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**Radioactive, Internal Colonialism: The Uranium Industry's Historic and
Current Impact on the Navajo Nation**

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In partial fulfillment of a Bachelor of Arts Degree in Environmental Analysis

May 2023

Pitzer College, Claremont, California

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Abstract

The United States withheld information pertaining to the health problems associated with nuclear power, allowing uranium to be extracted, processed, and stored in the Southwest of the United States and more specifically the Navajo Nation. With this, many Diné people who had previously worked in the mines or lived within close vicinity to facilities developed various types of illnesses. This thesis argues that the development of nuclear energy in the United States is a form of radioactive, internal colonialism and that the current waste facility located in Carlsbad, New Mexico is furthering this history into the present day. This thesis examines the stages of uranium mining production, the United States' incentives for uranium extraction, the associated health risks, and significant nuclear spill events in order to present a holistic history of nuclear energy. The research includes a historical overview of how the United States government neglected to provide the proper information about the harms associated with nuclear power as a tool to perpetuate environmental racism as well as radioactive, internal colonialism. With this, the paper analyzes the role Indigenous-founded activist groups played in combating these injustices. The investigation of the Waste Isolation Pilot Plant, which is the only official national geologic respiratory waste facility in the United States, inspects the current prevailing dangers of nuclear energy. With this, the thesis concludes that nuclear energy as an alternative energy source to shift away from oil and gas will continue to commit acts of violence against Indigenous populations.

Keywords: nuclear energy, uranium, the Navajo Nation, environmental justice, radioactive colonialism

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Introduction

The lack of information from the United States government has led to many instances of people experiencing environmental injustices. The history of nuclear power is no exception. During the 20th century, the uranium mining industry, riddled with secrets, withheld information from the public in order to prevent taking proper procedures to protect public safety. The United States government, in particular, hid the health concerns associated with nuclear energy from miners and workers in the industry as well as from people located near the mines and facilities, many of whom were Indigenous people. The nuclear industry, supported and funded by the United States government, historically and currently, perpetuates harm to the environment and causes health complications. These environmental harms disproportionately affect Indigenous communities in the Four Corners and Latinx communities of the greater southwest. Environmental injustices will continue as the United States further invests in this industry. With these environmental injustices Indigenous-founded activist groups found tactics to resist environmental injustices in the 20th century. By uncovering the history of uranium mining, the lack of information given to people who worked in the industry, and the current threats imposed by waste management facilities, one will be able to identify the ways in which the government neglected to prioritize the wellbeing and sovereignty of Indigenous communities.

Background

The United States' uranium mining industry started in the early 1900s, initially as an element to create metal for aircraft, extracted alongside vanadium, but the industry sky-rocketed in the late 1950s with nuclear technology advancements. The increased interest in uranium during the 20th century centered around economic growth and the development of nuclear weaponry. After World War II, the Cold War began which incentivized the United States to

invest in uranium mining even further (Eichstaedt, 1994). The Atomic Energy Act of 1954 assisted the development of nuclear energy by licensing nuclear materials in the United States (NRC, 2020). In the 1950s, seven hundred and fifty mines were operating, allowing many people looking for work to pursue a career as a miner (Brugge, 2002). The development of nuclear power within the United States, however, came to a halt in 1979 after a minor nuclear meltdown in Three Mile Island, Pennsylvania which caused the evacuation of an entire town (Zimmerman, 1983). The operation of uranium mines has yet to be as significant as in the 1950s; however, with the demands for alternative energy sources in order to reduce carbon emissions, nuclear power has reemerged into the conversation for the United States.

Nuclear power creates a significant amount of energy, thus making it a difficult alternative energy source to rule out. However, it is essential for the United States government to reckon with the past injustices the nuclear energy industry is accountable for. The United States' harmful effects from uranium mining in the 20th century must be resolved in order to ethically continue their investment in uranium, if possible. Nuclear energy is suggested as a plausible band-aid solution in order for the United States to reduce its carbon dioxide emissions. This indicates investment into the nuclear industry will be prior to solving its prevailing issues. Investing and relying on nuclear energy may avert environmental injustices in the future because it has the potential to prevent temperatures from rising more than already predicted, but Indigenous communities will bear the brunt of its immediate calamities to the environment.

These complexities make the topic interesting to study, especially since many current discussions about nuclear energy neglect to include the history of its environmental injustices. The United States leased, degraded, and polluted land due to the location of uranium deposits. With degradation to the land, the United States also infringed on Native Americans' sovereignty

as well as exposed them to radioactive contamination which led to health problems such as lung cancer. This history only builds upon the past forms of colonialism and environmental injustices experienced by Indigenous people since the United States began pursuing the violent beginnings of manifest destiny. The uranium industry is specifically a form of radioactive colonialism, which is a term to describe the exploitative process of uranium on Native American land for economic incentives. The Navajo Nation, located in the four corner states of Arizona, Utah, Colorado, and New Mexico, is a crucial location to investigate the tradeoffs of nuclear energy since the environmental injustices that occurred in the 1950s were severe, devastating, and prevailing. The Navajo Nation is located close to and on large sums of uranium deposits, which led to the community's safety to be at risk as the United States tried to extract this resource. The Navajo Nation is also a significant location due to the immense amount of activism, reparations, and justice initiated from this issue.

This thesis aids the field due to its in-depth analysis of the dilemmas of nuclear energy and how it is internal, radioactive colonialism. This will help envision the potential future harms of nuclear energy if the United States invests further in uranium mining. This thesis analyzes the uranium industry which then allows the thesis to investigate the Waste Isolation Pilot Plant (WIPP) located in Carlsbad, New Mexico, and contextualize this facility as another and current form of radioactive colonialism. The analysis of Indigenous-founded activist groups from the Navajo Nation explores resistance tactics that aid decolonization efforts. This investigation builds upon previous scholars in the field and enables their theories and discoveries to be applied to the present day. This is important because it makes evident that the uranium industry is still riddled with environmental injustices and will continue to harm marginalized groups. Finally, it

is imperative to discuss the harm perpetuated by the United States when conversing about nuclear energy to ensure everyone's voices are heard, recognized, and acknowledged.

Throughout this thesis, the Navajo Nation and Diné people are used to refer to the same group of individuals. Diné is a translation meaning "the people" in Navajo language and is a term Diné people use to refer to themselves (Iverson and Roessel, 2002), Diné people are also commonly referred to as Navajo. This thesis will use these terms interchangeably but commonly use Diné to describe a population of people while Navajo is used to define a structural representative body, for example, the Navajo Nation and the Navajo government. I also acknowledge that I am writing my thesis about a group that I do not share the same identity with. I discovered this topic during an environmental justice class and my choice of this topic was due to my own lack of awareness of the ways in which nuclear energy is responsible for environmental injustices. Centering the Navajo Nation is important for understanding how the United States government is complicit in land theft, degradation, and genocide. As I desire to highlight this history, it is equally as important to discuss the Diné people's resistance and activism to present their strides in decolonization and strengths as a sovereign nation.

Methodologies

My research addresses the adverse environmental effects and environmental racism of uranium mining on the Navajo Nations' population. This thesis' methodologies mainly include historical analysis and primary source examination but also encompass discussions with academics, activists, and cross-tabulation of data. These multiple methods provide an intricate and holistic view of the uranium industry's relationship with environmental degradation, health problems, and colonialism. The initial historical analysis enables a comprehensive, evidential telling of the events that influenced the uranium mining boom in the 20th century. This allows

the reader to grasp the prolonged duration of the uranium industry in the southwest as well as the immense amount of investment in uranium. The explanation of the mechanics to turn uranium into usable energy and how it leads to radioactive contamination and serious health conditions allows the reader to understand the multiple, detrimental ways radioactive contamination impacts communities. This history then sets the stage for the discussion of the United States' colonialist approaches to achieving economic gain with nuclear power. This historical analysis is imperative in order to grasp this history's severe acts of violence.

The thesis explores primary source analysis of activism in response to nuclear energy. The activism can be analyzed through an environmental justice framework that incorporates theories of internal, radioactive colonialism. This analysis then comprehensively presents the ways in which the activist groups used decolonization to maintain independence. Using environmental justice as a framework also creates a means to explore the significance of land degradation by the United States as an act of violence towards the Navajo Nation. This allows the environment to be viewed as both a tool for the oppressor to oppress and for activists to liberate themselves.

The establishment of current facilities and waste management sites can then finally be recognized as environmental racism and radioactive colonialism by building from historical narratives and primary source analysis. This allows current administrative decisions to be viewed with skepticism. The similarities in the ways that the government historically advertised nuclear energy and how they are currently promoted will be apparent. This is significant to explore because it allows the reader to view the current policy and investments with a deeper understanding of the real impacts nuclear energy has on Indigenous communities.

Literature Review of the Scholarship about the United State's Uranium Industry in Relation to Indigenous Populations

As the United States begins to diverge from oil and coal as energy sources, nuclear energy is being considered an alternative and increasingly desirable source of energy. However, the United States has a grim past of harming Indigenous communities through mining, radiation, and pollution. This literature review maps the variety of topics relating to the uranium industry and Indigenous populations; from health issues and cancer rates, injustices to activism, and historical issues to present clean-up measures.

To begin, scientific literature about uranium, radon, and radiation with reference to public health is imperative to the discussion of nuclear energy since it provides concrete evidence that uranium has dangerous properties that lead to health adversities. The book, *Radionuclides: Properties, Behavior and Potential Health Effects* edited by Nataša Todorović and Jovana Nikolov (2020) assembles scientific literature about uranium from its chemistry to the ways in which it can threaten people's health. One chapter explores the interaction between radionuclides and other properties such as hydrogen and Strontium (Sarap and Jankovic, 2020) Another latter chapter then discusses and analyzes radon within the context of potential health risks by using case-controlled studies of people directly exposed to radiation (Mancini, et al., 2020). The literature makes evident that when radon is in the body, it leads to lung tissue damage and potentially lung cancer. The various chapters in Todorovi and Nikolov's book are significant since they are able to compose information about the chemical properties of radon and its health risk.

As briefly mentioned in Mancini, et al.'s chapter, case studies are essential to providing evidence for health risks stemming from radiation. In the research article, *Perceived Occupational and Environmental Exposures: A Case Study of Former Uranium Millworkers*.

Environment and Behavior (Madsen et al., 1996), the paper's findings demonstrate that Millworkers are at risk of cancer due to their occupation. The paper states 92.5% of the respondents experienced health issues and of that 92.5%, 56% of the health problems were identified as respiratory (Madsen et al., 1996). This research article also includes anxiety and depression health symptoms that arise when working at the uranium mills. This presents a wide range of consequences from uranium exposure, which is important to consider when examining how different people may be affected. Finally, this research article separated the sample population by Indigenous and non-Indigenous and found that Indigenous people experience higher levels of health impacts (Madsen et al., 1996). This allows the need for further examination of how uranium has disproportionately impacted Indigenous people which other authors examine in deeper contexts.

