Hacettepe University Graduate School Of Social Sciences

Department of American Culture and Literature

# CLIMATE CHANGE AND ECOLOGICAL ECONOMICS IN KIM STANLEY ROBINSON'S *FORTY SIGNS OF RAIN, NEW YORK 2140,* AND *THE MINISTRY FOR THE FUTURE*

Başak ALMAZ

Master's Thesis

Ankara, 2022

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*To the pale blue dot…*

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# ABSTRACT

ALMAZ, Başak. Climate Change and Ecological Economics in Kim Stanley Robinson's *Forty Signs of Rain, New York 2140,* and *The Ministry for the Future*, Master's Thesis, Ankara, 2022.

American science fiction author Kim Stanley Robinson depicts the devastating impact of neoliberal capitalism on climate change in his novels *Forty Signs of Rain* (2004), *New York 2140* (2017), and *The Ministry for the Future* (2020). Environmental disasters induced by anthropogenic climate change pose a tremendous threat both now and in the near future. Examining the source of these disasters and threats as well as how mainstream economic practices are criticized in Kim Stanley Robinson's selected novels, this thesis proposes that advancements in science and technology, collective actions of citizens, and state-sponsored interventions will contribute to solving climate change-related issues. This thesis aims to examine Kim Stanley Robinson's views on the effects of a steady-state economy within the framework of ecological economics as an alternative to neoliberal capitalist economic models in mitigating the consequences of climate change. In the first chapter, Kim Stanley Robinson's critiques of the human impact on climate change are addressed through scientific research and capitalist economic policies that always aim to sustain economic growth. The second chapter explores how neoliberal capitalist economy practices influence climate change, the active role of science and technology in catastrophe management, the impact of collective actions, and the significance of the transition from the mainstream economic model to ecological economics. In the third chapter, the economic alternatives put forward by Kim Stanley Robinson to eliminate the destructive impacts of the neoliberal capitalist economy on climate change are evaluated, and these ecological economics-based praxes are analyzed within the framework of Herman Daly's steady-state economy. As a result, this thesis examines Kim Stanley Robinson's criticism of the relationship between climate change and neoliberal capitalist economy in his selected novels. Given these criticisms, it is claimed that the economic alternatives introduced by the author are based on the ecological economics model, and

government-supported steady-state economy practices have an effective role in mitigating the impacts of the climate crisis and dealing with climate change.

**Keywords:** Climate change, cli-fi literature, Kim Stanley Robinson, ecological economics, Herman Daly, steady-state economy, *Forty Signs of Rain* (2004), *New York 2140* (2017), *The Ministry for the Future* (2020)

# ÖZET

ALMAZ, Başak. *Kim Stanley Robinson'ın Forty Signs of Rain, New York 2140* ve *The Ministry for the Future* Adlı Romanlarında İklim Değişikliği ve Ekolojik Ekonomi, Yüksek Lisans Tezi, Ankara, 2022.

Amerikan bilim kurgu yazarı Kim Stanley Robinson *Forty Signs of Rain, New York 2140* ve *The Ministry for the Future* adlı romanlarında neoliberal kapitalizmin iklim değişikliği üzerindeki yıkıcı etkisini ortaya koymaktadır. Antropojenik iklim değişikliğinin sebep olduğu çevresel felaketler hem günümüz hem de yakın gelecek için tehdit niteliği taşımaktadır. Bu tez, Kim Stanley Robinson'ın seçilen romanlarında bu felaket ve tehditlerin kaynağını incelerken ana akım ekonomik uygulamaların nasıl eleştirildiğini, bilim ve teknolojideki gelişmeler ile halkın kolektif eylemleri ve devlet destekli müdahalelerin iklim değişikliği kaynaklı sorunların çözülmesine katkı sağlayacağını öne sürmektedir. Bu tez, iklim değişikliğinin etkilerinin azaltılmasında neoliberal kapitalist ekonomik modellere alternatif olarak ekolojik ekonomi çerçevesinde durağan durum ekonomisinin etkilerine dair Kim Stanley Robinson'ın görüşlerini incelemeyi amaçlamaktadır. İlk bölümde, Kim Stanley Robinson'ın iklim değişikliği üzerindeki insan etkisine dair eleştirileri, bilimsel araştırmalar ve her daim ekonomik büyümenin sürekliliğini amaçlayan kapitalist ekonomik politikalar üzerinden incelenmiştir. İkinci bölümde, neoliberal kapitalist ekonomi uygulamalarının iklim değişikliğini nasıl etkilediği, iklim felaketlerinin yönetiminde bilim ve teknolojinin aktif rol almasının yanı sıra halkın kolektif eylemlerinin etkisi ve ana akım ekonomi modelinden ekolojik ekonomiye geçişin önemi ele alınmıştır. Üçüncü bölümde ise, Kim Stanley Robinson'ın neoliberal kapitalist ekonominin iklim değişikliği üzerindeki yıkıcı etkisini ortadan kaldırmak amacıyla öne sürdüğü ekonomik alternatifler değerlendirilmiş, ekolojik ekonomi temelli bu uygulamalar Herman Daly'nin durağan durum ekonomisi çerçevesinde analiz edilmiştir. Sonuç olarak, bu tez Kim Stanley Robinson'ın seçilen romanlarında iklim değişikliği ve neoliberal kapitalist ekonomi ilişkisine dair eleştirilerini incelemiş, bu eleştirelere dayanarak yazarın öne sürdüğü ekonomik

alternatiflerin ekolojik ekonomi modeline dayandığı ve hükümet destekli durağan durum ekonomisi uygulamalarının iklim krizi etkilerinin azaltılması ve iklim değişikliği ile mücadalede etkin rol oynadığı iddia etmiştir.

**Anahtar Sözcükler:** İklim değişikliği, iklim kurgu edebiyatı, Kim Stanley Robinson, ekolojik ekonomi, Herman Daly, durağan durum ekonomisi, *Forty Signs of Rain* (2004), *New York 2140* (2017), *The Ministry for the Future* (2020)

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# INTRODUCTION

*There exists a passion for comprehension. . . . Without this passion, there would be neither mathematics nor natural science.*

Albert Einstein

American science fiction author Kim Stanley Robinson depicts the devastating impact of neoliberal capitalism on climate change in his novels *Forty Signs of Rain* (2004), *New York 2140* (2017), and *The Ministry for the Future* (2020). Environmental disasters induced by anthropogenic climate change pose a tremendous threat both now and in the near future. Examining the source of these disasters and threats as well as how mainstream economic practices are criticized in Kim Stanley Robinson's selected novels, this thesis proposes that advancements in science and technology, collective actions of citizens, and state-sponsored interventions will contribute to solving climate change-related issues. This thesis aims to examine Kim Stanley Robinson's views on the effects of a steady-state economy within the framework of ecological economics as an alternative to neoliberal capitalist economic models in mitigating the consequences of climate change.

Human agency strains the planet's earthly limits by degrading the natural ecosystems. Extreme climate-related catastrophes happening all over the world exacerbate climate change leading to climate collapse. The risks of climate change are escalating at such a rapid pace that they may soon outpace society's ability to adapt, resulting in a terrifying future. Floods, wildfires, and famine have already displaced millions, numerous species have disappeared, and the world’s natural life-support systems have suffered from human inflicted ecological damage. Climate change is an existential concern, and climate concerns cannot be fully addressed until unified global policies to combat climate change are enacted. As a result, it is critical to be aware of the emergency and urgency of global climate change and to take climate action before it is too late. When the core causes of the climate catastrophe are identified, the problem may be reframed as an opportunity to

build a better future. Literary genres such as science fiction, climate change fiction, and speculative fiction may play a significant role at this juncture since they can both illustrate and give answers to basic challenges. Even disaster scenarios might spark climate action by alerting the reader to what the future holds. Thus, human-induced climate change may be addressed by human activity, since literature is a human creation itself.

The creeds of human preeminence strengthen the concept that humanity is at the center of the world with its capacity to reason. As a result, nature's agency is neglected since it is seen as an inferior entity. Because this notion supports the human ambition for supremacy in communities and nature, it leads to a distorted perspective of the outer world and nonhuman beings (Estok 208). As a result, the entire natural world becomes a massive market of resources. The term Anthropocene has become widely accepted to indicate the severe human impact on the Earth's life support systems. Anthropocentrism is the belief that everything exists for people and to serve people. Anthropocentric thinking views the earth and all living and nonliving entities in it as a resource that can be exploited by humans. In other words, "anthropocentrism promotes the exploitation and commercialization of the natural environment" by neglecting "the intrinsic value of nature" (Kuper 267). For instance, individuals who advocate for the use of animals for human benefit frequently utilize the concept that animals were created for humans to justify their actions. Anthropocentrism is a sort of discrimination; it is the marginalization of nonhuman species with the belief that they are inferior to humans just because they are not human and should serve humanity. For ages, Anthropocentrism has been a kind of Eurocentrism and misogyny, supporting the view that all non-Europeans and non-whites should serve the European white man who is generally the one that holds the largest share of the market. As a result, anthropocentrism dominates global economies and legitimizes capitalism. On the other hand, capitalist thinking views even nature itself as capital in its pursuit of everlasting growth. However, it is often ignored that planetary resources are limited on a finite planet (Daly, *Beyond Growth* 33; "Economics" 1). Nonetheless, human activities exploit natural resources and contribute to global climate change.

