread this information to the public, scientific misinformation propels a narrative that climate science is untrustworthy and inaccurate, and portrays an overrepresented side of climate change deniers to the climate debate. Misinformation is spread by harming scientist's reputations, curating fake science, lobbying, investing in organizations that have prominent and previously trusted names, and most importantly, by spreading doubt about scientific findings (Union of Concerned Scientists, 2017). Because misinformation (coupled with lobbying) motivates an anti-environmental policy mindset in our elected officials, bills are challenging to pass. We must work without this legislation by promoting environmental solutions that also have economic benefits that attract the support of investors as well as elected officials. These solutions include the promotion of individual investment in renewable energy, an increase in green employment, and an increase in carbon capture and other technologies that utilize released carbon to make profitable products. These solutions have the potential to strengthen our economy while working towards a green economy.

Introduction

Today, 97% of the scientific community concurs that climate change is caused by the human addition of greenhouse gasses (AAAS, 2009). Despite this, for decades, climate science has been seen as debatable and ultimately, overlooked when it comes to political policy. Only one out of every five Americans are aware that scientific consensus is over 90% when it comes to human induced climate change (Nuccitelli, 2019). If the scientific community, including the

United Nations and the scientific societies of the United States (AAAS, 2009) agree that there is adequate evidence of anthropogenic climate change, where does the doubt come from? Doubt and misinformation about climate related scientific findings is amplified and endorsed by voices in the media, political figures, and corporations that have powerful and prominent voices. This information that is being portrayed as the other side of the climate debate has to come from somewhere; time and time again, history of science-industry interactions show us that this misinformation and distrust in the scientific community comes from many tactics that corporations use including quietly investing money for people with legitimate degrees to twist scientific consensus and spread doubt about climate change (Oreskes & Conway, 2014, Farrell et al., 2019). This doubt that has been absorbed by the American conscience, threatens the scientific process and delays legislation that is needed to build a sustainable economy and society (Oreskes & Conway, 2014). However, the spread of misinformation is deeply rooted in the American culture, economy, and democracy and may even take a generational shift to eliminate. This shift would take place once tactics are researched, assessed, and put in place to inoculate the spread of misinformation to the public (Farrell at al., 2019). Long term, once this generational shift, or a widespread understanding of misinformation takes root, solutions to this problem include spreading further defence techniques against misinformation as well as legislation that drives companies to provide financial transparency (Farrell et al., 2019). However, these legislative solutions cannot take place while corporations are lobbying against scientific fact and are winning the fight (Oreskes & Conway, 2014, Farrell et al., 2019). Short term solutions are key to show that environmentally aware businesses can prosper and strengthen our economy. If such businesses and solutions are economically promising, legislation could potentially, and only initially, be sidestepped. These solutions include, carbon capture, green power, and creating jobs

that maintain and restore the environment as well as build green energy. These solutions have great potential to help work toward a sustainable economy and society while keeping our economy prosperous. The objective of this paper is to look deeply into the spread of misinformation's correlation to the delay of necessary climate legislation as well as short term, economic solutions to help the economy advance while being environmentally conscious.

The Consensus of Anthropogenic Climate Change

The fact that climate change is caused by human activity is fully endorsed by the scientific community. A United Nations panel, the Intergovernmental Panel on Climate Change (IPCC), states unequivocally that human activities are affecting Earth's climate (IPCC, 2014). This statement has been assessed and supported by NASA, National Academy of Science (NAS), American Meteorological Society (AMS), the American Geophysical Union (AGU), American Association for the Advancement of Science (AAAS) and more (Oreskes & Conway, 2004, AAAS, 2009). A total of 928 scientific papers were assessed to look deeper for scientific consensus (Oreskes & Conway, 2004). Out of these 928 abstracts, 75% of them were either directly expressing their agreement to the consensus or indirectly agreeing by talking about mitigation or impacts of human caused climate change. The remainder 25% of the abstracts took no position on the consensus at all and 0% disagreed with the consensus. These studies have repeated time and time again, and now have been around for upwards of twenty years. Yet, one out of every five Americans do not know that scientific consensus is above 90% (Nuccitelli, 2019). Why is the public understanding of scientific findings lagging behind facts that have been backed by the majority of scientists all over the world for decades? This lag in understanding is called the 'consensus gap' and is as prominent as it is because of misinformation and strategies