Moving away from scientific literature and research articles in *As long as grass grows: The indigenous fight for environmental justice, from colonization to Standing Rock*, by Dina Gilio-Whitaker (2020), this author explores the activism that arose when Indigenous women developed birth defects from uranium mills. The book identifies the movement in South Dakota on the Pine Ridge Reservation, in which Indigenous women founded Women of All Red Nations (WARN). WARN conducted preliminary research that examined how women were experiencing increased rates of miscarriages (Gilio-Whitaker, 2020). This allowed the identification of health risks and how they may differ based on different identities such as sex. With the current knowledge discussed above, health impacts, specifically on Indigenous populations and women are essential to examine within the realm of uranium mining. The Oglala Sioux people in South Dakota were fighting against uranium mining and made strides towards justice as made evident in Dina Gilio-Whitaker's book.

The Navajo Nation is estimated to have 25 percent of the United States' recoverable uranium (LaDuke, 2005). Because of this, mining in this location persisted throughout the 20th century, especially in the 1950s. Academic literature about the historic legacy of nuclear energy in the United States and Navajo Nation documents the ways in which the United States government took little action to protect Indigenous peoples. For example, Eichstaedt (1994) and Churchill and LaDuke (1986) covered the Navajo Nation's history with uranium and brought to the forefront the problems of nuclear energy. Eichstaedt (1994) in *If You Poison Us: Uranium and Native Americans* covers a comprehensive history of uranium mining including anecdotes of people who had first-hand experiences with the uranium industry either through family members or being a worker themselves (Eichstaedt, 1994). Churchill and LaDuke (1986) in "Native America: the Political Economy of Radioactive Colonialism. Insurgent Sociologist", explore the economic incentive for uranium in the 20th century and how it led to a neocolonial rule of the Navajo Nation (Churchill and LaDuke, 1986). All of these historical aspects stress the importance of acknowledging the legacy of the uranium industry. Churchill and LaDuke's piece is especially relevant when analyzing how nuclear energy became a form of oppression that further infringed on the Navajo Nation's sovereignty.

Waste is another prominent issue in the 1950s pertaining to nuclear energy. David Lewis in his journal article, "Native Americans and the Environment: A Survey of Twentieth-Century Issues", dedicated a section of his article to waste storage and atomic threat. His article discusses the nationwide issue of nuclear waste in a multitude of different Indigenous communities (Lewis, 1995). LaDuke (2005) in her article "Navajos Ban Uranium" discusses how harm from contamination and radiation has already been prolific and the want to further develop the nuclear industry during Bush's administration has continuously placed the Navajo Nation at risk

(LaDuke, 1995). Lewis's and LaDuke's work surrounding waste is a crucial part of the conversation since it not only acknowledges the harm the Navajo Nation experienced in the past but also the possibility of further harm from nuclear energy development in the future.

Literature about this topic also focuses on the current impacts of the uranium industry on Indigenous populations from waste, persisting cancers, and the potential risk of reopening the mines. *Wastelanding: Legacies of Uranium Mining in Navajo Country* by Tracci Voyles written in 2015 discusses the term “zombie mines” coined by Diné activists. This term addresses the abundance of mines that have yet to be cleaned up from the 1950s. Zombie mines can also be seen as a metaphor for the perpetual damage the uranium industry has caused since people are still living with cancer (Voyles, 2015). Zombie mines are also seen as “undead” since the mines are not in operation but currently pose the threat of being reopened. Eugene Stepp (2014) addresses the current steps that need to be taken in order to decontaminate the Navajo Nation. He specifically provides an executive summary from a federal standpoint about the procedures that need to be followed to ensure no further harm can occur from the abandoned mines (Stepp, 2014). Literature on the prevailing harm from uranium mining is imperative since it poses the question: How can the United States invest in more nuclear energy when the past uranium has yet to be cleaned up?

The literature on the uranium industry and Indigenous communities focuses on health implications, waste, historical injustices, and activism. As nuclear energy is once again being considered as an energy source that will allow the United States to move away from oil and coal, the legacy of uranium mining on Indigenous populations must be acknowledged and taken into great consideration. Literature has yet to discuss the future impacts and implications of the investment of uranium and Indigenous communities, specifically pertaining to waste

management. As uranium still exists in the Navajo Nation as well as other areas such as Pine Ridge Reservation, there must be action for history to repeat itself. For the remainder of this thesis, I will be discussing the history of uranium mining, environmental justice, and the current threats from the industry.

Chapter Summaries

In Chapter 1, this thesis investigates the life cycle of extracting uranium in order to produce nuclear energy and traces the harms perpetuated through each stage of this process. This begins with a discussion of the history of uranium mining and the developing incentives for nuclear energy which include the atomic bomb to alternative energy sources.

This then leads into Chapter 2, where the thesis analyzes how nuclear power has disproportionately harmed the Navajo Nation. This history is then contextually framed within internal, radioactive colonialism to further explain the unique environmental injustices experienced in the Navajo Nation. Building from historical analysis, this thesis discusses past and present activism by analyzing active Indigenous-founded organizations and their projects to achieve environmental justice. The thesis then conceptualizes the strength of grassroots organizations and collaboration with academics and governmental agencies as well as these groups' strides toward autonomy over their land.

Finally, Chapter 3 analyzes the Waste Isolation Pilot Plant (WIPP) located in Carlsbad, New Mexico. This exploration includes history, lawsuits, demographics, and EPA reports to create connections between this site and past events involving the uranium industry in the southwest. This then sets the stage to discuss the current administrative decisions around nuclear

energy and public opinion to speculate on who will be most affected by nuclear energy moving forward.

Chapter 1

The Initial Developments of Uranium Industry's Legacy on Navajo Land

The United States has a long record of mining on the Navajo reservation, dating back to the early 20th century. To understand the gravity of this situation, it is important to review the different factors and mechanics that play a part in this history. This chapter summarizes the mechanics of uranium production, the origins of uranium mining and nuclear energy, the United States' incentives for uranium extraction, and the health issues that arise from uranium mining and the ways it leads to contamination. These components are crucial in understanding the severity of the issues on the Navajo reservation. The background on the United States' differing incentives for uranium mining, specifically during the Cold War, also makes evident that the uranium industry disregarded the wellbeing of people because of the covert nature of technological development during this time. This historical context and knowledge of the intricacies of the industry are instrumental in understanding the lifecycle of uranium and the risks associated with nuclear energy. It thus becomes clear that the United States government disregarded certain group's wellbeing in order to increase their economy, demonstrate military strength, and protect their country against foreign power which left countless people with irreparable damages.

Uranium Mining, Nuclear Energy, and Climate Change

Before exploring the historical background of uranium mining in the United States, it is important to understand the mechanics of the uranium extraction process to provide an explanation of uranium's impact and sources of pollution. The most common form of extraction in the 20th century was uranium mining which is the process of extracting the element uranium either by physically digging uranium up from rocks or in open pits typically from sedimentary

rocks (Monson, 1983). After mining, the uranium goes through a process called milling and tailing. The uranium is crushed and leached with acidic or alkaline, creating a substance called yellow cake (uranium oxide) (Johnston et al., 2007). This process leaves radioactive waste, which can lead to the contamination of air, soil, and water (NRC, 2020). The radioactive waste is also difficult to dispose of and is stored in barrels underground or in nuclear facility sites.

Now, in the 21st century, in situ leaching is a more common means of extraction. In situ leaching began in the 1960s in multiple countries, including the United States. In situ is the process of injecting a suitable leach solution under the water table into the ore zone. This oxidizes the uranium and makes uranium available for extraction (IAEA, 2017). This then dissolves the water-soluble uranium and extracts it through production wells (Monson, 1983). Wyoming was the first state to implement this type of extraction in 1963 and by the late 1960s in situ leaching expanded into the southwest (IAEA, 2017). Currently, in situ leaching is the majority method of uranium extraction in the United States (IAEA, 2017). Unlike mining, in situ leaching does not produce airborne radioactive contamination but does pose the risk of polluting groundwater (Monson, 1983).

After milling and tailing or in situ leaching, the uranium is then ready to be processed in the reactors, where nuclear fission creates energy. Nuclear fission occurs when uranium-238 is inundated with neutrons. Once this happens, the uranium releases neutrons to maintain its fission reactions and produces heat energy (Chan, 2020). This is also where the uranium is enriched, meaning the composition of the uranium element is changed by the separation of isotopes. Even though different reactors have varying approaches for producing nuclear fission, boiling water reactors is one common reactor type. This reactor has a single coolant and works as follows: the core inside the reactor vessel creates heat and water is moved upwards through the core and goes

through two stages of moisture separation (NRC, n.d.). Then, steam enters the turbine generator producing energy. With this, there are substantial hazards associated with nuclear reactors. Nuclear fission occurs in the reactor which uses fuel rods containing fuel pellets (IAEA, 2019). These fuel rods are highly radioactive and must be diligently stored in waste management facilities (IAEA, 2019). Furthermore, mismanagement of nuclear reactor sites and management facilities can lead to irreparable environmental conditions. There have already been several incidents of mismanagement that have led to dangerous and life-threatening situations. The most notorious being Chernobyl.

Chernobyl, a catastrophic radioactive disaster in the U.S.S.R. in 1986, is a prime example of the risk of nuclear plant meltdowns that provides insight into the worst-case scenario when a government tries to cover up a nuclear disaster. In this case, the fission reactors underwent extensive boiling which caused the fuel to overheat and disintegrate. These severed reactor pieces were then ejected into the coolant, causing an explosion on a massive scale (Garrick, 2013). In hopes of extinguishing the reactor's burning core, the administrators at Chernobyl administered boron carbide, sand, clay, and lead on top of the core, but this ironically caused the reactor's temperatures to increase even further (Petryna, 2003). This caused radioactive exposure to drastically increase as contamination immediately released into the air. This led to the eventual displacement of citizens and high levels of radioactive exposure to people living near and downwind from the plant. Soil and waterways were also heavily contaminated (Petryna, 2003), highlighting that Chernobyl did not only affect citizens but the environment as a whole.

The Soviet Union had the possibility to protect people from radiation, but the U.S.S.R. avoided taking direct action in an effort to protect its reputation. General Secretary Mikhail Gorbachev did not alert the public of the radiation until eighteen days after the meltdown,

causing thousands of people to be exposed, many of whom developed cancer in the following years after the event (Petryna, 2003). Many people became sick but did not have the science or the information to articulate their health problems (Kuchinskaya, 2014). This left many people ill with unanswerable questions. This similarly happened to people in the United States, which will be discussed later in this paper. Nevertheless, this demonstrates the lack of responsibility from governments that left people sick and dying without the ability to explain why.