And yet, the term Capitalocene has become more explicative in showcasing the fact that the entire natural world has become a massive market, a vast capital for human wellbeing. In other words, the term Capitalocene, with a view of global economies, underlines capitalism's responsibility for environmental catastrophes. In 2013, Jason Moore coined the term to underline the fact that humans shape the era with their activities rather than existence. In a way, it is capitalist thinking that views even nature itself as capital in its pursuit of everlasting growth. However, it is often ignored that planetary resources are limited on a finite planet (Daly, *Beyond Growth* 33; "Economics" 1) making it more important to engage in the scientific understanding of the Earth system.

To detect and track the human impact on the environment, several stations and satellites have been gathering data from various spots on the Earth for almost a century. Throughout the year, these instruments record the air temperature fluctuations every day and night. The temperature, which was roughly 16°C in the 1960s, has been rapidly rising since the 1970s. As these anomalies show the world has warmed over 1°C in thirty years, implying that the Earth has seen a quite substantial quick shift on a global scale. This global phenomenon is known as global warming. Many believe that global warming is a non-threatening concept. Living through a long summer and without wearing a coat in November or December may sound appealing at first, but global warming is a dangerous shift. Indeed, global warming is the worst tragedy that the planet has faced up to now. The most obvious sign of global warming is raising temperatures. These rises cause different issues in various places of the world, and the human impact on the formation of these problems is significant. Relying on scientific evidence, human impact on global climate change has been repeatedly stated for years now. It was 1989 when American environmentalist and author Bill McKibben touched upon the human impact on atmospheric distortion (*The End* 99). As years went by gathering a great deal of scientific data, Tim Flannery stated in 2005 that climate change was primarily caused by humans (35). Following The Geneva Association's statement revealing a significant rise in ocean temperatures (Niehörster et al. 5), the Intergovernmental Panel on Climate Change Working Group I published the first part of the Sixth Assessment Report in 2021, which pointed out that "human influence has warmed the atmosphere, ocean, and land" (4). The study was quickly dubbed "a code red for mankind" by UN Secretary-General António

Guterres (United Nations). His statement succinctly underlined that climate crisis was developing for the entire world, and that climate change, then, is often viewed as a human-induced phenomenon that affects all life forms on the planet. Anthropocene,

> refers to the impact that humans have produced on the earth's climate, and specifically the fact that global warming is induced, at least to a certain degree, by humans. . . . In the sense of humankind's influence on nature, it refers to the fact that climate change is inevitably linked not only to nature, as the climate is a natural phenomenon, but also to culture and to politics, as they play a great role in its alterations. (Maleska 317)

Undoubtedly, there are natural forces affecting the climate, such as solar activity variations, massive volcanic eruptions, or the usual melting of glacier bottom layers due to hot spots created by geothermal energy in oceans. Nonetheless, due to the degree of hazard observed on the atmosphere, land, oceans, and other surfaces, human impact on climate change is defined as the paramount cause. Burning fossil fuels, bad land management, and consuming habits are the most detrimental anthropogenic influences, and these are all linked to cultural, political, and economic activities. Comparing the natural and artificial causes of climate change, the human impact outweighs natural factors as it can be verified just by the amount of greenhouse gas emissions in the atmosphere, which results in ocean acidification and warming, thus melting polar ice caps and glaciers as well as thawing permafrost along with many other climate-related causes and effects. Given the human impact on the climate, climate change is accelerating, widening, and deepening. Wildfires, extreme weather events, and floods have become more widespread around the world, particularly in the twenty-first century, and they now dominate the catastrophic landscape. The last decade is widely viewed as the peak of severe consequences of global warming. According to NOAA National Centers for Environmental Information's Global Climate Report for Annual 2020, the warmest decade was 2011-2020, which "surpassed the previous decadal record (2001–2010) value of +0.62°C (+1.12°F)" ("State of the Climate"). The next year's report conveyed that 2021 "culminated as the sixth warmest year on record for the globe with a temperature that 0.84°C (1.51°F) above the 20th century average" and the warmest decade shifted to 2013-2021 (NOAA "Assessing the Global Climate"). These statistics prove that each year surpasses the preceding one, worsening. However, these extremes, on the other hand, are

not limited to the last decade but span the past 50 years. Published by World Meteorology Organization in August 2021, WMO Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970-2019) states that more than 11.000 calamities ascribed to weather, climate, and water-related disasters occurred between 1970 and 2019, resulting in just over 2 million deaths and US$ 3.64 trillion in costs (7). What is clear from this statement is that the economic losses are as prominent as the loss of life and biodiversity. It would not be inaccurate to state that the worst is yet to come for future generations. Depending notably on the regional and socio-economic factors, the level of exposure and vulnerability to these disasters in the forthcoming years is estimated to be variable. The IPCC Working Group II report, published early in 2022, projects the feasible climate-related hazards between the years 2021-2040 as follows:

> Global warming, reaching 1.5°C in the near-term, would cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans (very high confidence). . . . Continued and accelerating sea level rise will encroach on coastal settlements and infrastructure (high confidence) and commit low-lying coastal ecosystems to submergence and loss (medium confidence). If trends in urbanisation in exposed areas continue, this will exacerbate the impacts, with more challenges where energy, water and other services are constrained (medium confidence). The number of people at risk from climate change and associated loss of biodiversity will progressively increase (medium confidence). Violent conflict and, separately, migration patterns, in the near-term will be driven by socio-economic conditions and governance more than by climate change (medium confidence). (13)

As presented in the second part of the IPCC Sixth Assessment Report, vulnerability to disasters for the next twenty years is not only tied to climate change or environmental catastrophes but also to how governments handle these crises, and socio-economic markers are equally essential. Concordantly, Emmanuel Raju et al. alleges “blaming nature or the climate for disasters deflects responsibility” (2) and initiates the necessity of climate science to deal with the hazards. To illustrate, the Netherlands, for example, has constructed barrier islands to divert water and avoid flooding, which has been made possible by advances in technology. As Hendrik J. Verhagen points out, thanks to dikes and a national policy carried into effect “for compensation of all coastal erosion,” the Netherlands should be able to manage the risks of sea level rise (838). Climate science and administrative measures are effective in this case when it comes to reducing vulnerability to environmental catastrophes. Rising sea levels, on the other side, are

displacing Pacific Islanders. According to reports, these islands are "among the poorest countries in the world" (qtd. in Halstead, 826). Although the residents started building seawalls as early as 1980s (Luetz 18), these attempts have not been completely successful due to both natural and economic reasons and the lack of effective technologies. Some of these islands are eventually being evacuated, and their inhabitants are forced to migrate. In comparison to the Netherlands, climate migration is, in some ways, self-evidently associated with socio-economic conditions. In his essay "Is It Too Late?" Kim Stanley Robinson writes, “In the damage that will come first, before any better time, the poor will suffer much more than the rich, both because the rich will be better able to afford adaptations to the degrading environment and because many of the poor live in the parts of the world that will be most hammered by climate change” (375). Finally, the third part of the IPCC Sixth Assessment Report by Working Group III has been published quite recently. The report titled “Mitigation of Climate Change” investigates the goals of reduction in global emissions as well as the sources of those emissions and then evaluates how effective these goals will be. Fiona Harvey asserts, “This [report] is likely to be the last published while there is still time to stay within the 1.5 C limit.” This statement alone demonstrates the emergency of climate change mitigation. In this respect, loss and damage caused by climate change will increase rapidly with further warming, and in many cases, it will generate hazards to which humans and nature cannot adapt. The lack of adaptation will pose a paramount threat not only to the contemporary generation but also to their offspring, who will be unfortunate to inherit a messed up environment and a social system from their parents. If global emissions are reduced only at the rate as currently planned, the resulting temperature rise will still pose a threat to food production, water supplies, human health, coastal settlements, national economies, and much of the natural environment's survival. Obviously enough, the only way to avoid environmental corruption will be to make faster and stricter cuts and restrictions when it comes to the well-being of all generations.

It is hard to discuss the effects of climate change without including changes in ice sheets, the greenhouse effect, and consumption habits. Glaciers are massive chunks of ice that have accumulated over time as a result of the snow that has fallen on the valleys. They can be hundreds of meters thick and kilometers long. Glaciers are quite heavy, so they

move slowly in the direction of the slope. Shrinking glaciers due to melting add tons of water to the seas. This condition affects the ocean currents while posing the risk of sea-level rise. Global warming, on the other hand, has a negative impact on the Poles, the planet's freshwater reservoir. The North Pole is a 3-4 kilometer thick mass of ice floating in the North Sea with no land beneath it. The South Pole is an ice-covered continent known for its penguins. Although just a few researchers live in the poles, these areas are home to a diverse spectrum of animal populations. Climate change threatens both land and ocean populations of penguins, polar bears, seals, foxes, reindeer, fish, and other animals. Furthermore, the poles act as a mirror, reflecting sunlight. Additionally, cold winds traveling from the poles cool ocean currents that have been warmed in the Equator, cooling the oceans. When the poles shrink, the oceans cannot cool down and sunlight cannot be reflected sufficiently, causing global warming to accelerate.