to instill distrust in the scientific community (Nuccitelli, 2019). In recent years, these misinformation campaigns have won the battle. Elected officials in congress and sometimes even in the white house are deniers of anthropogenic climate change. These people have heard and believed the misinformation being spread and are therefore a catalyst for the information themselves because they have a public voice and a platform to spread it. Science has spoken and the consensus is concrete yet continuously overlooked and pushed aside. With a 97% consensus that climate change is anthropogenic (AAAS, 2009), the other side of the debate that is portrayed is nothing more than false controversy. While it is challenging to confidently call anthropogenic climate change a fact, because the consensus has not reached 100%, it is simpler to think about how challenging it would be to disprove the magnitude of scientific findings it took to reach this current 97% consensus. Furthermore, there is always more to learn about a scientific subject, there are always more questions and always more data to collect and analyze. This is why scientific consensus is so important and prominent, it might be challenging to definitively say something is a fact, however, based on the thousands of journals and findings that are in agreement, saying anthropogenic climate change is a fact is not too far out of bounds (Oreskes & Conway, 2014).

The Spread of Misinformation

False information regarding anthropogenic climate change or climate change in general is created and spread by corporations using five main tactics: create fake science, threaten scientists who counter their agenda, create doubt in science, use well known names to fabricate their image, and finally, lobby and manipulate government figures (Union of Concerned Scientists, 2017). Each of these tactics were analysed by the Union of Concerned Scientists (UCS), which is

a nonprofit organization of scientists fighting for change based on scientific consensus (UCS, 2017). Each one of these tactics has been used in the past relating to other environmental or public health issues. It has been seen in campaigns against smoking tobacco, the cause of acid rain, the source of ozone depletion, and currently human caused climate change (Oreskes & Conway, 2014). It is important to study these tactics so that their elimination is possible, or at the very least light is brought upon these issues to try and counter their strength.

Looking into the first tactic highlighted above, the creation of fake science greatly propels misinformation campaigns. The official scientific process has a high degree of objectivity and integrity that is required for every publication and assessed by the scientific community. To avoid these scientific standards, companies utilize a small number of experts, commonly with Doctorate degrees to conference, draw selectively from data, and delegitimize scientific findings (Farrell et al., 2019). They write papers, they publish online, and present to the media their curated information as the other side of a scientific argument while using false facts and skewed data (Farrell et al., 2019). These organizations internally acknowledge climate change while publicly denying or propagating doubt. ExxonMobil is an example of this where between 1977 and 2014, 80% of their private documents recognized climate change and its threats while 81% of their external, public documents instilled doubt (Farrell et al., 2019). This tactic causes confusion in the public eye which propels continued support for a company's environmentally damaging or unhealthy products. This also gives a foundation to climate change deniers that currently hold seats in congress and can use it as validation for voting against climate legislation. An example of this can be found looking into the 'debate' over the correlation between smoking tobacco and rising cancer rates in the United States in the 1900s. Before scientific consensus considered the correlation a fact, the tobacco industry took legitimate

questions that were in fact answered by the scientific community and posed them as unanswered questions to the public and media (Oreskes & Conway, 2014). This generated belief that the product's cause of cancer was still widely doubted when, in fact, the scientific community had solidified answers to the posed questions and were nearing a widely accepted consensus(Oreskes & Conway, 2014). Furthermore, in the 1980s, R. J. Reynolds Tobacco company invested $45 million dollars to produce research that defended their product (Oreskes & Conway, 2014). Twisting the science already in existence and curating science with a set outcome in mind enabled the tobacco industry to delay prosecution against their product for upwards of thirty years (Oreskes & Conway, 2014).

Similarly, companies and organizations fund think-tanks and groups with similar intentions and ideologies (Farrell et al., 2019). The money they invest is concealed by using donor-directed foundations that screen the investor's identity from the public (Farrell et al., 2019). This allows this curated science to be propagated and supported by the public (or an editor of a journal publication) without knowledge that it is subjective and funded by a company with a specific agenda. Therefore, the science is presented in articles and news sources that have high quality reputations and therefore, further boost the legitimacy of curated science. In this way, tailoring scientific data is closely linked to how the same corporations use well known names to strengthen their image and scientific standing. For example, ExxonMobile invested in the AGU and participated in their conferences to have a prominent appearance in the scientific environmental community (UCS, 2017). This also shows that many organizations are willing to accept funds even if they are not from environmental sources, leading to many of these interactions. The hidden money paths of investments into curated science and the use of prominent names to make corporations seem more trustworthy than they are, is a major issue that