Knowing the detrimental effects nuclear energy poses to public health safety from the case of Chernobyl it may seem surprising that multiple countries invested in this energy source. However, currently, in the 21st century, nuclear energy is proposed as the solution to climate change because of its ability to help meet the United States' energy supply while not emitting carbon dioxide (Department of Energy, n.d.a). Climate change is a real threat to humanity as temperatures are predicted to rise 2 degrees Celsius above pre-industrial levels, prior to the 19th century (Zheng et al., 2019). This will cause irreversible changes to our ecosystem. One reason for this occurrence is carbon emissions being released into the atmosphere from burning fossil fuels, such as coal and oil. Carbon dioxide makes up 76% of anthropogenic greenhouse gas emissions (Zheng et al., 2019). If we continue to rely on these energy sources we will further exhaust our resources, leading to more drastic changes in our environment.

Renewable energy seems like a plausible alternative due to its low carbon footprint, however, relying solely on renewable energy will not be enough to provide for the high demand for energy from wealthy countries such as Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. These seven countries make up 60% of global net worth (Zheng et al., 2019). The emerging economies of Brazil, Russia, India, China, and South Africa, in combination with the seven wealthiest countries, contribute to over 60% of greenhouse gas

emissions (Zheng et al., 2019). This is important to discuss because it presents the problem: What will these countries do to keep up with their energy consumption? Currently, many of these countries have already turned to nuclear energy and in over 30 countries nuclear reactors are in operation and contribute approximately 14% to global electricity in order to meet the demands of energy consumption (Ahearne, 2011). As we find ourselves in a critical moment to decrease our carbon emissions, nuclear energy, even with its risk, is being considered to save our planet from temperatures rising and an unforeseeable future for humanity, but at the cost of harming Indigenous communities across the globe.

The History of Uranium Mining and the United States Incentives

Uranium extraction in the United States began in the 20th century and continues into the 21st century. The purpose behind uranium mining has changed over the centuries, which is important to note while discussing nuclear power because it provides insight into the lengthy duration of degradation and pollution that has been perpetuated throughout the years. This also supports the reasoning behind the United States not taking proper precautions in order to protect people from the harmful effects of the uranium industry, especially toward Indigenous people. The United States prioritized its reputation, as seen during the arms race, and thus led to land degradation on Indigenous land.

Initially, mines in the Four Corners (Arizona, Utah, Colorado, and New Mexico) were erected in the early 1900s to extract vanadium which is a metal that helps produce steel alloys (Kelley et al., 2017) and uranium mining for nuclear energy did not begin until 1942 (Voyles, 2015). The Colorado Plateau, which is where the Navajo Nation resides, was targeted for this initial vanadium extraction because the area contains high amounts of the mineral carnotite

which contains vanadium (Eichstaedt, 1995). Vanadium is still used today in steel products and batteries, but the majority is produced outside of the United States (Kelley et al., 2017). It is also important to note that vanadium present in soil, air, and water from natural weathering or mining can be a harmful pollutant potentially leading to cancer (United States. Agency for Toxic Substances and Disease Registry, 2009). Finally, vanadium is significant to the uranium industry because both elements are from the mineral carnotite (Eichstaedt, 1995). This highlights that the exposure to hazardous substances in the Navajo Nation started not with uranium extraction but over a century ago with vanadium, making the effort for healthy living standards a long, tedious, and ongoing fight.

The 1920s caused a lull in vanadium extraction in the United States, mainly because a vanadium company in Belgium monopolized the business (Johnston et al., 2007). During this time, knowledge of nuclear energy advanced. By 1938, Otto Hahn and Fritz Strassman discovered the decrease in uranium mass due to nuclear fission can be converted into kinetic energy, which then can be converted into heat (Gosling, 2010). This knowledge thus started the Manhattan Project in 1942 where the United States government employed 129,000 people to develop and research nuclear weaponry (Winkler, 1987). During this time the United States tested its first nuclear weapons in Alamogordo, New Mexico (Winkler, 1987), a city three-hundred miles south of Los Alamos, where the atomic bomb was initially built (Norris, 1996). The Manhattan Project and the atomic bomb led to the death of 250,00 people in Hiroshima and Nagasaki in 1945 with the initial impact, and many more from radiation exposure during the aftermath (Barnaby, 1995). This devastating event was the benchmark for the end of WWII and simultaneously the beginning of more investment and research into nuclear energy leading to the arms race. Some scientists also declare this as the beginning of the Anthropocene

(Zaretsky, 2018), an epoch where humans are able to change the earth's climate. This time period is a crucial moment in history to analyze how the United States government used fear tactics of a different country threatening the nation in order to invest in nuclear power. This ironically enabled the United States government to commit acts of violence on its own land.

As WWII ended and the Cold War began in 1947, uranium mining soared to new heights in the United States. The arms race is a term to describe the competition between the U.S.S.R. and the United States as well as other countries to advance their nuclear weapons from 1947 to 1991. The United States was already known to have scientific knowledge of nuclear power due to Hiroshima and Nagasaki, however, this did not deter them from further investing in uranium. With this, uranium mines became abundant in the United States, with many mines being located in the Four Corners. Just under 800 mines produced uranium in the Colorado Plateau by 1953 (Eichstaedt, 1995). Uranium was in its highest demand yet and proceeded to be heavily mined until the end of the Cold War in 1991.

The idea of mutually assured destruction withheld actual detonations of nuclear weapons but did not prevent wealthy countries from investing in creating nuclear energy. France, China, India, North Korea, Israel, Pakistan, and the United Kingdom are all countries that took membership in the arms race (Chen, 2020). With this, all of these countries needed testing sites for their nuclear weaponry, many of which were located on islands in the Pacific or Indian Ocean. The United Kingdom tested on Montebello Island, an island located off the coast of Australia, Christmas Island, Malden Island, as well as other locations (Johnston, 2007). The Soviet Union tested in Siberia, Ukraine, Kazakhstan, Uzbekistan, and Turkmenistan (Johnston, 2007), all of which were controlled territories of the U.S.S.R. post World War II. Finally, Israel and South Africa tested their weaponry on Prince Edward Island (Johnston, 2007). Due to the

scope of this thesis, these countries' extraction of uranium and testing sites will not be further explored. However, The Swedish Parliament documented in 1997 that 70 percent of the world's mines were located in lands inhabited by Indigenous people (Johnston, 2007). Nevertheless, it allows speculation on how many other people were exposed to radiation contamination, especially Indigenous people during uranium extraction and Pacific Islanders during weaponry testing.

The United States chose the Marshall Islands as its test site slightly prior to and during the Cold War due to the seclusive nature of the island and the ability to keep testing a secret, and in the act displaced Micronesian residents (Johnston, 2007). The people located at Marshall Island were thus exposed to extremely high levels of radiation as sixty-seven bombs were detonated from 1946 to 1958 (Dawson and Madsen, 2007). The United States even documented health adversities in Marshallese after the Bravo Fallout, one of the first testing of high-yield weaponry, and found cancer, immune deficiencies, and birth defects plagued islanders (Johnston, 2007). To further exacerbate the history of nuclear energy specifically harming Indigenous communities, the United States government in 1995 confirmed that they purposely exposed Marshallese people to radiation in order to obtain information about how radiation contamination can affect people's health (Johnston, 2007). The radiation exposure in Marshall Island is devastating, and highlights one way the United States committed acts of violence towards Indigenous population for the sake of developing nuclear weaponry.

The United States tested most of its high-yield atmospheric tests on the Marshall Islands, but the low-yield atmospheric and underground tests in the Nevada Proving Ground. Nevada testing was only 1% of the yields that occurred in Marshall Island (Johnston, 2007) but is important to discuss because contamination still occurred. The United States in 1951 to 1992

executed over 800 underground nuclear tests in Nevada (Dawson and Madsen, 2007). With this, countless people were exposed to radiation who were “downwinders”, which means people downwind from the mines, without ever being informed about the health adversities, many of whom were Diné people located in the Four Corners (Powell, 2018). Not until the 1960s, a mere ten years after initial trials, were workers in uranium mines and others downwind from test sites notified about the harm associated with the nuclear industry (Dawson and Madsen, 2007). The negligence from the United States signifies that government officials were more interested in threatening other nations with nuclear weapons than they were in protecting U.S. citizens.

Nuclear power was in full throttle until an alarming mishap in Pennsylvania. In March of 1979, Three Mile Island, a town in Pennsylvania, lost its coolant, which means a high amount of water that maintains the reactor's temperature escaped (Zaretsky, 2018). This caused radiation to leak into the atmosphere and groundwater, but no real explosion occurred and the reactor was able to retain its coolant shortly after (Zaretsky, 2018). This, nevertheless, prompted an uproar from American citizens in fear for their own safety, and by April of the same year, the site was shut down (Walker, 2004). Nuclear energy's reputation in the United States after this event was ruined. The industry faced many hardships and by 1985 was seen as a business disaster (Walker, 2004). Three Mile Island marks a decisive moment when nuclear energy began to recede because non-Indigenous people began to fear the industry's risks.

A similar event, but shared less often by Americans when discussing nuclear accidents, is the Churchrock reactor nuclear spill in July 1979 in the Navajo Nation. The catastrophe occurred when an earthen dam failed and released approximately 1100 tons of radioactive mill waste into the North Fork of the Puerco River in New Mexico (Brugge, 2007). Radioactivity in water, soil, and air samples increased after the spill, leading to the exposure to radiation as well as

contaminated water sources (Brugge, 2007). Churchrock was declared a superfund site in 1983 but has yet to be completely cleaned up (Lynch and Stretesky, 2011). Churchrock contaminated groundwater sources, restricting accessible water sources, and is speculated to be the cause of kidney cancer in the area (Lynch and Stretesky, 2011). This accident was only four months after Three Mile Island and exposed higher levels of radiation yet the United States took very little immediate action after the spill. This highlights how the United States viewed the event as trivial and demonstrated an overt lack of empathy toward the people of the Navajo Nation. This example is significant because it reveals a lack of urgency from the United States when protecting the Navajo Nation. If another disaster occurs from current or future nuclear reactor sites, it would not be presumptuous to assume that the United States would be slow to address the situation. Nevertheless, the uranium industry by 1980 began to decline drastically due to general trends of Americans' disapproval of nuclear energy. The collapse of the Soviet Union in 1991 is the benchmark for the end of the Cold War and by this time nuclear sites in the United States were sparse compared to twenty years prior.

Health Effects of Uranium Mining

Uranium mining can cause radiation exposure in multiple stages during the process of cultivating energy from the physical extraction, milling, and tailing, the expended fuel rods, and the abandoned mines after the fact. This section will explore the health adversities associated with radiation exposure. This is imperative to acknowledge in order to understand the severity of the situation, as well as the neglect of the government to protect people working and close to the mines.

The start of uranium extraction in the early 20th century caused high exposure of radon to countless miners as well as their families. Open pit mining releases radon-222 and is able to pollute surfaces and groundwater (Monson, 1983). Not only does this affect the miners breathing in the air, but downwinders as well. Exposure to open pit mining directly links to lung cancer in miners, which was acknowledged by the United States government in 1932 yet no safety procedures were taken in the mid-20th century to protect these miners (Monson, 1983). Miners were even drinking from water sources inside the mines (Johnston et al., 2007). Miners' families were exposed to radiation as well because men came home covered in radioactive dust, causing radiation to be present in households (Johnston et al., 2007). Later in the century, ventilation was introduced as a way for radon to be less present in the air miners breathed. However, ventilation systems were poorly managed. For example, in 1952 after an assessment of a mine in Shiprock, New Mexico, it was discovered that the ventilation fans did not work and miners were exposed to radiation levels ninety to one hundred times higher than safety levels (Johnston et al., 2007). Open pit mining was a tremendous and devastating way people were exposed to radiation and affected an even larger community due to the contamination of water sources. This illustrates that from the initial extraction of uranium, pollution immediately followed.