The conditions on Earth are substantially different from those on the other planets in the solar system. The most significant of these distinctions is that the atmosphere is permeable. By reflecting most of the energy accumulated during the day back into space, the permeable atmosphere prevents the planet from overheating. The melting of the ice sheets, excessive sunshine, and the effect of greenhouse gases disrupt the planet's cooling process. Because greenhouse gases absorb sunlight and trap it in the atmosphere. Fossil fuel consumption is a major contributor to the growth in the greenhouse gas effect in the atmosphere. Another contributing factor is human dietary habits. Animal husbandry is critical at this point since it results in excessive water consumption and pollution. Furthermore, animal husbandry is the largest contributor to another greenhouse gas, methane. According to the Food and Agriculture Organization of the United Nations, animal enteric fermentation accounts for 30% of methane in the atmosphere. It is well known that methane retains heat. Furthermore, CO2 emissions from the meat-producing process are relatively substantial. This rate has been proven to be more than the total amount of CO2 emitted by the transportation sector.

On the other hand, some argue that human activity is not to blame for climate change. The radical ones are called climate deniers today. Many of these conflicts are fueled

primarily by energy firms. The outcomes of these conversations show that there are undiscovered causes bringing about climate change and that global warming is a natural process that will occur even if not for humans. The first reason some claim that global warming is not caused by people is that the Earth has already experienced temporary temperature variations known as 'Ice Ages'. The existence of at least five previous ice ages prior to the advent of modern humans demonstrates that the Earth experienced warm and cold periods without human intervention. As aforementioned, scientific research has revealed the impact of human activities on climate change. The shrinking of glaciers, on the other hand, indicates global warming and climate change in their most basic form. Because there is no other explanation for the world's ice sheets retreating but global warming. Since global warming is a human-induced environmental calamity, there are measures and actions that may be performed on an individual and national basis as well as global scale. In this regard, science serves as a guide in establishing the variables that cause warming, what is being done incorrectly, and developing an action plan by investigating the causes of warming. So far, some climate actions, such as the Paris Agreement, have been adopted and promoted internationally.

The most generally voiced climate activities, which are also prescribed by the Paris Agreement, are the reduction of fossil fuel consumption, the promotion of clean agriculture, reforestation, the limiting of single-use plastics, and recycling, which now has options such as upcycling. Because fossil fuel burning is the leading cause of greenhouse gas emissions into the atmosphere, the usage of clean energy sources should be expanded. Carbon-neutral technologies, such as generating power from renewable and clean sources such as solar and wind energy, using LED lighting that consumes less electricity, electric cars, and promoting public transportation, will be effective in reducing fossil fuel consumption. As previously indicated, the livestock sector contributes significantly to greenhouse gas emissions. On the one hand, there is an increase in methane gas in the atmosphere; on the other hand, the increasing requirement for nourishment in direct proportion to population growth is a major issue. At this juncture, it is vital to consider alternatives that will minimize meat production and consumption, hence limiting animal husbandry. Reforestation is another option. Deforestation is caused by expanding urbanization, mountain top mining, and, most notably, wildfires. Trees need

carbon dioxide to strengthen their trunks. For this reason, they pull in carbon dioxide and exhale it as oxygen. It is suggested that reforestation is one of the most important methods for reducing greenhouse gas emissions and increasing oxygen levels in the atmosphere. Finally, while recycling and upcycling efforts diminish consumption on a global scale, they also limit manufacturing. Furthermore, thousands of tons of waste are thrown into landfills every day and gradually covered with soil. Methane is produced as garbage decomposes in garbage areas. Many discarded packaging, on the other hand, is reusable. Garbage not only endangers the atmosphere but also pollutes soil and aquatic ecosystems. Garbage accumulating in the oceans generates massive floating mounds, which have a name today: the Seventh Continent. These garbage islands violate the marine population's right to life. Furthermore, when the fires breaking out due to methane emissions are included, waste poses a risk to all four elements on the planet. As a result, increasing public awareness about recycling can help minimize the amount of accumulating garbage.

Overall, literature plays a role in raising climate awareness. As Scott Slovic states, “Literature is a lens through which we’re able to sharpen our understanding of the world’s vital problems — and literary criticism the mechanism for articulating what we come to understand” (*Going Away* 8). Ecocriticism, therefore, becomes the instrument for interpreting global climate change. Ecocriticism, according to renowned ecocritic Cheryll Glotfelty, is the examination of the interaction between literature and the environment and “seeks to evaluate texts and ideas in terms of their coherence and usefulness as responses to environmental crisis” (xvii, 5). However, ecocriticism has expanded beyond Glotfelty's definition to include "the study of the relationship between human and non-human, throughout human cultural history, and entailing critical analysis of the term 'human' itself," according to Greg Garrard (5). With these analyses of ‘human’, economics and its impact on the environment has been taken into consideration. In this sense, economic activities have been found to be destroying nature (Daly, *Beyond Growth* 106), thus it is imperative that literary studies and ecocriticism include the examination of economics. The evaluation of economics and its impact on the environment have long entered American nature writings. In *Walden* (1854), Henry David Thoreau observes the relationship between people and their surroundings and challenges the idea that nature is an instrument to be exploited to serve humans in whatever manner imaginable. He

opposes the market economy and its operations, claiming that "the land is wrongly perceived as an instrument for profit" (Kuper 275). Aldo Leopold highlights the environmental consequences of a market-based economy in *A Sand County Almanac* (1949). He expresses that economic actors engage in positions comparable to "conquerors" believing they are superior to the environment and that there is continual exploitation and draining of the land for economic purposes (13). His 'land ethic' defending "boundaries of the community include soils, waters, plants, and animals, or collectively: the land" (2) recommends that economic actors should reevaluate how their self-interested actions affect the ecosystem. Following their lead, Edward Abbey, Terry Tempest Williams, and many other contemporary literary figures, including fiction writers such as Kim Stanley Robinson, Margaret Atwood, Barbara Kingsolver, Ursula Le Guin, Richard Powers, and Ann Pancake, begin giving thought to economics and the environment. As a result, the interaction between economics and the environment has made its way into fiction. Furthermore, with the emergence of a literary genre known as climate fiction, the influence of economic activity not only on the environment but also on climate change has begun to appear in fiction. Climate fiction provides a futuristic perspective on factual truths regarding human action and its impact on the climate. Climate change, thus, is a cultural process that affects and reshapes daily lives, not merely a scientific phenomenon.

Cli-Fi is a literary genre that has characteristics similar to science fiction. It was first coined by journalist Dan Bloom in 2008. He was inspired by Nevil Shute's *On the Beach* (1957) which tells the post-apocalyptic story of people who are desperately waiting for death in the face of a future radioactive disaster. Becoming engaged in the climate crisis after reading this book, he has been addressing it for several years. After viewing the 2004 film *The Day After Tomorrow*, which depicts a catastrophic ice age, Bloom focuses his attention on writers who are concerned about the future of the planet. Trexler and Putra state that the 1970s mark the beginning of climate change fiction, addressing Heat (1977) by Arthur Herzog as "the first novel to engage directly with climate change" (187). However, J.G. Ballard's *The Drowned World* (1962) may be regarded as another groundbreaking work of fiction set in the near future in which the flooded world is mainly uninhabitable due to global warming. Following Herzog and Ballard, there are many other

authors engaged in writing about climate change and environmental deterioration. These writers include but are not limited to Paolo Bacigalupi, Emily St. John Mandel, Richard Powers, Saci Lloyd, Sam J. Miller, and Octavia E. Butler. All of these writers narrate stories concerning the effects of climate change on natural environments and human life. Climate fiction, as the name implies, deals with the climate catastrophe, observes what could happen in the world's present and future, and attempts to provide visions of potential futures. This genre of literature dealing with climate change and its consequences refers to the word "science fiction" (Sci-Fi). However, unlike science fiction, Cli-Fi narratives do not have to be speculative. Cli-fi may as well exhibit realistic and plausible settings of the present or the near future. It may also depict realistic and convincing scenes from the present or near future. T.C. Boyle's *A Friend of Earth* (2000), for instance, covers the narrative of environmental destruction caused by global warming. The MaddAddam trilogy (2003-2013) by Margaret Atwood depicts a catastrophic scenario produced by mankind and its ramifications. Saci Lloyd's *Carbon Diaries* (2008) is set in the UK following a series of extreme climate events. Ian McEwan's *Solar* (2010) delves into the depths of climate change while demonstrating the pursuit of solar energy-based remedies to climate change. In *The Bone Clock*, David Mitchell examines how humans have brought the world to catastrophe over years from an interspecies perspective (2014). *The Overstory* (2018) by Richard Powers illustrates how deforestation and apathy for nature's complexities led to the current existential dilemma. Jenny Offill's *Weather* (2020) exposes climate change concerns. Many of these cli-fi novels including that of Kim Stanley Robinson embody climate change, extreme climate events, and environmental collapse at the heart of their narratives. Cli-fi depicts the future impacts and calamities caused by the climate, which humans have wrecked by neglecting the implications of their actions—even if unintentionally. As the climate catastrophe becomes increasingly prevalent in literature, public awareness of the issue has grown. Nonetheless, reviewers have often noted that climate fiction is still a growing genre to detect and offer long-term visions. It's reasonable that cli-fi needs time to improve. Still, climate fiction connects people to the world they live in; it helps the reader comprehend what the environment will be like in the future and how the climate issue will influence the planet and people in various ways. Thus, the function of cli-fi is reminiscent of Scott Slovic's comments on the ecocritical responsibility to react to the climate crisis:

> it occurs to me more and more these days that literature is, indeed, much more than an intellectual toy, created for the pleasure of clever, but "irresponsible," critics who resist taking stances on what's happening in the world. Literary scholarship and literature itself are, on the most fundamental level, associated with human values and attitudes. We should, as critics and teachers of literature, consider how literary expression challenges and directs readers to decide what in the world is meaningful/important to them. (*Going Away* 28)

Kim Stanley Robinson, maybe not as a critic, but as a climate-conscious author, bears responsibility for responding to climate change. In *Green Planet*, Gary Canavan asserts that "the future has gone bad; we need a new one" (xi). If Canavan's assertion is acknowledged, Kim Stanley Robinson's literary work creates new possibilities or offers options for livable and sustainable futures. Award-winning American science fiction and climate fiction writer, Robinson has been publishing books since 1984. He authors more than twenty novels along with several short stories and nonfiction works. His most well-known work, the Mars trilogy, has been translated into twenty-four languages. He discusses ecological, economic, political, and cultural concerns, as well as the impacts of climate change, the subsequent climatic catastrophe, capitalism, and politics. Moreover, he displays these discussions from the point of view of multiple characters and settings in his novels. This multiplicity can be regarded as his literary writing strategy as an author. He does not focus on a single protagonist in his writings. In doing so, it can be asserted that he underlines the diversity of individuals regardless of their nationalities or socio-economic conditions when it comes to being vulnerable to climate change or exposed to its effects. Reading his novels, Robinson's readers travel around the world and in time as he sets his fiction from the West Coast of the U.S. to the East, from the Pacific to Europe in varying futures.

Moreover, Robinson's fiction is based on science and technological knowledge, as well as the collaboration of science and political action, all of which contribute to his optimism about climatic futures. His books typically give a bright outlook on the future, not because he believes the future will be devoid of issues, but because he believes environmental politics, ecological economics, and science have the potential to handle the challenges posed by the climate change disaster. In this sense, he maintains climate optimism, which encourages him to explore utopian rather than apocalyptic future scenarios. As a result,

he advises depending on environmental policies and technological advancements to combat climate change and take climate action. Just as many scholars claim that his works consist of utopian projections (Markley "'How to go forward'" 14; Murphy 149; Johns-Pudra 750) he openly states that he "think[s] of himself as a utopian writer" (Robinson, "Future Politics" 185). He further explains, "Utopia is a name for one course of history, a progressive course in which things become more just and sustainable over the generations. We're not there now, but depending on what we do, and what our descendants do, we could still be said to be living in a utopian history, as being on the path" (185). Even if Robinson does not redefine it, he interprets the definition of utopia in his own way and employs its ideals in his works.

In most of his works, Kim Stanley Robinson problematizes neoliberal capitalist economies due to their impact on the environment (Abbot 28; Markley "Falling" 788; Pak 10). Kim Stanley Robinson's criticism of the current global finance is a result of the fact that "the interrogation of capitalism… is often conducted through a concern with its impact on nature" (Robinson, "Future Politics" 182). Schneider-Mayerson et al. state that many of Robinson's novels have a sense of desire for activism "to raise awareness and generate behavioral and political change" (311). Therefore, Robinson often showcases initiations of both political and economic change in his novels. *Forty Signs of Rain* (2004), *New York 2140* (2017), and *The Ministry for the Future* mainly deal with climate change and its relationship with capitalist economies. Christman states that "Robinson turned his attention to climate change first with the Capital trilogy (2004 – 2007), and then with *New York 2140* (2017). Now he has done so again with *The Ministry for the Future.* All novels portray a setting of extreme climate events and how people manage their lives in this kind of setting. Another common motif of these novels is Robinson's representation of how he wishes to see the end of neoliberalism thanks to the public's collective actions.

Neoliberalism is an ideology introduced as a socio-economic model as a result of the collapse of trust in the welfare state in the west after the 1973-1975 Recession. Prior to that, the Great Depression marked the greatest economic crisis in the 20th century. Started

in the US and lasted almost a decade, the economic depression spread intensely all around the globe crushing global finance. After the intense crisis of the liberal system in 1929, classical liberalism was abandoned as a way out of the depression and social state organizations replaced it. By the 1970s, however, both the US and the world was in a major economic crisis. Seeking a bailout from the crisis, the major targets were privatization, formation of the free market, of capital flow liberalization, which laid the foundations of neoliberalism. As a reproduction of classical capitalist philosophy, neoliberal policies promote globalization. Thus, neoliberalism advocates the total dominance of the free market system with the globalization of the economy and capital, privatization, and the rejection of state intervention. Neoliberalism holds that economic activities should be separated from the state and that the private sector should regulate and govern the market. In other words, the state should not play an economic role in modern society, thus leading to privatization and a free market. As a result of these ideals, great masses are supposed to benefit and the level of prosperity is supposed to increase. However, neoliberalism brings about more exploitation of labor, more poverty, unemployment, extreme poverty, and injustice. In this way, the gap between socio-economic classes expands cumulatively while environmental degradation increases due to the economic growth ideals.

Kim Stanley Robinson criticizes neoliberalism for its insistence on continual economic growth. There is a constant struggle between economic development and environmental conservation since growth is a fundamental policy aim of most governments. Growth is believed to raise living standards, but it is no longer doing so since the market is about to run out of resources. The assumption that the environment is a component of the economy justifies natural capital exploitation. According to Lester Brown, humanity is "losing the war to save the planet" (xv), and he adds,

> Evidence that the economy is in conflict with the earth's natural systems can be seen in the daily news reports of collapsing fisheries, shrinking forests, eroding soils, deteriorating rangelands, expanding deserts, rising carbon dioxide ($CO_2$) levels, falling water tables, rising temperatures, more destructive storms, melting glaciers, rising sea level, dying coral reefs, and disappearing species. These trends, which mark an increasingly stressed relationship with between the economy and the earth's ecosystem, are taking a growing economic toll. At some point, this could overwhelm

> the worldwide forces of progress, leading to economic decline. The challenge of our generation to reverse these trends before environmental deterioration leads to long-term economic decline, as it did for so many earlier civilizations. (Brown 4)

In line with the quotation above, an "environmentally sustainable economy" is required (Brown xvii). In other words, the recent environmental disasters in many countries demonstrate that the climate crisis should be at the core of new economic thinking. In industrialized countries, particularly in the last 20 years, it has been argued that the criterion of economic success should not be rapid economic growth or welfare, but rather environmentally sustainable and rational growth. For example, in today's neoliberal capitalist economy, investments in fossil fuels outnumber investments in climate change mitigation or ecological restoration. The reason for this is that fossil fuels are utilized for more than just heating and transportation; for instance, coal and natural gas, both of which generate carbon, are primarily used in the production of electricity. Because electricity is required in the manufacture of all types of items, fossil fuels are the foundation of industry in general. Similarly, cement production is a significant source of CO2 emissions. Moreover, while natural gas is produced and delivered through pipelines, methane, a significant component of natural gas, is released into the atmosphere. To put it another way, the more natural gas is extracted from the ground, the more methane is released into the atmosphere. This type of fossil fuel economy is a sort of cancer to the environment. Rice production, on the other hand, contributes to methane gas emissions. As the world population grows, so does the demand for rice, which is the major diet of people living in East Asia, which has a high average population. As a result, while population control is a crucial concern for climate change, it is not supported by economic growth. Because more people equals more labor and wealth in capitalist systems. To mitigate the effects of climate change, there is a need for regulations in line with ecological economics to reduce resource usage, implement policies that promote clean production technologies, price carbon, and tighten emission standards. These regulations should override mainstream since it does not provide the conceptual framework needed to rebuild environmental resilience or respond to climate change.

Robert Constanza, one of the founders of ecological economics, defines ecological economics "as a bridge across not only ecology and economics but also psychology, anthropology, archaeology, and history" ("What is"). Ecological economics attempts to examine everything outside of the market. Peter A. Victor states "[t]he emphasis that ecological economists place on the throughput of materials and energy in understanding the relationship between economy and environment is not found in many neoclassical economic treatments" (236). Similarly, according to ecological economics, nature is not only passive waste storage and raw material supplier, but it is also a producer with its own technologies. Nature provides clean water, clean air, a warm climate, seafood, forest products, and sustainable agricultural areas shielded from erosion and drought, which are all products of nature. Ecological economics examines the economy holistically; human economic activities are merely one component of an entire ecosystem. The main goal of the economy, according to the notion of ecological economics, is to improve the quality of life of societies, not to grow monetized consumption. To provide maximum quality of life, ecological economics requires "an understanding of basic ecological concepts such as sustainable yield, carrying capacity, nutricient cycles, the hydrological cycle, and the climate system" (Brown 22). The mainstream approach aims to improve the economy by considering only a small portion of the factors that determine the quality of life. The ecological approach, on the other hand, attempts to model the economy by incorporating all of the components required for a sustainable quality of life. As a result of this modeling, the notion of ecological economics is that "human economic activity is bound by absolute limits" (Bartkowski). Ecological economists believe that "the sources of natural capital are fixed and therefore limit the potential growth of the global economy" (Sagoff 610). As a result, since the primary problem of the ecological economy is the healthy functioning of ecosystem components, economic concerns are secondary.