has been addressed by scientific journal's requirements to disclose funding; however, this should be further remedied with legislation that prevents the disguise of investments. Unfortunately, the use of these foundations that conceal money paths to propel misinformation has quadrupled in the past ten years (Farrell et al., 2019). An example of these investments is Coca-Cola's investment in research at the University of Colorado which persuaded people to increase exercise rather than reduce calorie intake as a weight loss tactic (UCS, 2017). Legislation would be extremely beneficial in curtailing the use of hidden funds in the spread of misinformation. Unfortunately, however, the same people that are benefiting from this misinformation, are using money to lobby their agenda with political figures in power, making the passing of laws against what they are doing that much more challenging (Farrell et al., 2019).

Lobbying leads to what the UCS calls "The Fix" (UCS, 2017). This is a tactic organizations use to sway political figures into voting on policies that benefit them. When this is used by corporations who have the money to do so, they are able to quietly influence policy. Lobbying is legal in the U.S., however, when these corporations use curated science, their influence on representatives undermines the democratic process. Because of this, legislation that needs to be set in place to curtail the investments into misinformation, will be difficult to pass. Between the years of 2000 and 2016, two billion dollars were invested in environmental lobbying. The money spent by fossil fuels, transportation and other similar industries exceeded the money spent by environmental organizations ten to one (Farrell et al., 2019). The Heritage Foundation is a specific think tank that is supported by General Motors, Mobile Oil and more corporations and conservative foundations (Oreskes & Conway, 2014). The Heritage Foundation specifically has lobbied for offshore oil development, reductions in air-quality standards, faster licensing for nuclear power plants and more (Oreskes & Conway, 2014). This think tank has

used lobbying, intimidation of scientists, instillment of doubt and more to spread the beliefs of their investors both private and corporate (Oreskes & Conway, 2014).

The next tactic that is important to explore is the intimidation of scientists who produce information or data that opposes a company's product or agenda (UCS, 2017). There are many examples of this throughout climate science history, one prominent example highlighted in "Merchants of Doubt" is that involving a scientist named Ben Santer (Oreskes and Conway, 2014). Santer is a highly honored and respected climate scientist who published findings in 1995 with the IPCC. His report was attacked and some people even claimed he admitted to doctoring the data and analysis. Despite the claims having absolutely no proof to stand on, the attacks stuck in people's minds as evidence that scientists were making climate change seem worse than it really was. The same people that attacked Santer's report persisted throughout many health and climate debates for years to come. They consistently did not contribute to scientific finding but instead attacked the science proposed by legitimate scientists. Despite their lack of evidence, their claims continued to be represented in the media as 'the other side of the debate' and used by political figures as "justification for inaction"(Oreskes & Conway, 2014). These attacks on scientists also lead to their presentations as "alarmists" (Oreskes & Conway, 2014), which is an important aspect of their tactic. If scientists were seen as a small group of over dramatic alarmists then why throw money and legislation at the issue?

Lastly and extremely importantly, is the doubt that these corporations instill in the objective scientific findings about climate change. This tactic has spread deeply into the American public and has been what propels climate change denial. First and foremost, this tactic is used to delay legislation against certain products that cause environmental harm. While there is still doubt in the air about certain scientific findings about the health of products or their

influence on the climate, it is feasible to delay the reduction or elimination of their use. This has been used in every campaign talked about so far. The health precautions of tobacco were portrayed as uncertain by the industry, the destruction of the Ozone layer by Perfluorochemicals (PFCs), the use and health concerns of Teflon, the list goes on (UCS, 2017, Farrell et al., 2019, Oreskes & Conway, 2014). Specifically, ExxonMobile invested in many different organizations that opposed climate science and spread misinformation (Oreskes & Conway, 2014). The company also paid journalists directly to write pieces that opposed science and spread further doubt about the topic (Oreskes & Conway, 2014). This tactic was used by many organizations in the fight to oppose climate science. We can see it again in the fight against the banning of CFC where people were paid to exclaim that there was little scientific evidence proving the harmful effects of CFCs (Oreskes & Conway, 2014). Long after these people left the public scene, their claims still hung in the public's mind and the media's platforms (Oreskes & Conway, 2014).