By the late 1970s Indigenous communities across the Americas shared the dangers of radioactive materials in the Akwesasne notes. The Akwesasne notes, an Indigenous newspaper from the 20th century published by the Mohawk Nation, discussed that radioactivity does not have the ability to be safe:

There is not now, and there will never be, technology which can prevent these losses of radioactive materials. A technology for that can't be developed because there are too many variables - too many tons of tailings, too many "human error" possibilities, too many possibilities of accident. Trying to shut off the escape or loss of radioactive materials is the technological equivalent of trying to stamp out the common cold. It can't be done because it's not one problem but hundreds of problems and scientists haven't

begun to identify most of those problems even after almost forty years of working with these substances (Akwesasne notes, 1979, p. 16).

This displays the longevity of radioactivity and the irreversible damages that uranium mining causes. The paper mentions the lack of development in the technology from scientists even after forty years of this business, which presents the disregards to human safety as well as the impossibility to implace proper safety procedures due to the nature of the material. This newspaper illuminates Indigenous voices that expressed their concerns and documented the experiences of the reality of the industry. Further discussion of the importance of sharing information will be developed in Chapter 2, but nevertheless important to note to signify that people noticed the United States negligence towards workers health.

Just as the Akwesasne notes mentioned, these mines are still a health risk today. There were over 876 abandoned mines in the four corners as of the 1990s, and nearly half of these vacant mines were used for shelter by different animals (Eichstaedt, 1995). This indicates that the entire ecosystem is at risk of health adversities from the uranium mines. The animals taking shelter in the mines are able to transport the uranium dust outside of the mines and if the animals have radiation in their bodies, once eaten by prey, the prey can be exposed to pollutants. This chain web can go on and on, representing the endless ways in which mines can pose a threat to human health, as well as the ecosystem, even when not in operation.

Millworkers, who worked where uranium is enriched, creating yellowcake, were at great risk of exposure as well. Swallowing yellowcake dust presented a health hazard as well as carrying the yellowcake home to the worker's families (Madsen et al., 1996). As laborers carried yellowcake home on their clothes, many families started to notice respiratory problems throughout households, such as emphysema and silicosis, and chronic obstructive pulmonary disease (Madsen et al., 1996). Milling and tailing are also where radioactive waste is created.

With this, soil and water contamination occurs. Studies documented that exposure to milling and tailing either by working there or living in close proximity led to higher miscarriages, cleft palates, and birth defects (Johnston et al., 2007). This is crucial to note because people who developed cancer or other health adversities did not have to be workers, but simply reside close to milling and tailing sites, displaying the extent to which the industry caused harm.

Shiprock not only had poor ventilation but the tailing left behind high amounts of radioactive waste as well. 71 acres of waste from milling and tailing were left exposed only 60 feet away from the San Juan River (Lynch and Stretesky, 2011). Navajos born in Shiprock between 1964 and 1981 experienced high amounts of birth defects and stillbirths (Lynch and Stretesky, 2011). Miscarriages and birth defects demonstrated that workers were not the only ones exposed to health adversities and future generations experienced the problems from the industry as well.

Mismanagement at uranium milling and tailing sites also led to contaminated water sources. Pine Ridge Reservation located in South Dakota in the 1970s surveyed contamination of water sources and found connections to an increase in miscarriages and abnormalities in infants. Even though this thesis is focused on the Navajo Nation and the Four Corners, this study connects to the intersectionality of reproductive health care and uranium mining. This also makes evident that the uranium industry affected different Indigenous communities and not exclusively the Navajo Nation. J. Haworth Jonte, a rapid city biochemist who tested Cottonwood Creek near uranium mining sites, found 19 picocuries of uranium per liter, which is three times the dangerous level according to the U.S. Public Health Service at the time (Means, 1980). WARN, a local grassroots organization, through a survey was able to find that within one month, 38 percent of pregnancies ended with miscarriages reported to the Public Health Service, and

60-70% of children suffered from breathing problems (Means, 1980). This illustrates that uranium does not only lead to cancer and lung damage but also impacts reproductive health.

One of the first environmental justices for the Navajo Nation was the acknowledgment that past and present uranium miners developed cancer because of radiation exposure. Similarly, with Pine Ridge, this started by investigating families who had a relation to the mines and then identifying cancer rates. Studies conducted in the 1970s and 1980s were able to identify that mining, milling, and tailing were in direct correlation to the increase in cancer rates. For example, scientists conducted multiple studies throughout the 1970s in order to identify respiratory illnesses in miners. They accomplished this by sampling 2,500 - 3,500 uranium miners since 1957 and monitoring their health annually (Saccomanno et al, 1976). Studies like these were important because they provided reasoning to multiple families who lost loved ones to cancer. Studies also were pivotal to developing the Radiation Exposure compensation act (RECA), which will be discussed in the next section about internalized, radioactive colonialism, and activism.

Chapter 2

Activism and Internalized, Radioactive Colonialism

With the knowledge of the historical legacy of the uranium industry and the health adversities associated with it, this chapter explores this history through an environmental justice lens. Specifically, analyzing how nuclear power has perpetuated internal and radioactive colonialism. Analysis includes assessing the historical background of the Four Corners and the Navajo Nation, and the land leasing during the 20th century for uranium extraction. This section also investigates the relations between colonialism and environmental injustices. This then opens the dialogue to discuss the activism that arose in the 20th century in response to these maltreatments. Finally, this chapter explores the current and ongoing activist groups that are still fighting for proper health care as well as taking preventive measures to ensure that nuclear energy will not cause further damage. This presents that the United States government never took accurate measures to protect people and still has not cleaned up its mess from the 20th century and illuminates that the nuclear industry committed acts of genocide towards the Navajo Nation. With this resistant towards genocide and colonialism is demonstrated by Indigenous grassroots organizations.

A Brief Overview of Diné People's History with the United States

To begin, it is important to define environmental racism, environmental justice, internal colonialism, and radioactive colonialism in order to understand the framework in which this chapter approaches activism. Environmental racism represents the disproportionately harmful effects of environmental degradation on people of color (Powell, 2018) and environmental justice is the effort to provide everyone with healthy living environments regardless of race, gender, socioeconomic class, etc (Powell, 2018). Internalized colonialism is a term to describe a

racial or ethnic group's homeland within the boundaries of a larger state controlled by different people (Chavez, 2011). This is a way in which to describe the status of the Navajo Nation since their reservation, established in 1868, is under the United States' supervision (Chavez, 2011). With this, one can analyze how, even though the Navajo Nation has autonomy over their reservation, it is still infringed upon, due to the nature and regulations in which the United States established it. This is further elaborated when discussing the leasing of land in the 20th century. Radioactive colonialism, which is applicable to internalized colonialism, is a term to describe the exploitative process of uranium from the military and nuclear industry on Native American land for economic incentives (Taliman, 1992). With this, the destruction of ecosystems, pollution of water and air, and harm to people as well as livestock are perpetuated, thus, oppressing Indigenous peoples (Taliman, 1992). Radioactive colonialism further specifies the harmful repercussions of extractive colonialism and the ways in which colonization has uniquely adapted to current times. Environmental racism, environmental justice, internal colonialism, and radioactive colonialism set up the framework for this chapter and are all interconnected while exploring the uranium industry and its impact on the Diné people.

Building on environmental racism, radioactive colonialism, and internalized colonialism, the United States government's actions are a form of slow violence. Slow violence, a term coined by Rob Nixon, refers to violence that occurs gradually over time in which the damage occurs in increments and thus is not recognized as immediate harm (Nixon, 2011). This term is applicable to many environmental injustices due to the nature of environmental degradation commonly occurring over slow progressions. The uranium industry's extraction, pollution of air, water, and soil, testing locations, and radioactive waste represent the slow buildup of harm that occurred over the span of the 20th century. Slow violence, combined with the other terms previously

discussed, contextualizes and allows one to reckon with the nuances as to why Indigenous people were disproportionately harmed by the uranium industry.

It is important to provide a brief history of the Diné people and their relationship with the United States, in order to partially understand the underlying dynamics that led to the internal, radioactive colonialism. Although debated between different archaeologists, some speculate that Navajo people resided in the four corners dating back to the 1300s (Kelley and Francis, 2019). The Navajo Nation's food practices consisted of traditional Diné herding, which incorporated the movement of herds seasonally (Kelley and Francis, 2019), this movement prevents soil erosion and over-cultivating the land. Due to the Four Corners being a hot and dry climate, Sheep were an integral aspect of Diné culture in order to prevent starvation (Iverson and Roessel, 2002). Sheep were utilized as a food source, wool, and a means of trading which helped influence social cooperation and interdependence (Iverson and Roessel, 2002). This valuable aspect of life was targeted as the United States tried to decrease the Diné population in the early 20th century and attempted to commit this act of genocide by targeting Diné livestock, which will be discussed shortly.

The Diné people fought for their land against the United States government dating back to the westward expansion in 1810, which was an overt act of displacement and genocide towards Native Americans. In the 1860s the United States government tried to achieve military hegemony over the Diné people by attacking their resources, especially their crops, and by 1867, 8,000 Diné people were on the Long Walk to the Bosque, an internment camp in present-day New Mexico (Voyles, 2015). In this camp, famine grew rampant causing many people to die from starvation. This camp either killed or forced Diné people to assimilate to Western culture. Both types of violence, whether cultural or physical, are forms of colonial genocide.

In the Bosque internment camp, Diné people experienced horrendous conditions, one of which displaced Diné people to an environment with high alkaline soils that prohibited crop cultivation, which left countless people to starve (Voyles, 2015). Changes in soil pH are also an issue that currently affects the Navajo Nation. Today changes in pH balance are caused by in situ leaching which can increase salinity and radionuclides in groundwater (Mudd, 2001) and the increase of acidity in soil can raise ammonium levels and further pollute the soil (Zhang et al, 2020). Changing pH in soil is a clear example of environmental racism; it is using the environment to disadvantage Indigenous people by affecting crop cultivation, livestock, and water. High alkaline soils in the 1860s and in situ leaching today have severely altered the pH balance of soils and clearly demonstrate the ways in which the United States government has disenfranchised Diné people throughout time by preventing them from growing and eating healthy food.