Many novel socioeconomic and sociopolitical concepts have emerged as a result of the ecological economy. The steady-state economy model developed by American ecological economist Herman Daly is just one of those concepts of ecological economics. Simple put, a steady-state economy is "an economy with a relatively stable, mildly fluctuating product of population and per capita consumption . . . and a viable alternative to a growing economy" (Czech and Daly 599). Herman Daly states that modern

economies grow at the expense of the natural environment, and that nature is the most basic yet most restricted economic capital. Morever, when mainstream economics "espouses growth forever, ecological economics envisions a steady-state economy at optimal scale" (Daly and Farley 23). Herman Daly's steady-state model opposes economic growth, which is promoted as the path to prosperity and happiness in mainstream economies. In *Beyond Growth* (1996), Daly investigates the costs of growth as well as the benefits of a steady-state economy. He contends that economic growth will not result in ultimate prosperity as it is not economic due to the fact that "the ecosystem is finite, nongrowing, and closed" ("Steady State Economics" 811). Therefore, a steady-state economy "can develop, but cannot grow, just as the planet earth, of which it is a subsystem, can develop without growing" (*Beyond Growth* 31). Moreover, economic growth that harms the biosphere but does not compensate for that damage is deleterious. In this context, the economies of most industrial countries do more harm than good to the planet and humanity. Because while resources are decreasing, world economies are in the pursuit of continuous growth ("In Defense" 945). According to Daly's steady-state economy, growth should be achieved through increased efficiency rather than the use of new resources, and it should be fixed eventually. Only in this way can growth compensate for the environmental damage it has created. It is also stated that the free market, as well as the globalized economy with unfettered free commerce and expansion, pose a significant risk because they produce widespread poverty and social misery while polluting the environment (Daly, *Beyond Growth* 146-147). Hinting at the neoliberal distribution of power, Daly claims that as global corporations exert power, governments lose control (99-100). He is also concerned about the fact that the environmental cost of growth is significantly larger than the gain from the output. To sum up, Herman Daly's steady-state economy is a physical concept "defined by constant stocks of people and physical wealth (artifacts) maintained at some chosen, desirable level by a low rate of throughput" ("In Defense" 945).

All in all, this thesis aims to examine Kim Stanley Robinson's criticism on the relation between neoliberal economies and climate change through *Forty Signs of Rain, New York 2140,* and *The Ministry for the Future.* Within the scope of the discussions, this thesis

will try to explain how Kim Stanley Robinson's alternatives to the mainstream economies relate to the principles of ecological economics while tracking his interpretation of Herman Daly's steady-state economics. All of the selected novels embody Kim Stanley Robinson's discontent with the neoliberal capitalist economies and their perpetual growth aims as well as his climate change-related concerns. Each novel problematizes global climate change and displays human-induced disaster scenarios of extreme climate events. However, Kim Stanley Robinson's plausible suggestions and alternatives for both economic transition and climate change mitigation are present in each novel.

The first chapter will observe the entanglement of extreme climate events and economic attitudes of politicans and their indifference to climate change. *Forty Signs of Rain* will be examined to observe the impacts of climate change mostly in Washington D.C., the role on science and technology in climate change mitigation, and the urgency of climate actions. Decays in natural systems such as warming waters and weather, sea-level rise, distorted ocean currents and melting ice caps, and extreme climate events such as storms, hurricanes, and floods will be examined to underline climate emergency. The chapter will seek to reveal how Kim Stanley Robinson initiates postcapitalism by criticizing neoliberal economic policies.

The second chapter will examine how Kim Stanley Robinson visions the end of neoliberal capitalism while pointing at a shift toward ecological economics. Fictional 2140s will be analyzed within the concept of the Capitalocene to highlight how capitalist practices in economics and production processes shape current environmental and socio-economic systems. Since *New York 2140* portrays a future setting with a new coastline due to the 50-foot rise in sea levels, the chapter will try to display what the future be like after a global climate collapse, and whether adaptation to climate change is possible or not. Finally, *New York 2140* will be analyzed to display how Kim Stanley Robinson deconstructs neoliberal regulations to offer a transition toward ecological economics and Herman Daly's steady-state economy.

The third chapter will try to explore whether there is a relation between Kim Stanley Robinson's economic revisions and the principles of ecological economics as well as Daly's steady-state economy. In doing so, Herman Daly's modes of steady-state economics will be tracked in *The Ministry for the Future*. The Paris Agreement will be examined to figure out how Robinson utilizes global climate action plans. The chapter will investigate the conditions of the Paris Climate Agreement, then compares the findings with Robinson's economic alternatives based on the foundation of the *Ministry for the Future* as a UN body and the introduction of the carbon coin as a new digital currency. The chapter will try to reveal how Kim Stanley Robinson's suggestions revise the current global economy and mitigate the impacts of climate change.

In conclusion, this thesis traces the economic, political, and social impacts of human activities on climate change in order to examine how mainstream economics leads to environmental deterioration in the neoliberal world. Examining the roots of climate disasters and the risks they pose to the biosphere as well as Kim Stanley Robinson's criticism on capitalism, this thesis proposes that advancements in science and technology, collective actions of citizens, and state-iniated regulations will contribute to climate change mitigation.

# CHAPTER 1

## THE ENTANGLEMENT OF HUMAN ACTIVITY AND CLIMATE CHANGE IN *FORTY SIGNS OF RAIN*

*But now, out in the wild, the sunshine on one's shoulders is a reminder that man has cracked the ozone, that, thanks to us, the atmosphere absorbs where once it released. The greenhouse effect is more apt name than those who coined it imagined. The carbon dioxide and trace gases act like the panes of glass on a greenhouse – the analogy is accurate. But it's more than that. We have built a greenhouse,* a human creation, *where once there bloomed a sweet and wild garden.*

Bill McKibben, *The End of Nature*

*We have known for some decades that the climate change we are creating for the twenty-first century was of a similar magnitude to that seen at the end of the last ice age, but that it was occurring thirty times faster… And so there has been little reason for our blindness, except perhaps for an unwillingness to look such horror in the face and say, 'You are my creation.'*

Tim Flannery, *The Weather Makers*

*Forty Signs of Rain* (2005) is the first novel in Science in the Capital trilogy, and it deals with extreme storms, torrential rain, and floods as a result of global warming and unstable ocean currents. In the novel, Kim Stanley Robinson introduces the main characters who will appear in the rest of the trilogy. This cast of characters includes scientists from the National Science Foundation, Anna and Frank; policymakers, Charlie and Phil; and

climate victims, the Khembalis, who are pursuing environmental justice on political grounds. *Forty Signs of Rain*'s spectrum of multiple protagonists highlights two standpoints: the role of diverse range of figures regarding science and politics in climate change mitigation. In this regard, the novel depicts a world affected by global warming, sea level rise, and extreme environmental disasters. *Forty Signs of Rain* begins when Anna and the Khembalis first meet. Since their island nation is drowning due to sea level rise, the Khembalis strive to raise awareness of the impacts of carbon emissions overheating the globe. As Anna introduces them to Charlie, Senator Phil Chase's environmental policy advisor, the Khembalis are assisted by climate lobbyists to take their argument to a political ground. Meanwhile, NSF funds scientific research tracking climate change and collects data to provide an accurate assessment of potential disasters. One of these projects uncovers an abrupt stall in Gulf Stream which regulates the oceanic ecosystems. This distortion disrupts the atmospheric order, resulting in heavy rain and a subsequent flood that wreaks Washington, D.C. Frank and Charlie attempt to alert authorities about the effects of climate change, to liberate science from the constraints of the capitalist order, and to launch climate action at both the National Science Foundation and the United States Congress. The flood at the end of the novel is an implication of further calamities and climate emergencies. Ultimately, the novel implies the need for political action to address neoliberal capitalism and reverse the impacts of climate change. In the novel, Kim Stanley Robinson not only raises awareness about global climate change but also reveals a critique of the limits of capitalism to respond to climate change. This chapter will survey the impact of human activity on climate change and claim that a shift in the current economic paradigm is required to take climate action on behalf of all living entities on the planet. As a result, the purpose of this chapter is to explore how climactic disasters affect the world and how science and politics are involved in climate change mitigation.

## 1.1. EXTREME CLIMATE EVENTS IN *FORTY SIGNS OF RAIN*

Given the human impact on climate change, Kim Stanley Robinson discusses the role of science and political action in dealing with climate change and preventing further

calamities while ensuring environmental justice in the Science in the Capital trilogy. In doing so, he emphasizes extreme climate events with a focus on global warming of the biosphere, which results in the distortion of both atmospheric and oceanic systems. In this regard, Robinson depicts heat waves, warming and desalination of oceans, disruptions in ocean currents, and explains how all of these climate events relate to the formation of catastrophic weather events as well as sea level rise. For all the undertones of cataclysmic climate breakdown, the trilogy does not stand for an end-of-world narrative. On the contrary, "the series is strikingly utopian, positing a future in which awareness of the devastating threat of climate change prompts dramatic action, within the United States and across the globe" (Evans 202). Robinson's Science in the Capital trilogy consists of three consecutive novels, *Forty Signs of Rain* (2004), *Fifty Degrees Below* (2005), and *Sixty Days and Counting* (2007), which were later revised as an omnibus, *Green Earth* (2015).