This installment of doubt in the American public is assessed by Cailin O'Connor and James Weatherall (2019) from a logic and philosophy of science perspective in a book called "The Misinformation Age: How False Beliefs Spread." They refer to the issue of scientific doubt as "The Problem of Induction" (O'Connor & Weatherall, 2019). They explain that corporations play into the fact that science can always be wrong, and that despite a large consensus on any subject, the scientific community will never know anything with absolute 100% certainty. They look into this idea in detail by examining Dupont's push for 'certainty' when it came to the risk of CFCs and their influence on the Ozone hole. While the CFCs were actively harming the environment and science was showing continuous results of this harm, Dupont, the creator of CFCs, kept pushing for more and more information before action was taken against the product. Eventually, NASA collected irrefutable satellite data which proved that the Ozone hole was

there. After an Antarctic exploration for CFC byproducts, the cause of the Ozone hole was found and was proved to be CFCs. Even after these developments, Dupont's CEO still called on congress to not be too quick with drawing conclusions and still was pushing for absolute 'certainty,' claiming it still was not there. This idea about certainty was also talked about in "Merchants of Doubt" when referring to the tobacco industry, the authors say that continued uncertainty "keeps the controversy alive" (Oreskes & Conway, 2014). Ultimately, these companies and organization's use of spreading doubt is not about being right or having correct data. The purpose is to keep the public questioning and keep politicians away from making definitive decisions against their product for as long as possible.

Methods to Fight Misinformation

Eliminating misinformation is crucial for inoculating the power that wealthy corporations have over environmental policies. Legislation is the ideal solution to the issues highlighted above. Specifically, laws that would expose the hidden transfer of money from corporations to organizations that produce false science and spread misinformation(Farrell et al., 2019). However, as previously mentioned, this will be challenging to do when lobbying against such laws is so common. Therefore, defensive techniques that can be done without legislation, must be assessed and put in place. These solutions include research that exposes money flows, education that brings to the forefront the techniques used by corporations to spread misinformation, and education that restores trust in the scientific process (Farrell et al., 2019). The support of grassroots organizations and campaigns is also an important aspect as it makes lobbying for specific agendas less effective and promotes our politicians to be less biased when it comes to voting on specific legislation. Educational solutions include shedding light on the tactics corporations use so that the public knows what to look for when it comes to health and

environmental ‘debates’ over potentially hazardous products. It has been shown that somebody with an initial foundation of knowledge geared toward climate misinformation will likely resist the false information when it is presented to them (Farrell et al., 2019). It is also important to highlight the scientific process to try and restore trust in the scientists producing information. A larger percentage of the public knowing the objectivity and strict review of scientific data analysis would lead to more trust in the consensus of climate change. Ultimately, until educational methods shine light on the tactics of corporations, legislation will not be past to combat the issues at the root.

Legislation that promotes environmental solutions has also been difficult to pass because these solutions have been seen as economic challenges rather than a way to grow our economy. Ultimately there would also be a shift in the way we think about businesses and products. While currently, economic deficits are at the forefront of business decisions, the harm these decisions do to the environment are often not considered and should also be a decision factor. This may be something that takes a while to be factored into final business verdicts or may in fact, never have a substantial impact. However, this would be a helpful tacktick, by applying monetary values to environmental deficits, understanding the environmental harm of products or businesses would be put in terms that everyone would understand(Jorquera & Lindblad, 2016). Until legislation to promote more environmentally sound practices is passed, we need to work within the current system and make environmental businesses and products attractive to investors, politicians and the wider public. To achieve this, we can further investigate environmental solutions that have economic benefits that range from the creation of jobs, prosperity in the energy sector, and the creation of environmentally friendly products that target large markets and generate substantial revenue.

Greening the economy through green energy and green employment

As previously mentioned, solutions to climate change have been seen as economic challenges which is a narrative largely spread by misinformation and those who invest in it. In many ways, this is why environmental legislation has been delayed or inadequate. However, reaching environmental goals does not have to be economically detrimental, in fact, according to Kruse et al., green policies can help avoid economic burdens and have the potential to even boost economic growth (Kruse et al., 2017, p.3). With misinformation delaying such policies and creating a situation where scientific fact does not have a significant influence on legislation, we must assess new solutions. Currently, our economic growth is very much related to a decline in the overall health of the planet. Ideally, there needs to be a switch in mindset that prioritizes reducing environmental damage along with economic deficits when it comes to businesses and producing products. This won't be done until misinformation is addressed but, until then we should promote economically beneficial solutions that are attractive to investors but also benefit the environment or reduce environmental damage of already prosperous businesses. These solutions include, but are not limited to, green power, the creation of jobs that build green infrastructure and energy, as well as carbon capture and utilization.