After years of Diné people resisting assimilation and genocide at the Bosque internment camp, the United States government established trust responsibility in the Four Corners, where Utah, New Mexico, Arizona, and Colorado meet, to the Diné people in The Treaty of 1868, which is now commonly referred to as the Navajo Nation. In the treaty, the United States allocated "limited sovereignty" (Voyles, 2015). This treaty established thirteen articles that allowed Diné people to return to their homeland in the Four Corners, peace between the United States and the Navajo, and multiple different tactics of assimilation to Western culture such as "civilization" provisions which included building businesses and schools (Wilkins, 2013). This treaty, however, was not the permanent boundary for the Navajo Nation. By 1880 many Diné people were living outside the reservation resulting in the United States expanding the boundaries of the reservation until 1918 (Voyles, 2015). Navajo leaders expanded their land

which is now 27,425 square miles (Powell, 2018). This expansion is an initial act of retaliation by Diné people in order to establish more sovereignty for themselves.

By the early 20th century, the United States recognized Navajo land to be valuable in resources, thus starting the negotiation and leasing of Navajo land as well as increased harm to the Navajo population. Previously, the United States government viewed the Four Corners as inhospitable land, neglecting the Diné people's ability to cultivate crops and raise livestock (Voyles, 2015), but their opinions changed once realizing the plethora of mineral deposits in the land. The United States aimed to regain control as well as diminish population size by killing many of Diné's livestock (Voyles, 2015). This is a form of environmental injustice since food sovereignty was stripped away from the Diné people again. This shows that the United States government sought to further murder the Diné people and tried to achieve their goal through environmental degradation by both seizing livestock and contaminating their lands. This form of biological warfare highlights the false promises proposed in the Treaty of 1868, and the determination of the United States government to commit acts of genocide.

Infringement on Sovereignty through Land Negotiations

The negotiation and leasing of lands throughout the 20th century was a pivotal way the United States gained control over Navajo land which subsequently led to devastating and lasting environmental conditions. When establishing the treaty of 1868, the United States government was unaware of the minerals that were densely located in this area. Over 60% of known uranium deposits are located within or near reservations, thus giving the United States government incentive to lease land from Native Americans (Taylor, 2014). With this knowledge made known in the 20th century, many negotiations were made. The United States proposed the mines as a

good-paying and close-by occupation for Navajo men, without informing them about the hazards of the job. One prominent example of this is the mineral extraction agreement with the Kerr McGee company in 1952, which employed 100 Navajo men to work in uranium mines (Churchill, 1986). This mine is located in Shiprock, where large amounts of waste contamination took place and will be more deeply explored later on in this chapter. This land leasing shows the United States' initial deceptiveness that sustained throughout the 20th century.

The Bureau of Indian Affairs (BIA) during the beginning of the 20th century was the sole agency in charge of negotiating land, which led to further inequality, displacement, and genocide. The BIA leased land to developers and in the negotiation Native Americans received royalties at fixed rates (Nelkin, 1981). This not only meant that degradation occurred when lands were leased, but also implies that Native Americans were not receiving proper benefits from the extraction itself. By 1975, there were 380 leases on reservation lands for uranium extraction (Churchill, 1986). These leases evicted thousands of Navajo people in Black Mesa which led them to move into trailer parks (Nelkin, 1981). People were either displaced because of mines physically occupying where they lived or forced out by outsiders moving in who wanted to partake in the mining industry (Nelkin, 1981). Due to the uranium industry, many Diné were relocated and displaced from sites with important cultural heritage and well as destroying sacred sites (Nelkin, 1981). This is a prime example of how radioactive colonialism is an act of displacement and genocide as it both forced Diné people to move and destroyed their land in the act.

Other Detrimental Effects of Land Negotiations

Even after displacement, contamination continued to affect the Navajo Nation. Kerr McGee uranium company has continuously caused environmental injustices ranging from its initial extraction to waste disposal and management. The company took no procedures to help protect the Navajo workers and left the site with radioactive waste that contaminated water sources. As previously discussed, mismanagement at the sites from ventilation and waste caused a wide array of health adversities. The facility closed in 1980 and left 71 acres of raw uranium milling and tailing that contained 85% initial radioactivity of the ore located 60 feet away from the San Juan River, and almost 200 open mine shafts were abandoned (Taylor, 2014). Kerr McGee tried to dispose of the waste, also known as raffinate, by incorporating it into fertilizer. This is once again another way in which the uranium industry irreparably damaged Navajos' food sovereignty as they physically poisoned their crops with radioactive fertilizer.

Waste storage is currently a large component of the environmental injustices from the nuclear industry and in the 20th century the Four Corners was proposed as the location to store it since the dawn of the mining industry. In the 1990s, the United State Office of Nuclear Waste Negotiators proposed a 100,000 dollar grant for tribes to store waste for 40 to 50 years without informing them of the health and environmental risk of the waste (Taliman, 1992). In order to combat this, Indigenous activist groups such as Diné CARE (Citizens against ruining our Environment), educated fellow Navajo people about the health adversities and risks from nuclear waste storage (Taliman, 1992). This highlights how important providing information is to try to achieve environmental justice because it allows people to group together and combat environmental injustices. If people are left in the dark about contamination, they will be defenseless against the harm, but if people are informed about the risks they will then have the

ability to resist contamination. Nevertheless, the Shiprock site for uranium provided countless examples of radioactive colonialism by polluting people from their place of work, water source, and food production. All of these avenues of harm demonstrate how divisive the Kerr McGee company was in order to profit off of Navajo people's labor and resources while simultaneously slowly increasing health adversities.

With the contamination of water from companies like Kerr McGee, ways of living were inextricably altered. The contamination had detrimental effects on the ecosystem and livestock, and other animals became ill when ingesting the water (Nelkin, 1981). This then altered the ways in which people grew food, received their water, and herded animals. These modifications are permanent and radiation will be ever present on the Navajo land.

Another form of radioactive colonialism was the uranium mining industry ability to assert economic control over towns where uranium was its main source of income. Kerr McGee's company in Shiprock created the town to be entirely dependent on the uranium industry (Akwesasne Notes, 1979). This thus forced Diné people to work at the mines to maintain a livelihood while also exposing themselves to radioactive material that lead to cancer. This control over the population's economy stripped the Navajo Nation of monetary independence while simultaneously signing them up for a death sentence. This sadistic tactic illustrates the United States ability to establish control over the Navajo Nation through the uranium industry. Economic independence by using other energy sources will be discussed shortly as a means of decolonization from Indigenous groups.

Activism in Response to Increased Mortality

As the 20th century progressed and uranium mining continued ferociously in the Four Corners, cancer and death rates escalated as well. This left many families in anguish about the lack of care the United States government took to protect workers and families in the nuclear industry. Reparations were in order, but it was a tumultuous and tedious fight to pass RECA. Lobbyists, activists, academics, scientists, and organizers all contributed to gain recognition of the harm that uranium posed on the Navajo Nation and led the fight for reparations. Other organizations also fought to prevent the leasing of more land to uranium companies by informing people of the health hazards. Providing knowledge to people during this period was crucial for making change because it counteracted the uranium industry withholding information.

Activism arose in the 1970s when people started to notice serious health conditions in numerous people who worked in the mines. Activists and lobbyists set a goal to inform uranium miners of radiation exposure, and then publicize the stories of harmed workers to get the government to listen and provide monetary compensation. Perry Charley, a social worker, noticed multiple barriers that prevented Navajo people from access to proper health care. Charley noticed that people were too sick to travel to the Indian Health Service (IHS) and physicians did not speak Navajo (Brugge, et. al, 2006). Charley thus started to take on the role of educating Navajo people about radiation exposure. Along with health surveys, Charley was able to reach a wider audience about the possible reasons why sickness was occurring in households. With this, more people were able to identify uranium mining as the culprit for illnesses which made the issue even more pressing as more people came forward as victims of the nuclear industry.

Harry Tomé, a council delegate of Red Valley Arizona, was a key player in passing RECA. He was able to access news coverage to make the public aware of the prevailing issue

(Eichstaedt, 1995). While Charley spread awareness within the Navajo Nation, Tomé aimed to reach a wider audience to share the stories and experiences of the Navajo people. He also lobbied for legislation in Washington D.C., and as a result, two bills were introduced to compensate affected miners (Eichstaedt, 1995). The extension of Senate Bill 1029 included uranium miners who developed lung disease and this led to the proposal of H.R. 1157 which also would include uranium miners for reparation for lung illnesses. However, neither of the bills passed (Eichstaedt, 1995). Multiple other bills were consistently reintroduced but nothing was able to be amended. Tomé contacted countless congressional representatives throughout the 1970s in pursuit of bills to be reintroduced and passed. Tomé then collaborated with Stewart L. Udall, a private attorney, who joined the fight and started to file multiple lawsuits and claims (Eichstaedt, 1995). Tomé represents the importance of spreading awareness and information to the public so that change can occur, even if incrementally.

Udall used his professional background in law to file multiple lawsuits and instill change within the US government. However, there were massive delays that prevented anyone from acquiring compensation. Udall filed 185 lawsuits against the government in 1979 on the behalf of miners and their families who were affected by the uranium industry (Eichstaedt, 1995). Eventually, Udall was able to file a lawsuit that stuck, which ultimately led to RECA in 1990. Scientist Susan Dawson was another key player in the fight, as she conducted multiple studies to provide concrete evidence that people experienced health problems as a result of their work in the mines. With the assembly of Tomé, Udall, Charley, Dawson, and many others, RECA finally passed in 1990. This act was amended due to the effort of multiple activists working together with the same goal: Providing compensation.

Diné CARE (Citizens against ruining our environment) is another pivotal grassroots organization. One of CARE's missions was to inform Navajo people about the waste from the Kerr McGee plants and expand RECA to include more people. Founded in 1988, CARE's initial goal was to prevent medical waste from being disposed of in the Navajo Nation (Dine-care, n.d.). This group later expanded to work on a wide variety of projects that would protect the Navajo Nation from environmental harm. One project was the Navajo Radiation Victims Project in which their principal was as stated:

Our goal is to address the health and environmental effects of radioactive contamination through a community-based approach. We intend to focus on increasing public awareness, eliciting community involvement, and educating our tribal members (Diné Citizens Against Ruining our Environment and the Navajo Nation RECA reform working group, 1998, p. 2).

Diné CARE along with other organizations such as the Post '71 Navajo Uranium Miners Committee, which will be discussed later in this chapter, banded together to reform RECA to include a wider group of people. Their methods included gathering organization leaders, receiving foundation grants, and working with Phil Harrison, a Washington D.C. attorney. This resulted in introducing to Congress the Redmond bill, HR 3539, The Radiation Workers Justice Act, and later the Senate bill for RECA reform (S. 2343), which included community health monitors. These bills proposed the expansion of RECA to compensate millers, families exposed to radiation, downwinders, and families located near milling tailing sites and mines.