Offering "an engaging primer on the science, economics, and politics of global climate change" (Evans 201), *Forty Signs of Rain* is the first novel of Robinson's Science in the Capital trilogy. The novel offers information on the climate and the prospective effects of global warming which depends on scientific evidence implying humans as contributor to climate change. The novel focuses more on natural disasters in a warmed Washington, D.C. setting and partly the West Coast as a result of Robinson's interest in "finding stories that would explore the money/science/politics/environment complex of issues" (Robinson, "Future Politics" 179). It is also stated that Robinson "point[s] to growing awareness of ecological issues that are somehow pouring into fundamental discourses, like politics or economics, and are, in turn, largely being ignored" in *Forty Signs of Rain* (Brunori 57). In this way, Robinson depicts a near-future setting in which the melting of ice sheets has been hastened. When the ice melts faster than predicted, the polar sheets are unable to reflect the energy from the sun back into the atmosphere, causing the oceans to absorb the excess energy and warm up faster than usual. As the waters warm, the amount of ice that melts increases. To put it another way, the more water warms, the more ice thaws, and the cycle repeats (Robinson, *Forty* 3). The Gulf Stream is distorted and stalled as a result of this pattern of environmental deterioration described in *Forty Signs of Rain*, which brings about a colder and windier climate. Upon this very incident, Kim

Stanley Robinson illustrates the indifference of a society to take measures and action in the face of climate catastrophes through a cast of characters ranging from scientists to politicians to Buddhist islanders. Each chapter provides scientific data while introducing the current status of the globe as a summary of what has happened, is happening, and is expected to happen. Throughout *Forty Signs of Rain*, multiple protagonists display various points of views at times of climate crises, as well as raising questions about "intergenerational ethics, ecological economics, social justice, and sustainable cultural values" (Morrell 88). Besides, Trexler and Johns-Putra also state that Robinson's use of multiple protagonists forms "a response shaped by participation and cooperation rather than individualism or heroism" (192), which is a common motif in Robinson's fiction. Still, each chapter is observed to center on one of the three main characters: Anna Quibler, a scientist at NSF (National Science Foundation); Charlie Quibler, a stay-at-home dad and Senator Phil Chase's environmental policy advisor; and Frank Vanderwal, a sociobiologist who works under Anna at NSF and is interested in human behavior. Robinson suggests that scientists be the primary decision-makers in the fight against climate change. To put it another way, he advises that scientists not only advocate political transformations, but also participate actively in climate change politics, making scientific politics the major focus of *Forty Signs of Rain*.

Charlie, Anna, and Frank work to uncover the veracity of the perils of global warming, a phenomenon that poses a threat to all life forms on Earth. The novel emphasizes the conflict between science and politics by concentrating on scientists and their interactions with politicians because "environmental science and political will must unite in order to redress climate disaster" (Trexler and Johns-Putra 187). In other words, when the climate catastrophe and its components are fairly assessed, politics and science are intimately interwoven. Because these three major characters are deeply worried about the risks of climate change, they are all involved in addressing them in varied contexts regarding their occupational statuses. Anna tries to initiate climate justice as a means of her position at the NSF, whose executives provide research funding, and strive for the promotion of scientific activity on the federal level. Working as a visiting scholar for a year at the NSF, Frank is highly worried about the government's political inaction in terms of mitigating the impacts of climate change. He keeps up with climate news on a daily

basis (Robinson, *Forty* 105), some of which are displayed at the beginning of the chapters, and he gradually gets enraged by the insufficiency of NSF for climate change mitigation; as he puts it, "NSF is simply too small to have any real impact" (210). While Anna and Frank combat the climate crisis from a scientific standpoint, Charlie endeavors to persuade politicians, even the President himself, to support the climate bill he has drafted for Senator Phil Chase to bring the issue of the climate crisis on the Foreign Relations Committee's agenda. As Robinson explains, this bill "would require the U.S. to act on certain recommendations of the Intergovernmental Panel on Climate Change" (43). Therefore, Charlie's bill could potentially initiate political climate action.

### 1.1.1. The Weather

As global warming heats the earth to unprecedented levels, the severity of the heat waves surrounding the U.S. can be tracked with Kim Stanley Robinson's choice of adjectives to describe how the heat feels such as 'humid,' 'blanching,' 'mind-numbing,' 'steamy,' and 'stupendous'. He further details the impacts of global warming and rising temperatures with a weather phenomenon called the Hyperniño, which seems to be a "permanent El Niño" (*Forty* 32), the warm phase of the El Niño–Southern Oscillation (ENSO). It is a climate pattern that causes temperature fluctuations between the atmosphere and the Pacific Ocean. Characterized by the exceptional warming of the surface water, El Niño is a natural phenomenon triggering extreme weather events such as heavy rains, storms, floods, heat waves, and droughts, which are all present in *Forty Signs of Rain*. A climate modelling report published in 2014 propounds that atmospheric warming generates the formation, frequency, and intensity of these extreme weather conditions (Cai et al. 111). The Hyperniño, therefore, implies a combination of El Niño and global warming, together forming a sweltering weather in the Pacific Coast Highway in San Diego County. The effects of rainy, foggy, or cloudy weather are so intense that residents of the coastal region take "vitamin D and antidepressants to counteract the effects of sunlight deficiency disorders" (Robinson, *Forty*, 115). Despite the depressingly cloudy weather in the coastal regions, a perpetual June Gloom, as Robinson puts it, is there to "bake desert all the year round" even in "ten miles inland" (115). The worst of heat waves is depicted as follows:

“People had thought it was hot before, but now it was July, and one day the temperature in the metropolitan area climbed to 105 degrees, with the humidity over ninety percent.” (236). Apart from the hot weather, the West Coast is also hit by multiple storms triggered by the forty-second-month-long Hyperniño. “The fourth in a series of pineapple-express storms” is so severe that sandstone cliffs of “La Jolla, Blacks, Torrey Pines, Del Mar, Solana Beach, Cardiff-by-the-Sea, Encinitas, and Leucadia [are] all taking a beating” (329) eroding discernibly. As a result, the impacts of Hyperniño do not only distort the atmospheric order but also change the coastline as well.

### 1.1.2. Warming Waters, Distorted Ocean Currents, and Storms

*Forty Signs of Rain* depicts a chaotic Washington D.C. with extreme heat and cold, weather events and a consequent flood that hits the whole city as the title suggests. The scientific data provided by Robinson presents, “[t]wo and a half billion metric tons of CO2 added to the atmosphere by American industry every year, some 150 percent more than the Kyoto agreement would have allowed if they had signed it, and rising fast” (*Forty*, 159). Carbon emission is one of the key figures in global warming, and triggers many other forms of environmental degradation, breaking the harmony of the sky and land. When nature's harmony is disrupted, the marine, atmospheric, and terrestrial systems inevitably fall down one by one. In this regard, the effects of exceeding carbon emissions, particularly in the United States and other developed countries, cause permafrost to thaw and glaciers to melt faster than usual, while polar sheets are unable to refreeze in the winter months to make up for the amount lost due to rising temperatures. According to the first chapter, the Arctic ice caps "averaged thirty feet thick" in the 1950s, but "by the end of the century, it was down to fifteen" (Robinson 5). Water temperature is also significant in the regulation of the ocean currents. University Corporation for Atmospheric Research (UCAR) Center for Scientific Education notes, “In the North Atlantic, water heated near the equator travels north at the surface of the ocean into cold, high latitudes where it becomes cooler. As it cools, it becomes more dense and, because cold water is more dense than warm water, it sinks to the deep ocean where it travels south again”. Following the melting of Arctic ice, in the beginning of the third chapter

there is talk of desalination of the North Atlantic, which might stall the Gulf Stream and result in severe cold (Robinson, *Forty* 73-74). Desalination refers to the decreasing amount of minerals and more importantly, salt in waters. It is a process directly linked with the density of water. Desalination, and hence density, are critical when it comes to ocean streams because "[t]he melting ice causes freshwater to be added to the seawater in the Arctic Ocean which flows into the North Atlantic. The added freshwater makes the seawater less dense. This has caused the North Atlantic to become fresher over the past several decades and has caused the currents to slow" ("How Melting Arctic Ice"). Less dense water, freshwater in this case, does not sink deep into the ocean since "[c]ooling salty water sinks more easily than cooling fresh water" (Robinson, *Forty* 73) and distorts the cycle of the currents. It is exposed in *Forty Signs of Rain* that ocean streams are disturbed by the changing warmth and the amount of freshwater added to seawater as a result of melting ice, which is a primary factor of the severity of the weather events as it gets "windier and drier in the Northern Hemisphere, and colder in places, especially in Europe" (74). Bill McKibben comments on the relationship between extreme weather events and the ocean currents as follows:

> A hurricane draws its might from the heat transferred to the atmosphere when ocean water evaporates. The warmer the ocean's surface, and the farther beneath the surface the warm water runs, the more powerful the hurricane. If the sea turns cold a few meters beneath the top, the winds of the hurricane will soon churn up that frigid water and the storm will brake itself. But if the warm water runs deep –and in the tropics it may stretch down a hundred and fifty meters or more– the hurricane can build and build. (*The End* 103)