Energy supply is traced to 35% of human released carbon dioxide, therefore, this sector leads to high potential for mitigation if green power becomes more prominent (Frie et al., 2018). So how do we do this and are we on our way? In 2016, the UCS promoted solar, wind, and energy efficient technologies to reach each state's Clean Power Plan set in place by the EPA in 2015 (UCS, 2016). They highlighted clean energy coupled with a carbon dioxide trading program as an economic solution to reach reduced carbon emission goals (UCS, 2016). This plan highlighted many goals by 2030 that predicted renewable energy would boost economic growth,

these goals included: 204 gigawatts of renewable energy which would lead to $189 billion in capital investments, $64 billion for energy efficiency advancements, $17.8 billion revenue from carbon allowance sales, and $103 billion in health and climate benefits (UCS, 2016). With losses in energy production from coal and other limited natural resources, some of these monetary benefits will not be quite as impactful, but the value in the energy sector itself will not decrease with this switch. Also, the monetary values placed on the environmental and health benefits of this switch are unparalleled. An important concept is that the replacement of harmful energy with green energy will still stimulate the economy and will bring health benefits, for which we can in fact, assign monetary values.

The largest issue when it comes to green energy, according to Frei et al. (2018), is the market's liquidity, or the ease with which it can be traded. This is deeply assessed in *Liquidity in green power markets – An international review* (Frei et al., 2018) and farther referenced here. If the market is seen as too risky to invest in, renewable energy is seen as non-financeable. The major aspect to increase the favorability in the renewable energy markets is demand from the public. Currently, Tradable Green Certificates (TGCs) are being used as a means to trade Certificates of Origin (COs). COs are used to prove the origin of green energy after it is added into the electrical grid. In voluntary green power markets, it is the consumers that drive the demand for this product. To increase liquidity, green energy needs to be promoted and more TGCs need to be traded. Frei et al. (2018) emphasise that green power generation has quickly increased after voluntary demand and political support escalated. The U.S. is slowly making its way: in 2014, coal, the worst energy polluter, made up less than 39% of energy generation while natural gas was around 28% and renewable energy was at 7% (UCS, 2016). By 2050 The UCS

optimistically predicted that with investments in renewable energy, coupled with technology improvements 80% of U.S. energy could be generated by green power (UCS, 2016).

An increased support for green energy is economically justifiable in many ways. It has been shown that energy development increases economic growth in many sectors; a transfer to sustainable energy will impact manufacturing, transportation, services and training, agriculture and more (Yi, 2014). In 2018, 85% of Americans, including 71% of republicans, supported having 100% of our energy be renewable by 2050 (E2, 2019). This statistic is obscured by the significantly smaller consensus, however still a majority of Americans, at 58% who believe a switch to renewable energy will improve economic growth and creation of jobs (E2, 2019). In summary, the numbers show that, while the vast majority of Americans want to make the switch to renewable energy, there are significantly less people that believe this switch will be economic. This is a clear example of misinformation at play, while the majority of Americans in both parties support renewable energy, their voices are somehow not as loud as those who spread the idea that renewable energy will not be as profitable as current energy production. When referring to a clean energy economy, the Pew Charitable Trust believes it will "generate jobs, businesses and investments while expanding clean energy production, increasing energy efficiency, reducing greenhouse gas emissions, waste and pollution, and conserving water and other natural resources" (Yi, 2014). A clean energy economy includes green energy and power as well as the increase in green employment (Yi, 2014). A clean energy economy will be profitable and will sustain employment demand.