This project and its challenges present the United States government's efforts to exclude the Navajo Nation from policy-making, which perpetuated environmental injustices. During the efforts of processing bills HR 3539 and S. 2343, Republican legislators held a closed-door meeting that excluded members of the Navajo Nation (Diné CARE, 1998). During this meeting, the legislators planned to scrap both bills and only expand RECA slightly to include 300 more

miners as a “compromise” (Diné CARE, 1998). This exposes how legislators used lack of information and secretaries as an exclusion tactic that allowed environmental racism to continue, which is parallel with the history of the uranium industry as a whole. Immediately after this occurrence, a press release statement prevented the compromised bill (Diné CARE, 1998). The government withheld information in an effort to avoid providing proper reparations to the people impacted by uranium mining and Diné CARE combated this by spreading information to a wider audience. Both The Radiation Workers Justice Act (H.R. 3539) and Senate bill for RECA reform (S. 2343) were introduced but were not passed (Diné CARE, 1998). Nevertheless, CARE took tremendous steps to fight slow violence by resisting the uranium industry to further contaminate their land.

Different Approaches to Decolonization

Many Diné environmental justice activists’ ideologies centered around decolonization and the ability to self-govern without the economic reliance of their oppressor. Decolonial is thus defined as the approach to disconnecting the people being colonized from their oppressors and regaining the independence to function on their own. For the Navajo Nation, activists tried to achieve this by creating their own energy from renewable sources. The Cameron wind farm, initiated in the 1980s, was a large-scale communal renewable energy system that was a form of energy activism that created an active landscape of power that enabled Diné people to regain control over their land by preventing the development of other energy sources (Powell, 2011). This form of anticolonialism is multifaceted because while gaining autonomy from the United States government by not relying on their energy sources, they are also simultaneously creating an industry that can provide revenue.

Adjacent to the Cameron wind farm, solar power was another considerable renewable energy source. In an article published in the Akwesasne Notes, solar energy was considered an energy source that aided self determination and self-sufficiency (Akwesasne Notes, 1980). The Solar Demonstration Project provided the opportunity to both reduce energy costs and offer jobs to unemployed people on the Navajo reservation. These renewable energy not only benefits the Navajo Nation economically, but also strengthens the community. Due to children's education being taught in English, there became a disconnect between older and younger generations, but the Cameron wind farm and The Solar Demonstration Project brought different generations together to work for the same cause (Akwesasne Notes, 1980). This is decolonization work because it prevents younger generations, who were experiencing more assimilation to Western culture, to be isolated from their cultures and elders. This instead restores the community and also utilizes the sunny environment of the southwest.

Protests against energy development on Navajo land were not ubiquitous. Other Diné people viewed development in energy as a necessary evil to establish their own economic autonomy. This Machiavellian approach was supported by Peter MacDonald, tribal chairman in 1971, who formed the Council of Energy Resource Tribes (Powell, 2011). MacDonald viewed the further development of coal energy as decolonization because of its ability to control natural resources, while also increasing economic gain. This was widely disputed amongst young activists, who viewed decolonization as a movement away from the reliance on the energy industry (Powell, 2011). MacDonald and his council, Diné youth activists, and the Cameron Wind Farm have all independently tried to use different anti-colonial activist approaches. This allows for the recognition that ideas of liberation were not homogenous and as time advances, one can acknowledge that there will be different pathways to justice.

RECA, while an act that provides restorative justice, had and currently has countless loopholes that made it difficult for people to actually be eligible for compensation. For example, Marriage licenses and birth certificates were required, making it impossible for multiple Navajo people who did not have this eligibility to receive compensation (Taylor, 2014). This makes evident that even with the accomplishments of activists, lobbyists, lawyers, and scientists, there were still injustices needing to be addressed.

One crucial persisting problem is the abandonment of uranium mines and the lack of cleanliness of these sites. In 2005, the Navajo Nation Council passed the Diné Natural Resources Protection Act, a law prohibiting uranium mining and processing on any site of the Navajo Nation (*Uranium classification act of 2019*, 2019). Contamination and pollution persisted even after the mines shut down and the cold war came to an end. There are over 500 mines abandoned in the Navajo Nation and only 219 sites have available funds for clean-up and remediation efforts as of 2019 (*Uranium classification act of 2019*, 2019). Thus leading into the current environmental justice movement surrounding uranium mines and the legacy of the nuclear industry.

Present-Day Activism

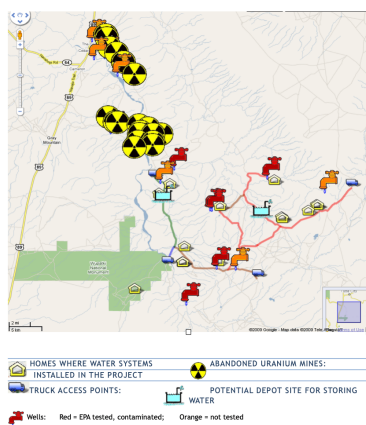
The uranium mining's legacy is still persisting in the Four Corners because waterways are still contaminated, people are still fighting cancer, and waste management facilities are persisting in the Southwest as a location for storage; this makes evident that work still needs to be done. There are many individuals and groups that have fought against injustices in multiple ways. The discussion of activism in this section, makes evident that tactics of resistance are

ever-present as the United States persistently executed acts of internal and radioactive colonization.

Forgotten People, a non-profit organization founded in 1974, displays the successes of collaboration to achieve environmental justice. The group is in the Navajo Nation and its mission is to “improve the well-being of the Diné people” (Forgotten People, n.d.). The organization has four ongoing projects: Native American Emergency Relief, Quilts Beyond Borders, Community Service Projects, and Black Falls Safe Drinking Water. For the Black Falls Safe Drinking Water, Forgotten People organization collaborated with the Environmental Protection Agency (EPA) and the Capacity Building Initiative at the Heller School, Brandeis University. With this collaboration, The Forgotten People constructed a report published on September 30th, 2009, discussing the environmental injustices experienced in the Black Falls region in regard to drinking water. The report found that one of the main issues in the community is the need to haul water due to lack of piped water in this region, and the water being hauled are from contaminated wells (Forgotten People, 2009). The report creates multiple policy recommendations such as the construction of sanitation systems and investment in improving health care. The report also gathers estimated costs of these recommendations as well as creates a map to outline the water system. The project successfully received a 2 million dollar pilot water hauling program funded by the EPA. The outreach portion of the project also identified that families were still drinking contaminated water.

From observing this project, one can analyze the effectiveness of collaboration between grassroots organizations, governmental agencies, and academics. All three groups brought different perspectives and strengths to the project. Forgotten People brought this issue to the forefront of attention and organized the project. The EPA’s government funding allowed the

project to be pursued. The university resourced students to volunteer to help with creating the temporary water system as well as document and report the project. The academics also have the ability to share this project with their colleagues, reaching a wider audience. This project used these groups to achieve the goals of their project and aided the start of providing Diné people with a basic human right to safe drinking water. The mapping of the water system in Black Falls is an extremely interesting way in which the project provided information. In figure 1, the map shows the effectiveness of including visuals in the report. This allows the audience to conceptualize the abundance of abandoned mines as well as how the mines are connected to waterways. This project was conducted at the beginning of the popularity of geographical information systems (GIS), thus interesting to see the preliminary of data visualization and GIS.



(Figure 1, Forgotten People, 2009)

With this project, further actions can be done to reduce the contamination of drinking water. The implementation of a sanitary system and improving safe drinking water accessibility are essential but do not solve the issue of contaminated water. The wells located near the abandoned mines are still contaminated and have yet to be cleaned up, as well as many other mines in the United States. However, Forgotten People as well as other grassroots organizations continue to help repair the Navajo Nation from the damage caused by the United States government.

Another group formed of Navajo widows banded together to share their stories in order to raise awareness and donations for their community. Yan (2020) tells the story of Navajo widows who lost their husbands to health complications from working at the mines in the 1950s and how the Navajo widows joined together to make a change in “‘Uranium Widows’ in Navajo Country: Uranium mining has been banned in Navajo country—could it come back?”. Through local fundraising, some of the women traveled to Washington D.C. in 1979 to testify and provide compensation for uranium miners and people near the mines who experienced exposure to radiation (Yan, 2020). Their voices were finally heard in 1990 when the Radiation Exposure Compensation Act passed. However, even with the act, the article discusses the injustices that still prevail for the Navajo Nation: families are still grieving, women are currently experiencing kidney problems, and mines have yet to be cleaned up.

The power of empathy and compassion is crucial for the Navajo widows and storytelling is a way to connect with people removed from the situation. One meaningful quote from the article states: “All they're doing is testing, testing. I don't know what they're testing for. When is the actual cleanup going to start?” (Yan, 2020, n.p.). This provides great insight into the modern-day issue of abandoned uranium mines. In the previous decades, the goal was to first have the government acknowledge and compensate the family impacted by the mines. However, as the financial compensation has been delegated, many mines have been left and the clean-up for the abandoned areas is slow. As the Navajo Widows share their story they also are able to communicate with a wider audience who may be unaware of these injustices. Not only does this spread awareness, it also humanizes the problem. With people sharing their stories, other people will be able to understand the issue in a new light. The widow's sorrow from the passing of their husbands is heartbreaking and allows people to empathize with their stories. Documentation of

history is a form of resistance and goes beyond recommendations, solutions, and data. Personal anecdotes remind the audience that the legacy of uranium mining is still affecting families in the Navajo Nation as the children of the fathers who passed enter their middle age life.

As previously discussed, RECA's many loopholes prevent people from receiving compensation, one of them being the inability for compensation if a person started working in mines after 1971. With this, the cohort Post-71 Uranium Workers Committee formed. This group of workers' goal is to document the health adversity of workers past 1971 to illustrate that they were experiencing sickness as well and deserved compensation. Their methods included sending out surveys to past employees of the uranium industry. The committee received 1,300 surveys and with this, documented crucial information about the health conditions of past employees (MASE, 2015). Seventy-nine percent of workers did not receive proper training and education on the health dangers of uranium mining, sixty-six percent informed the committee that radon was never monitored, and thirty percent of female workers and forty percent of female spouses reported birth defects and reproductive health problems (MASE, 2015). With this information, the committee demanded that RECA be revised and expanded. One of the committee's priorities was to not only include these workers in the act but also expand the act to compensate for a wider range of illnesses and health problems. The Post-71 Uranium Workers Committee used collecting information as a form of activism. Historically, the United States government withheld information in order to achieve economic gain and avoid taking the proper health precautions. Post-71 counter this by collecting information to platform themselves and make evident that more people needed compensation for the wrongdoing from the United States government.

The Post-71 Uranium Committee as of 2015 pursued to pass new legislation that will aid compensation for workers. The first one, the NM Legislature HR 95 Memorial, recognizes the

contributions and ongoing health problems of New Mexico uranium workers (MASE, 2015). The second is, US Senate S 331 which extends compensation to Post-71 workers, and expands *some* additional uranium-related health conditions and funding for a health study of uranium-related medical conditions (MASE, 2015). Both of these bills highlight the progress still needed in the legislation to qualify these workers for compensation.