Robinson's catastrophic storm that hits Washington D.C. is closely connected with the distorted activity of the Gulf Stream. Having analyzed the recent data obtained from the movement of whales with GPS devices attached, Frank notes, "The Arctic Ocean ice pack breakup has flooded the surface of the North Atlantic with fresh water, and… that has stopped the surface water from sinking, and stalled the circulation of the big Atlantic current" which is a climate fact "identified as a major trigger event in Earth's climactic history" (Robinson, *Forty* 319-320). In line with McKibben's statement, warmed surface water ends up building a catastrophic storm and following that, a severe flood by which Washington D.C. is harshly hit. This correlation between warming of the atmosphere and waters, ocean currents, hurricanes, and storms highlights the unity, the entanglement in

nature and natural environments. Because the order that breaks on earth, similarly disturbs the one in the sky, and the consequences of both systems' breakdown influence each other again. In other words, when a climactic system is interrupted by the human impact, the others get interrupted as well, proving the harmony in nature. Kim Stanley Robinson puts forward global warming as the primary trigger of the natural systems' breakdown and environmental disorder in *Forty Signs of Rain* while the weather feels like "the inside of a sauna" (150). As previously notified, rising atmospheric and oceanic temperatures become the major cause of the current and the forthcoming climate disasters in the novel. One of the news sections of *Forty Signs of Rain* demonstrates that the time of the novel is "[o]ne of the five hottest years on record" meanwhile it also reads, "Two Billion Tons of Carbon Added to the Atmosphere This Year" (115). Therefore, the storm and the flood depicted in the novel represent the potential impacts and consequences of global warming while pushing the planetary climate limits. However, these extreme weather events are just the beginning of the worse climate catastrophes to come in Robinson's trilogy as a result of "the heat added anthropogenically to the atmosphere" (75-76) which is a statement that underlines the human impact on global climate change. He furthers his portrayal of climate disasters, both environmental and social catastrophes, and their impacts in detail in the rest of the Science in the Capital series, and lays bare the consequent facts in *New York 2140* while portraying a scenario of what the near future will be like.

### 1.1.3. Sea Level Rise

Another destructive consequence of higher temperatures around the world is the rise in sea levels and coastline disruption. In parallel to this environmental deterioration, coastal regions and islands are sinking, albeit slowly. Nevertheless, as Charlie in *Forty Signs of Rain* puts it more correctly, the islands are "not sinking, it's the ocean that's rising" (Robinson 147). John R. Campbell notes, "some working in the area of climate-change impacts foresee large numbers of people being forced to move as a result of rising sea levels, increases in the magnitude and/or frequency of climate-related extreme events, and other forms of environmental degradation caused by global warming" (1). These people Campbell mentions are often the residents of Pacific Island Countries and

Territories (PICTS), and they are considered to be the first victims of rising sea levels. Despite contributing the least to the carbon-based climate crisis, inhabitants of PICTS are bearing the worst of the consequences. It is a global political issue as these people eventually become climate migrants seeking sanctuary since “the processes of climate change and their effects in the region are likely to have serious implications for PICTS, and communities and governments will have to find ways of respond to them” (Campbell 3). Carteret Islands and Tuvalu are the most affected Pacific state islands; the former marks the first “’climate change refugees’” (Luetz 20) while the latter is estimated to be the next island to be evacuated (24). In spite of their initial reluctance to evacuate the island, "after fighting a lost war against the water for more than 20 years (building sea walls and planting mangroves), . . . the islanders have given up hope" and have been transported to Bougainville Island (20). The possibility of Tuvalu becoming the next island to be evacuated appears on Kim Stanley Robinson’s agenda. As he lists the challenges which the Pacific Islanders are facing through a fictional institution, the League of Drowning Nations, he also covers the issue of Tuvalu because sea level rise "slowly but effectively killing them off" (Shukman). Supported by the Pew Center on Global Climate Change, Tuvalu is portrayed to be “asking for financial compensation for this from Australia and other countries” (Robinson, *Forty* 68). Though not explicitly stated in the novel, the League of Drowning Nations represents the "low-lying countries" threatened by sea level rise (105). Robinson's focus on climate migration issue is redirected to Khembalung, one of the small island nations. It is a fictitious island in the Bay of Bengal, close to the Ganges Delta in South Asia (12). Khembalung, on the other hand, is depicted to be an ancient civilization which originated in Tibet[1] and has just recently been recognized as an island nation. When China invaded Tibet, the Khembalis fled their homeland, first to India, then to their small island (65). The Khambalis first meet Anna, then Charlie and Frank, upon establishing their first embassy on the ground floor of the NSF building. They were advised by Dutch advisors to “establish an embassy here [Washington D.C.], to join their campaign to influence American policy in these

[1] Kim Stanley Robinson is known for his interest in Eastern cultures, particularly Buddhism. His 2002 novel, *The Years of Rice and Salt* presents an alternative world in which the Black Death wiped out 99 percent of Europe, leaving Buddhism and Islam as the world's two religions.

matters [global warming]" (66-67). Their engagement with the Dutch extends further, as Drepung, one of the young Khembalis in the embassy explains,

> 'Over the years we have built a nice town. . . . Schools, houses—hospital. All that. And sea walls. The whole island has been ringed by dikes. Lots of work. Hard labor. . . . Dutch advisors helped us. Very nice. Our home, you know? Khembalung has moved from age to age. But now…' 'Global warming?' Anna ventured. He nodded, swallowed. (66-67)

As stated in the quotation, the Khembalis have made an admirable effort to rebuild their civilization over the years after being displaced several times but they are now endangered by the effects of global warming. Khembalung has been flooded multiple times "whenever the monsoon hits hard" (105), and the Khembalis are now at risk of sea level rise. As a result, the Khembalis are on the verge of climate migration; they seek climate action and justice through the Embassy of Khembalung, which is "the last best hope for their community" (Markley 17). In the meantime, Anna invites them to meet Charlie to ask for his views on the island's current situation as he could have many suggestions on their climate troubles due to his profession as an environmental policy advisor (Robinson, *Forty* 147). After having dinner with the Khembalis, Charlie contacts an old colleague, an attorney in immigration law, working for "a small but prestigious firm representing several foreign governments in their dealings with the American government" (147). Since the Khembalis need lobbyists, Charlie asks Sridar to be their representative. Sridar sounds reluctant at first asking, "You're asking me to take on a sinking island nation? . . . what are we going to be able to do about that, stop global warming?" yet, he agrees to take on the Khembalis. (147). In this regard, Charlie's call to Sridar not only provides political support to Khembalung in the world of the U.S. politics but also an initiation to take climate action as he answers Sridar's question regarding global warming, "Well, yeah. That's the idea" (147). Ultimately, even the slightest initiation may precipitate further climate change related actions. Charlie's initiation may seem like the United States assisting lesser nations; yet, Robinson depicts a developed country assuming responsibility, hence aiding climate sufferers in need. Taking the big picture into account, assisting a nation suffering from a climate catastrophe entails not just assisting that nation's welfare, but also helping the entire planet, and therefore one's own. Furthermore, the battle against climate crisis is not only just a

regional issue but also a socioeconomics one. Neither Carteret Islands could afford to build up more seawalls to mitigate the other impacts of climate change on their own, nor can Tuvalu pay more on measures. Additionally, disaster damage costs rise year after year, getting unaffordable for developing countries. Robinson illustrates this damage cost in the early 2000s as $600 billion as a result of hurricanes, tropical storms, and mass flooding since "[t]he Earth's atmosphere now consists a percentage of carbon dioxide and other greenhouse gases that is higher than it has been since the end of the Cretaceous" ( 225). Within this context, as will be elaborated in Chapter II, New York City in *New York 2140*, one of the world's most densely populated cities though, is not affected by sea level rise as much as Khembalung. The reason for this is that, in addition to geographical and economic variables, catastrophe mitigation and management requires access to science and technology, as well as the administration and application of scientific and technological knowledge. As a result, vulnerability and adaptability to climatic changes and damage vary by country and are dependent on data from science, technological application, and political initiative. All of these units necessitate a substantial amount of money, namely capital, which is to be particularly allocated to climate disaster management. Given both the realities of the status quo and Maslow's hierarchy of needs, developing nations are unlikely to be able to spare that budget for climate related issues. Ultimately, this implies the variety of the distribution of wealth among nations, and it denotes the praxis of capitalism. Robinson remarks on capitalism's role as the primary contributor to climate degradation as follows:

> . . . capitalism itself is a big part of the climate problem, really we need to attack the problem of capitalism's detachment from reality if we are to have any hope of stabilizing the climate and our relationship to the biosphere more generally. Not to mention justice among humans, which is a question with an environmental impact too. (Robinson, "Future Politics" 206)

This quotation reveals that what Robinson proposes is to reconsider capitalist thinking to reverse climate change and cope with the climate change crisis, which –if accomplished- could eventually secure climate justice in the world. Because the capitalist thinking influences both economic equity and climate justice due to uneven income distribution and social strata. *Forty Signs of Rain* covers Robinson's thoughts on the capitalist world today by explicating, "A tiny percentage of the population is immensely wealthy, some

are well off, a lot are just getting by, a lot more are suffering. We call it capitalism, but within it lies buried residual patterns of feudalism and older hierarchies, basic injustices framing the way we organize ourselves" (343). Obviously enough, with a talk of how much wealth people have or lack, his criticism on capitalism, in sum, touches upon economic conditions as well.