Green employment and renewable energy go hand in hand, as green energy has been seen to be a large contributor to environmental employment (Kruse et al,. 2017). There are two definitions of green jobs: either positions that produce products or provide services that help the

natural environment or conserve resources or positions that focus on making a business use fewer resources or are more environmentally friendly (Novello & Carlock, 2019, p. 6). This defines three main categories: renewable energy production, energy efficiency, and environmental management (Novello & Carlock, 2019). In terms of renewable energy production, in 2016 alone, 8.1 million jobs were generated globally in green energy with the largest contributing sectors being solar, biofuels, and wind (Kruse et al., 2017). In the U.S. in 2018, there were three times more clean energy jobs than those in fossil fuels (E2, 2019), and by 2030, 4 million jobs could be created by the expansion and promotion of renewable energy (Kruse et al., 2017). For green power the employment levels are higher per megawatt of produced energy than in emission releasing power sources (Kruse et al,. 2017). Despite this, because green policies may call for a reduction of energy overall, there still may be a drop in energy demand (Kruse et al., 2017). However, if energy production stays high, (which is expected for the next few years) the labor intensity of green energy would boost employment. Looking at a short term energy forecast by the U.S energy administration, in 2021 electricity consumption is expected to increase by 1.6% and continue to rise in 2022 (US EIA, 2021). They also predict that in 2021, coal production will rise by 5%, while natural gas use will decrease because of its climbing cost (US EIA, 2021). As an alternative, we need to make green energy more attractive than coal, so that when prices drive us to look for alternatives we use renewable sources rather than environmentally damaging ones.

The next green employment category is based on energy efficiency. This includes occupations related to improving the efficiency of any electronic requiring power to the efficiency of motors in vehicles. This category further includes public transportation employees, and workers that would improve insulation and energy efficiency of homes and businesses

(Novello & Carlock, 2019). In 2018, energy efficiency accounted for 2.3 million jobs, being considered the largest category of green employment (E2, 2019). Efficiency is an important topic when it comes to reducing the CO_2 emitted to the atmosphere. When process efficiency is high, it means that the process uses less energy to create the desired outcome. When efficiency is low, more energy is needed to create the same outcome and, therefore, more CO_2 would be released into the atmosphere. This is something people can implement today and see a direct return when it takes less energy to heat their home or less gas to fill their car. Initially it takes an investment, but there is a major financial benefit to the individual homeowner or business owner in the long run. This is clearly an important sector when it comes to working towards a green economy. There are other benefits to this sector as well, green jobs in general, are less likely to have low-paying wages compared to their non-green counterparts (Novello & Carlock, 2019). The typical low-wage worker in green sectors makes $5 to $7 more than that of the average American low-wage worker, in each job sector the wage difference can be seen in the chart below (Novello & Carlock, 2019).

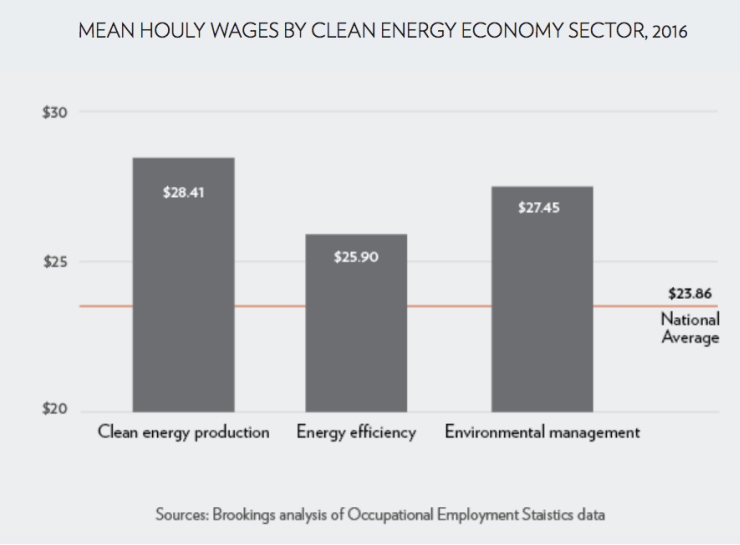

Figure 1: “Mean hourly wages by clean energy economy sector, 2016” (Novello & Carlock, 2019)

It is important to note that this does not mean switching to green jobs will exclude American workers that have less education or means of training. One out of six construction jobs are in energy efficiency and a significant portion are in manufacturing which is projected to rise (E2, 2019). A study by the Organisation for Economic Cooperation and Development provides the following figure.