In a discussion with Linda Evers the official vice president and co-founder of Post-71 uranium miner workers, she explained the successes of her group as well as the current troubles. Evers explained that collecting surveys is extremely important as well as collaboration with other groups. MASE (Multicultural Alliance for a Safe Environment) is an accumulation of activist groups located in the southwest and its mission is stated as follows, “We are communities working to restore and protect the natural and cultural environment through respectfully promoting intercultural engagement among communities and institutions for the benefit of all life and future generations” (MASE, n.d., n.p.). With this alliance information, funding, and support are shared to each group creating strength in numbers. Funding and grants are especially important because it allows projects to flourish.

These organizations have shown tremendous strides in anti-colonial work as well as achieving environmental justice and there is still more work to be done. When discussing with Linda Evers and Peter H. Eichstadt, the author of *If You Poison Us: Uranium and Native Americans*, they both separately mentioned the Waste Isolation Pilot Plant (WIPP) located in Carlsbad, New Mexico, and the current environmental injustices that are occurring. Eichstadt and Evers expressed their concerns and the dangers of the transportation of radioactive nuclear rods to the site and the risk to the site in general. The next and final chapter of this thesis will discuss in detail WIPP and its role as the only official geologic repository for waste in the United

States and tie the site with slow violence. With this, this thesis will have mapped the entire life cycle of nuclear energy and its environmental hazards.

Chapter 3

WIPP facilities and the Future of Nuclear Energy in the United States

The activist groups discussed in the previous section centered their goals around reparations for medical issues as well as preventive measures for ensuring abandoned mines and the nuclear industries' legacy will not further pollute waterways, air, and soil. Diverging from this and exploring a current and pressing issue, this chapter examines the Waste Isolation Pilot Plant (WIPP) located in Carlsbad, New Mexico. WIPP, a nuclear waste facility, is a current concern in regard to the nuclear industry due to its potential risk to the people of Carlsbad and New Mexico as a whole. By analyzing WIPP's history, the demographics of Carlsbad, and the history of the usage of salt beds for nuclear energy in the past, this chapter examines the risk associated with the waste management site as well the ways in which the corporation and the government has falsely portrayed the safety of this site. This concludes the uranium extraction life cycle allowing for this chapter to then discuss the significance of what the potential future entails for nuclear energy in the United States. WIPP is the ongoing embodiment of radioactive colonialism, representing that this history is not behind us but instead prevalent and dangerous.

Before analyzing WIPP, it is significant to examine the demographic of Carlsbad, New Mexico in order to acknowledge who may be most at risk and if the people are a part of marginalized groups. Carlsbad, New Mexico is located in the southeast corner of the state. As of 2021 according to census data, Carlsbad has a population of 32,238 with a poverty rate of 15.5%. (*U.S. Census Bureau quickfacts: Carlsbad City, New Mexico, 2021*). This is three percent higher than the national average poverty rate and three percent below New Mexico's average poverty rate. The majority race in Carlsbad is white and half of the population identifies as Hispanic. The high density of the Hispanic population is significant because it presents the possibility that

Latinx people will be exposed to more environmental injustices than their non-Hispanic counterparts. Regardless, no one should endure environmental injustices and their wellbeing to be at risk, but from the historical events of the United States government, one may confidently assume that there will be a lack of quickness and care if marginalized communities are the ones who are targeted. This includes the disenfranchised, such as people experiencing poverty. Carlsbad's demographics illustrate that nuclear energy is still committing environmental racism and will continue to as further investments are made.

Carlsbad, New Mexico historically is a location for nuclear tests resulting in atmospheric fallout. In 1961, the Project Gnome was executed, a subsurface nuclear test denoted in a salt dome (Johnston, 2007). With this, heat and debris escape the dome during detonation causing a radioactive cloud to travel over Carlsbad depositing iodine-131 fallout, and then moving further west. Even with this dangerous occurrence, during the late 20th century, this location was proposed as a safe place to store nuclear waste. This is a crucial event to observe since it highlights that salt beds are not a secure place for nuclear testing or waste the way in which they are presented. This further presents how the nuclear industry is continuing, to this day, to neglect to inform the complete truth of the uranium industry. No matter where nuclear waste is, it will not be able to be safely stored, there will always be a prevailing uncertainty for risk. This displays that nuclear energy cannot be pursued in the future with guaranteed safety.

The United States Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP) is currently the only deep geologic repository for waste and stores waste in salt beds. WIPP's website claim that salt beds are chosen due to the reliability of infrastructure:

Bedded salt is free of fresh flowing water, easily mined, impermeable and geologically stable — an ideal medium for permanently isolating long-lived radioactive wastes from the environment. However, its most important quality in

this application is the way salt rock seals all fractures and naturally closes all openings (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d., n.p).

The word “permanent” in this statement is, however, misleading. Salt beds are not guaranteed to store radioactive waste indefinitely even in their current security. Salt beds in New Mexico formed 250 million years ago as the Permian ocean that inhabited the space dried leaving a 2,000-foot-thick salt bed (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d.). This essentially means that eons ago there was an ocean coastline in Carlsbad, New Mexico. This is important information because salt is highly soluble, thus the salt beds prevailing for multiple centuries indicated that no water is present in this space. If nuclear waste is stored in salt beds, one may confidently assume that no water will penetrate the waste. That is, however, never a complete guarantee. With the climate changing in extraordinary ways, salt beds become less reliable as a safe storage space. As sea levels rise and hurricanes worsen, seawater will continue to move inland. It is likely that in our lifetime salt beds are likely to remain intact, but there is no definite statement that is able to conclude that these salt beds will not be exposed to water in the future. The WIPP’s website takes no action to acknowledge these risks indicating the negligence of the industry to inform people of the ever present risk of storing nuclear waste.

Timeline of WIPP’s Land Withdrawal and Pushback

Regardless of the safety of the salt mines as a storage space, there is always a possibility for human error. The Waste Isolation Pilot Plant has undergone periods of time when it is not in operation due to its many inspections, regulations, and mishaps which are all listed on WIPP’s website. The website provides information on why and when these shutdowns occur; however, when close reading the website, one can notice the ways in which the website undermines the events and lacks responsibility for the occurrences. With this language, WIPP is then lacking to

provide the entire reality of the storage facility, which is comparable to the ways in which the mines were originally presented in the 1950s.

The website's general history section glosses over WIPP's struggle for authorization of the site. The first out of two events mentioned in the general history page is in 1979 when the United States Congress authorized the U.S. Department of Energy's Waste Isolation Pilot Plant (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d.). This allowed DOE to withdraw 9000 acres of federal land administered by the Bureau of Land Management for operations (Watkins, 1994) and begin building and testing the site in the 1980s. The second event mentioned on WIPP's website historical overview is 1998 when the U.S. Environmental Protection Agency (EPA) certified WIPP for safe, long-term disposal of transuranic (TRU) wastes (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d.). These two events are shown in the general history section of the web page, but do not illustrate the many trials and hurdles WIPP had to go through in order to operate. This highlights how WIPP is currently trying to construct a simplified narrative of the actual events that took place.

The timeline section 1990-1999 on WIPP's website reveals a more comprehensive history of the efforts from people who, throughout the 1990s, tried to prevent WIPP from operating. One figure mentioned on the website is Tom Udall, the son of Stewart Udall who is previously mentioned in Chapter 2 and a pivotal attorney in the fight against the uranium industry. The website states that Tom Udall filed a federal lawsuit against the Department of Energy and Department of Interior for the withdrawal of land from public use for a WIPP test phase (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d.). This lawsuit demonstrates the slow violence of nuclear energy through the damage caused by waste disposal. Similar to policies on Indigenous land in the Navajo Nation, this history shows how the uranium industry

has sought to privatize land and authorize policies that cause land degradation and harm to local communities. This brief overview given on the WIPP's website does not inform the reader of the ways in which WIPP used 9,000 acres of federal land for extended periods of time and began storage before authorization.

This lawsuit alone did not stop WIPP's operations completely but did halt the site until EPA regulations were emplaced. The official name of the lawsuit is *New Mexico v. Watkins*, 969 F.2d 1122, 1125 (D.C. Cir. 1992). Udall, attorney general of the state of New Mexico, sued to restrain the transportation and deposit of the waste at WIPP because the Department of Energy (DOE) failed to observe constraints Congress placed on administrative withdrawals of federal lands in the Federal Land Policy and Management Act of 1976 (FLPMA) (*New Mexico v. Watkins*, 1992). This states that DOE did not have a permit for the management of TRU waste at WIPP, as required by RCRA and WIPP required interim status. Organization-intervenors in the FLPMA also initiated an action, under the citizen suit provision of the Resource Conservation and Recovery Act. The Resource Conservation and Recovery Act states that withdrawal of land that is more than 5000 acres can only be withdrawn up to twenty years. WIPP extended this lease by changing its purposes, which displays the initial effort to avoid abiding by certain policies. This then illustrates the lack of care for the environment and WIPPs incentive to be an operational facility forever located in southeast Carlsbad.

The lawsuit, in summary, revealed that WIPP and DOE were withdrawing land and extending the withdrawal periods since 1983. Udall sued WIPP under the violation of the withdrawal purposes, in which WIPP was no longer only constructing and testing the area, but began to transport nuclear waste to the site as well. WIPP defended this claim by stating that extensions of the withdrawal were for the "protection of the land", but eventually changed their

purpose for their land withdrawal act (*New Mexico v. Watkins*, 1992). This lawsuit declared that WIPP began transporting nuclear waste to the facilities even when not permitted in their initial land withdrawal, and with this, they did not oblige to any EPA regulations since there were no regulations created for this site. This lack of safety procedures from the site shows negligence for the protection of the land as well the people in New Mexico. This is parallel to the uranium extraction land leasing earlier in the century because in both cases the uranium industry pursuits were business-centered and lacked the proper procedure to ensure protection for people's safety. This lawsuit also reveals a larger problem with the land withdrawal act because it is an infringement of public land. Even though WIPP is incrementally leasing land, the land leased will never be able to be safe for the public again. This land will always be an environmental hazard that must be managed throughout time, similarly to the abandoned mines in the Four Corners.

As the 1990s progressed, EPA emplaced regulations with partial credit due to Udall's lawsuit, a small victory, but did not halt WIPP from progressing its operation and eventually authorize the site to officially store waste. In 1992, WIPP Land Withdrawal Act passed allowing transuranic waste disposal operations, but with limits. The act states:

[T]he Secretary [is required]to prepare and submit to the Administrator of the Environmental Protection Agency (EPA) for review a plan for: (1) conducting test phase activities at WIPP to demonstrate compliance with applicable disposal requirements; and (2) removing transuranic waste emplaced at WIPP during such testing should removal of such waste be required. Conditions plan approval by the EPA Administrator upon the meeting of specified standards. (S.1671-Waste Isolation Pilot Plant Land Withdrawal Act, 1992, n.p.).

This highlights that strict compliance with EPA regulations enabled more protection to the environment and the people of Carlsbad. To conclude the WIPPs history in the 1990s, Clinton amended the Land Withdrawal Act which required DOE to submit all chapters of the compliance

application to EPA by October 31st, 1996. With this, operations of storage started in 1999, and consequently, instances of radiation exposures occurred in the 2000s (Thakur and Ward, 2019).