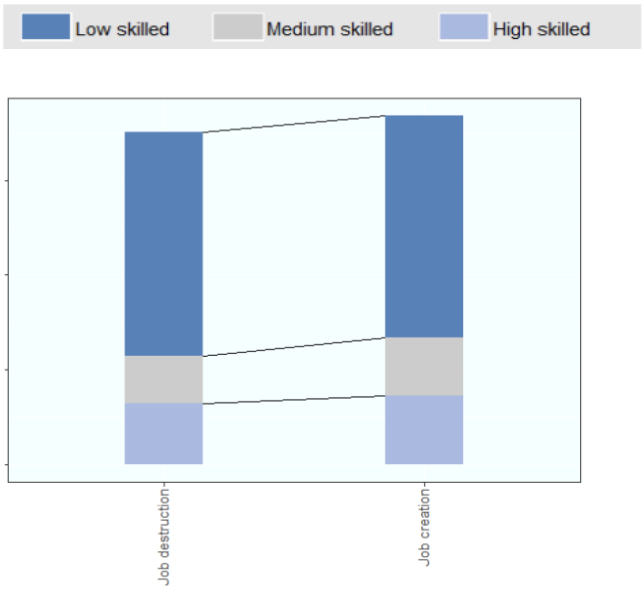

Figure 2: "Ambitious green policies create and destroy similar job types" (Kruse et al., 2017)

The evolution of a green economy will not favor more or less skilled workers in the industries. Particularly, because the energy efficiency sector has high rates of typically less skilled occupations, the increase of jobs in this sector will positively impact those with any wage and income while benefiting the economy and green power sectors (Kruse et al., 2017).

The last main category of green employment is environmental management such as environmental remediation, restoration, legislation and more. There are large economic benefits associated with environmental remediation and restoration. The resources provided to humans by the environment is limitless. Ensuring those resources are maintained is the role of many

environmental management occupations and will have future economic benefits. Already, climate change is undeniably causing economic deficits. From wildfires that destroy thousands of homes and businesses to ocean levels rising and storm surges that are projected to cause $5 trillion dollars in damages by 2100 (US EPA, 2015), stabilizing the environment will continuously reduce these economic deficits. On top of this, there are many sectors that rely on current environmental services; for example agriculture and forestry. The EPA predicts that environmental remediation could save $6.6 to $11 billion in damages in agriculture and $500 million to $1.5 billion in damages in forestry. Therefore, the increase of jobs in environmental remediation will help the economy today as well as in the long run by reducing future damages and costs to agriculture, forestry, and other major divisions in our economy. Jobs will also be generated through waste management and recycling (Kruse et al,. 2017). Recycling is known for being one way in which we can reduce our individual environmental footprints. In a study performed by the EPA (US EPA, 2020), it is seen that recycling more materials actually produces more jobs and revenue than the landfill alternative. In 2007 EPA's findings were that recycling materials boosted employment, wages, and tax revenue. Since 2007, these trends have turned downward, however, this could have been affected by the economic climate in the country at the time (US EPA, 2020). This EPA (2020) study shows the potential that the recycling industry has on the economy. Overall, actively working to combat energy inefficiency and environmental degradation will be economically beneficial today as well as in the future.

The increase of green employment will further be promoted with the implementation of green policies. As previously mentioned, policies may be delayed due to their current partisan stigma, however when executed properly, policies have the potential to boost economic growth and overall increase employment. The key to this transition will be preparing the workforce with

the proper training as jobs in typical less environmentally friendly sectors will decrease while green jobs become available (Kruse et al., 2017). Labor that is flexible will be key to hold on to while a more environmentally friendly economy comes into place (Kruse et al., 2017). If skills in certain aspects of the economy are able to transfer over to green jobs, the ease of a switch in employment will be increased (Kruse et al., 2017).

Development of New Technologies

In addition to promoting energy efficiency and green energy, new technologies have the potential to increase green jobs further. An example of this kind of technology is carbon capture, storage, and utilization. It is important to note here that since there are environmental alternatives that do not release CO_2, carbon capture should not be promoted as an avenue for the continued use of fossil fuel generated power. Rather, carbon capture will be important to counter the CO_2 that is released during processes that humans can no longer live without and ones that, currently, do not have low carbon alternatives. Today, transportation and production of many products are major examples of such processes. A major category is the industrial sector which produces glass, cement, steel, and more (Psarras et al., 2017). This industrial sector alone releases 5.5 gigatons of CO2 (roughly 23% of total global carbon emissions) into the atmosphere (Psarras et al., 2017). Manufacturing is projected to increase by up to 50% globally by 2050, and will therefore, contribute more and more greenhouse gases. Carbon capture at flue outputs has not been widely implemented because of its steep expense (Psarras et al., 2017). But, what if we could capture the carbon produced during the manufacturing process, and turn it into a product that ideally balances out the cost of the carbon capture? This is a relatively new theory that has attracted funding to spark innovation and has been showing promising results. The market for

products produced from carbon is estimated to be over one trillion dollars in value, however, in 2019 our economy was only seeing 250 million being invested (Xprize, 2019). The Carbon Xprize was introduced to promote the invention of carbon products to more fully take advantage of the value estimated in the use of carbon dioxide (Xprize, 2019). Finalists were chosen based on the products with high economic value and market size; the final carbon products were advanced materials, polymers and bioplastics, fuels and chemicals, and lastly, building materials (Xprize, 2019).

An example of these products was proposed by the company Carbon Upcycling Technologies (CUT) which uses captured CO_2 to produce solid powders that have a range of uses. CUTs also make the process of manufacturing specific polymers and plastics more efficient by decreasing the energy input by ten to thirty percent (as previously mentioned, efficiency is an extremely important limitation when it comes to the release of CO_2). Another product awarded the Carbon Xprize are carbon nanotubes created with captured carbon. Because of its incredible strength, this product has high potential in many high cost markets including steel, aluminum, and carbon fiber. Currently, the production for carbon nanotubes is stunted by the high cost of manufacturing but the new proposed technology is one hundred times cheaper. In addition, by replacing applications of steel and aluminum with carbon nanotubes, the CO_2 emissions from these metal's manufacturing processes will also be reduced. One last awarded product worth mentioning is AirCarbon®. This is a biodegradable plastic that is made from captured carbon and methane (which is another highly potent greenhouse gas). The plastic market is highly profitable and continuously growing in demand, however, it is also under pressure to be replaced with more sustainable alternatives due to the CO_2 emissions released by the manufacturing process and the post-consumer pollution. AirCarbon® addresses these concerns by being

biodegradable and carbon negative (beyond carbon neutral) if renewable energy was used to produce it. These examples and more show the incredible potential for carbon capture (Xprize, 2019).

There are many more applications for using captured carbon. These products use captured greenhouse gases to target markets with high demands. In addition to reducing CO_2 emissions through carbon capture, the new technologies and materials further reduce CO_2 emissions by decreasing the use of materials who's manufacturing processes pollute and by increasing the efficiency of other manufacturing processes to reduce energy usage. The potential for these products to be carbon negative allows specific carbon emitting processes, that are deemed necessary for our society and economy, to continue operating while we work towards carbon neutrality. There are many avenues to commit to environmentalism but also propel our economy forward. These have been discussed above and include green jobs, renewable energy, and technology that produces products from carbon dioxide.

Conclusion

Scientific misinformation propels a narrative that climate science is untrustworthy, inaccurate, and unsettled. This misinformation has been set in motion by corporations that use their deep pockets to curate science, use well renowned scientific names, lobby against scientific action and more (UCS, 2017, Farrell et al., 2019, Oreskes & Conway, 2014). Their efforts have been rewarded with elected officials voting for policies that continue to support unsustainable practices and provide huge financial benefits to those corporations, while also amplifying the misinformation throughout the country. This misinformation is what has propelled climate change denial and seemingly has given it a foundation to stand on. This is dangerous and

extremely limiting when it comes to the support needed to pass the legislation necessary to work towards a green economy which is imperative to curtailing further harm to the environment. Because misinformation (coupled with lobbying) motivates an anti-environmental policy mindset in our elected officials, environmental bills are challenging to pass. While combating this misinformation will take time, we must work within the system by promoting environmental solutions that also have economic benefits that attract investors as well as elected officials. These solutions include the promotion of renewable energy, increase in green employment, and carbon capture and other technologies that utilize released carbon to make profitable products. We can research, assess, and promote environmental and economic solutions that go far beyond the scope of this paper. Environmental legislation that cuts the use of products and byproducts that worsen our climate has exceeded in the past with CFCs, dichloro-diphenyl-trichloroethane (DDT), teflon, and more (Oreskes & Conway, 2014). The ban against these products did not limit the economic prosperity of the companies or corresponding sectors. Instead, engineered alternatives were produced that are economically profitable and not environmentally harmful.

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