WIPP in the 2000 and its “Mishaps”

Waste disposal at WIPP took to full flight in the 2000s and with the operations in full force, issues arose. Shipments from the Savannah River Site in South Carolina, the Hanford site in Washington, Argonne National Laboratory in Illinois, and Oak Ridge National Laboratory in Tennessee arrived at WIPP throughout the first decade of the 21st century (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d.). Nuclear waste from the entire nation arrived at WIPP and by 2009 the site received 8,000 shipments. This immense amount of waste is on its own risky to transport, since radioactive nuclear rods need to be driven across the country (IAEA, 2019). Nevertheless, WIPP transported waste and stored it in the salt beds successfully, storing over 100,000 waste containers underground (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d.). However, eventually mismanagement of the site led to “mishaps”, as the WIPP website refers to the event that occurred in 2014.

In 2014 the WIPP site experienced its first major problem causing the site to suspend operations. According to the WIPP’s website:

WIPP temporarily suspends underground emplacement operations following a fire on a salt-haul truck. Eighty four employees safely evacuate. The Accident Investigation Board (AIB) initiates an investigation. Days later, a radiological release occurs underground in Room 7, Panel 7 contaminating part of the underground; some airborne contamination is released to the environment. Overall, 22 employees received minor exposures. No contamination was detected off site or in surrounding communities. (U.S. Department of Energy's Waste Isolation Pilot Plant, n.d., n.p.).

This statement, however, neglects to fully uncover the event and the dangers it posed to the people in New Mexico, who were already aware of the risks associated with WIPP due to Project Gnome. The language in this description downplays the seriousness of the event using the words and phrases: safely evacuate, *some* airborne contamination, *minor* exposure, and *no* contamination detected off site. This does not address the severity of the situation and risk of danger which led WIPP to halt operations for three years (Thakur and Ward, 2019). This also illustrates the complicity from DOE to allow risky occurrences.

The vagueness of WIPP's description of the occurrence aggressively undermines the events that took place. In 2014 a waste container in the repository underwent a chemical reaction, which then induced the container to overheat and rupture and release radionuclides and radioactivity escaped through the ventilation system and was detected approximately 1 km away from the facility (Thakur and Ward, 2019). This thus contradicts WIPP's statement because radiation was indeed detected off site. This event is also suspected to be in correlation with a brief detection of elevated americium and plutonium in nearby ambient air samplers, but it is unclear due to the residual contamination from the Gnome Project. Even though contamination and radiation exposure occurred from this event, scientists from Environmental Science and Pollution Research claim the exposure is not significant by health-based standards. Nevertheless, these events are similar to the events at Chernobyl and Three Mile Island previously discussed in this thesis due to one technical error causing radiation exposure. This proves that no matter how sophisticated the technology, there is always a margin for human error or factors that are out of the site's control, but the United States government will continue to not prioritize the well-being of the people in the southwest.

To conclude the examination of WIPP, EPA released a document in May 2022 to investigate WIPP and its ability to continue their operations called the Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance With the Disposal Regulations: Recertification Decision (Environmental Protection Agency, 2022). This shows that the EPA implemented strict regulations that WIPP needs to comply with, as well as concerns that WIPP needs to improve on by next inspection. In this report the EPA identified multiple issues in their review including errors in the geochemical database used to perform actinide solubility calculations, inaccurate initial assumptions for solubility calculations, and actinide solubility uncertainty. This proves that the WIPP will never be a perfect facility and they will have to consistently work to stay up to regulations.

It is imperative that WIPP follows the EPA's criteria for operation because it ensures that the site is not conducting careless decisions that may harm the environment. However, as from the occurrence in 2014 and the 2022 EPA report, one can acknowledge that safety is never a guarantee. The people of Carlsbad are at most risk of radioactive contamination and these people are majority Hispanic/Latinx. This demonstrates that the imposing risk from the WIPP facility will be an act of environmental racism. It is slow violence as well due to the gradual build of waste in the salt beds. If a serious problem ensues, the impact can be catastrophic, and will impact a majority Latinx population. WIPP is not on Native land, however, radioactive colonialism is still prevalent as Navajo land is downwind from Carlsbad. As seen during Project Gnome, radioactive fallout can travel across the entire state of New Mexico. This thus poses the potential that the Navajo Nation may experience more radioactive contamination and in turn radioactive colonialism will prevail. This concludes that every step in the process for nuclear energy has harmed Native Americans and will continue in the future.

United States' Opinion on Who Supports What

WIPP is currently in operation and the waste the United States already stored in this space is unavoidable. However, we as a country, have the decision to decide if more waste will be generated. Nuclear energy is a contentious political topic and it is becoming more prevalent as climate change becomes a greater pressing issue. Currently, Biden's administration invested in more nuclear energy allowing for environmental injustices to prevail. The public opinion is not in parallel with policy makers and there must be prevention for further investment. It is unclear who in the future will have the political power to invest or divest in nuclear energy, but the advertisement of nuclear energy as a "clean" source of energy is entirely unfactual. United States citizens should be aware of the present harms and the historical racism and colonialism associated with the uranium industry.

The Department of Energy in November of 2022 posted its announcement of Biden-Harris' investment in nuclear energy. The announcement states a large investment of money in order to decrease carbon emission, while maintaining jobs:

Funded by President Biden's Bipartisan Infrastructure Law, the \$6 billion CNC program supports the continued operations of safe and reliable nuclear energy facilities, preserving thousands of good-paying clean energy jobs while avoiding carbon emissions. As the nation's largest source of carbon-free power, America's current fleet of nuclear reactors is a vital resource for achieving the President's goal of 100% clean electricity by 2035 and a net-zero emissions economy by 2050. (Department of Energy, n.d.b., n.p.)

This is acutely similar to the way in which the uranium industry has advertised itself before. The emphasis on "good-paying clean energy jobs" is presented the same way it was to the Navajo Nation in the 1950s. This is not clean energy, the nuclear waste produced from nuclear sites is detrimental to the environment. This oxymoron of a statement is misleading and untruthful,

further indicating that the United States will continue to withhold information to the public and the people most impacted by the industry. The Biden-Harris administration is also using the fear of climate change as a tactic to convince people to invest in nuclear energy. This is comparable to the arms race because in both of these events nuclear power is presented as the only solution to a threat.

This investment from the Biden-Harris administration, even with its presentation of jobs and the use of fear tactics, is in opposition to public opinions on nuclear energy. The Pew Research Center: American Trends Panel 67 conducted a survey with a sample size of 10957 United States Adults via a web-based survey with a 1.4% margin of error at a 95% confidence interval in 2020 reveals hesitancy of nuclear energy. Specifically analyzing one question from the survey: “(Do you favor or oppose expanding each of the following sources of energy in our country?)... More nuclear power plants to generate electricity.” 43% of the survey participants were in favor while 55% opposed nuclear development (The Pew Research Center & the Press. Pew Research Center: American Trends Panel Wave 67, 2020). With cross-tabulations, white non-Hispanics survey participants were 15% more in favor of the expansion of nuclear energy compared to Black survey participants and 7% more in favor compared to Hispanic survey participants. This is crucial information because it makes evident the people of color are more hesitant about the investment of nuclear energy. One reasoning, from the evidence illustrated throughout this entire thesis, is the United States history of environmental racism and radioactive colonialism. Nevertheless, this presents the disconnect between the administration and the citizens of the United States, displaying that nuclear energy should not be further invested in.

Conclusion

This thesis explores the nuances of the nuclear power industry to better contextualize the current controversy regarding the United States investment in nuclear energy and how it will affect the Southwest. By conducting historical analysis of the United State's secrets, environmental injustices, and colonialism which the Navajo Nation experienced, it becomes clear that the nuclear industry has never been an ethical source of energy. The Navajo Nation resisted colonization since the initial interaction with the United States government and resisted even further when uranium was extracted from Navajo land.

This thesis findings conclude that the development of nuclear power in the United States has disproportionately harmed the Navajo Nation and the Navajo Nation resisted colonization through advocacy work, but still experienced detrimental effects to their environment and community. The Navajo Nation is still experiencing the ramifications of nuclear energy from prevailing contamination of resources and the construction of the Waste Isolation Pilot Plant. This is made evident by the active Indigenous founded grassroots organizations that have continued to fight for environmental justice. This thus makes it imperative to be critical of the United States government's current arguments to invest in nuclear energy because the Navajo Nation will continue to endure environmental degradation if investment in nuclear energy continues and increases.

In the historical analysis of the uranium life cycle, the thesis frames the industry by each stage of the extraction process. From initial extraction, processing the uranium into uranium oxide, processing the uranium in the nuclear reactor, and storing the waste. In each of these stages radioactive contamination is addressed. In open pit mining, air, soil, and water contamination are present. In situ leaching leads to groundwater contamination. Processing

uranium into uranium oxide creates radioactive waste as well as transforming the uranium into energy. With all these factors, health adversities are associated, such as lung cancer and miscarriages. This presents that if more reactors are established across the states there will be a higher chance that people will be exposed to radioactivity. If more nuclear reactors are built it is essential to ask “where?”. This thesis illustrates that Indigenous populations are victims to this contamination and will continue to be as nuclear energy is further invested in.

The Navajo Nation in the Four Corners historically suffered from genocide by the United States government specifically by the targeting of resources. Land leases, killing livestock, contaminating waterways, and hiring workers knowing they would develop cancer from radiation were tactics to strip the Navajo Nation of their sovereignty. However, throughout time, the Navajo Nation combatted these acts of violence through forms of resistance. Grassroots organizing proved to successfully pass the Radiation Compensation Act, prevent further mines to be established on Navajo land, and spread awareness to Diné people about the harms of nuclear energy. Indigenous groups also established creative, alternative energy sources that aided economic sovereignty as well as prevented the energy industry from further polluting their land. The Navajo Nation demonstrated its strengths and ability to maintain its independence and will continue to do so, even in the face of further nuclear energy.

The Waste Isolation Pilot Plant is a clear cut example of the repercussions of nuclear power. Waste needs to be stored, but the United States is experiencing a pivotal moment in history to decide if more waste should be created. Room for uncertainty will be ever present due to the potential site mismanagement and human error. Citizens of the United States are already hesitant towards nuclear energy. The Biden’s administration is displaying alarming similarities to the previous ways in which the United States downplayed the severity of the risks to human

health and the environment. The United States is using jobs, economic incentives, and fear tactics to persuade people to support nuclear energy.

In moments of panic as humanity is threatened to face environmental disasters as we continue to emit atmospheric carbon dioxide from coal and oil it is understandable to search for answers. We want to prevent people from displacement, contamination, and increased mortality. We are looking for ways to save lives and our environment. However, it is clear that the nuclear energy trade offs will consequently be the same effects of climate change but at a smaller scale. No one deserves to experience environmental degradation for the sake of others. Thus, we need to start looking for different and more sustainable solutions. Solutions to climate change need to uplift, strengthen, decolonize, and embody environmental justice.

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