## 1.2. THE ROLE OF SCIENCE AND POLITICS IN CLIMATE CHANGE MITIGATION IN *FORTY SIGNS OF RAIN*

Robinson's critique of capitalism in *Forty Signs of Rain* takes place within the context of politics, namely growth-obsessed political regulations pointing at neoliberal implementations. In other words, he attacks politicians' economic growth goals ignoring environmental costs. In this way, capitalist thinking dominates politics, emphasizing the reality that the novel's policymakers are great capitalists who fit perfectly to Herman Daly's definition of "growthmania" (*Steady-State* 183; "Steady- State" 150; "The Economics" 17). "In a healthy economy," says the President of the United States in the novel, "the weather isn't important" (Robinson 225), and this comment encapsulates his climatic apathy and unawareness as a politician, as well as his obsession of economic progress. In addition to this statement, Charlie's impromptu encounter with the President unveils a quite delicate but enlightening and approving specimen in this matter as Mr. President himself declares,

> You've got to stick to the common sense idea that sustainable economic growth is the key to environmental progress. . . . we'd be sucking the life out of the economy if we were to go too far with this. You chew on that a while. As it is, we're taking bites out of this problem every day. Why, I'm like a dog with a bone on this thing! Those enviro special interests are like pigs at a trough. We're weaning them from all that now, and they don't like it, but they're going to have to learn that if you can't lick them . . .

As a result, there is a biased distribution of national wealth in favor of the never-ending economic growth goals of the administration. Moreover, it is not only governance that is biased; science is also afflicted with similar indifference. Dr. Zacharius Strengloft, the President's science advisor, for instance, argues that CO2 is not a toxic substance

polluting natural environments; on the contrary, it may even be beneficial for agriculture. He goes on saying, “It’s a gas that is natural in our air, and it’s essential for plants. . . . The last time there was a significant rise in atmospheric carbon dioxide, human agricultural productivity boomed. The Norse settled Greenland during that period, and there were generally rising lifespans” (161). Dr. Zacharius Strengloft's attitude, in this regard, is reminiscent of climate change deniers. It is hardly unexpected that he was substituted for the administration's first science advisor because he stated, “. . . global warming might be real and not only that, amenable to human mitigations” which in fact “went too far for this administration” (155), since the essential principle of the President has been to “maintain the current system of carbon use that underpins the American economy” (Pak 10). Therefore, the fact that “CO2 levels in the atmosphere topping six hundred parts per million, from a start before the industrial revolution of 280, and predicted to hit a thousand ppm within a decade, which would be higher than . . . the past seventy million years” (Robinson, *Forty* 159) could sarcastically mean that American industry is working well for the neoliberal American economy.

Considering Dr. Strengloft's occupation as a science advisor, politics and science are inextricably linked. Politics in *Forty Signs of Rain* stifles scientific progress. NSF, for instance, is funded by the government in exchange for funding scientific research and projects (121, 124). This cycle of financial assistance demonstrates that if the NSF budget is curtailed, then funding to support scientific research is also reduced. As Frank notes, “its [NSF’s] budget has never surpassed ten billion dollars a year, in an overall economy of some ten trillion” (210). This is why Robinson contends that only a postcapitalist world will be able to deal with climate change mitigation. While capitalism intervenes in national income distribution, it is difficult to go beyond neoliberal economies, which is required to act on climate change and crisis. The future described by Robinson in *Forty Signs of Rai*n, according to Roger Luckhurst, “is still one hemmed in by the political forces of neoliberalism. It is ‘our’ contemporary science and technology that has to deal with catastrophic climate change” (171). In other words, beginning today, neoliberal politics define the future and constrain scientific progress. That is why, at some point, an economic transition will be necessary. This type of economic transition is not going to occur overnight. According to Robinson, “it [capitalist economics] is resistant to change

because its owners and clients are resistant to change" ("Is it too Late?" 378). Minor advances, on the other hand, can clearly lead to massive revolutions. In Robinson's novel, these minor steps pass through minor initiations to form environmental politics, which is enabled by scientific data because this data validates the threats of climate change and its future disastrous impacts.

Therefore, in the mitigation of climate change, science comes first, followed by politics. Because political action necessitates a catalyst, a drive to take climate action. In this context, science serves as the required trigger by supplying data. Charlie, Anna, and Frank are the voices of the science in *Forty Signs of Rain*. Their attitudes about the impending crises, as well as their professions, promote their scientific reliance. Although Frank and Charlie do not work together, they are related in some way, as are all other systems in nature. Frank works with Anna, and Anna is married to Charlie. This link, in some ways, illustrates the entanglement of science and politics; they cannot be considered independent entities. Frank and Anna represent science as NSF scientists, while Charlie represents politics as an environmental politics advisor.

Charlie, too, keeps up with climate news daily. Following recent climate developments, Charlie argues that climate issues should be addressed urgently in politics. As the crisis is approaching the point where it will be hard to reverse the degradation, broader political action will be required to curb the surge of climate change. Nonetheless, policymakers do not hear much of what he says. The bill he drafted for Senator Phil Chase incorporates progressive, sustainable, and eco-friendly solutions, as well as increased financing for scientific research. More precisely, the bill consists of

> [m]ore money for CO2 remediation, new fuel efficiency standards and the money to get Detroit through the transition to hydrogen, new fuels and power sources, carbon capture methods, carbon sink identification and formation, hydrocarbon-to-carbohydrate-to-hydrogen conversion funds and exchange credit programs, deep geothermal, tide power, wave power, money for basic research in climatology, money for the Extreme Global Research in Emergency Salvation Strategies project (EGRESS), money for the Global Disaster Information Network (GDIN)—and so on and so forth. (Robinson, *Forty* 239-240)

However, as "[Senators] are only geared to do business as usual" Phil has to negotiate with the others although ". . . the current situation requires a response that is more than business as usual" (Robinson, *Forty* 241). Depicted as "a very helpful" politician (Robinson, *Forty* 69), he is the best of the worst policymakers, and seemingly the most climate-conscious Senator in the US government. While Congress is filled with either climate change deniers or doomers as "there are quite a few members of Congress who think of it [global warming] as being too late to do anything." Senator Chase, on the other hand, is one of the politicians "who's really paying attention to the world" (188). Despite his enthusiasm for climate action, he has his own limitations since he competes against the capitalist way of mindset which ignores climate change and its impacts. Ultimately, it is explicated that

> The bill lost parts as they duked it out. Winston fought every phrase of it, and he had to be given some things or nothing would proceed. No precisely spelled-out fuel efficiencies, no acknowledgment of any measurements like the ecological footprint. Phil gave on these because Winston was promising that he would get the House to agree to this version in conference, and the White House would back him too. And so entire methodologies of analysis were being declared off-limits, something that would drive Anna crazy. Another example of science and capital clashing . . . (242-243)

Within this clash of science and politics, Phil has no choice but to negotiate since "President made it clear he would veto the comprehensive bill . . ." (243). As previously depicted, the President himself is not a climate-conscious politician. On the contrary, he favors constant economic growth. The identity of the President is never revealed in the novel, keeping him anonymous. Still, given the American era in which the novel was first published many critics regarded him as President George W. Bush (Luckhurst 171; Rose 282; Canavan et al. 209). One can remember his famous speech defending capitalism and free markets a couple of days before the G20 Summit. He proposed that "sustained economic growth" would be the only way to deal with the 2008 financial crisis, and pointing at privatization he continued, ". . . the surest path to that growth is free markets and free people" (Smith), emphasizing the parallelism between George W. Bush and the President in *Forty Signs of Rain*. Robinson approves of these assumptions by expressing that *Forty Signs of Rain* is his "utopian wish from out of the darkest of the Bush years" (Canavan et al. 209).

### 1.3. INITIATION OF POSTCAPITALISM IN *FORTY SIGNS OF RAIN*

Robinson's portrayal of a growth-obsessed president paves the way for a critique of capitalism and neoliberal policies in the American economy. Charlie's encounter with the President represents a clash between neoliberal politics and climate consciousness in favor of science. By challenging the President, Charlie resists the US government's neoliberal goals. Finally, Robinson highlights efforts for "the transition from neoliberalism to postcapitalism" (Bailey 181), which is not approved by the President. A postcapitalist government would stipulate a climate act limiting economic growth, carbon emissions, and "everything would have to change, the power generation system, cars, a shift from hydrocarbons to helium or something" (Robinson, *Forty* 156). All in all these restrictions might disrupt the American economy (165), which the President is keen to avoid. Since "we don't know for sure if any of that is the result of human activity," the President is not willing to claim responsibility on climate change and he suggests staying calm about it (159, 165). As far as it goes, the conversation between Charlie and the President indicates the capitalist psyche of politicians in charge manifesting itself within the frame of the neoliberal economy in an "ever-more-privatized World" (170). In this world of privatization Robinson observes, "Free market fundamentalists are dragging us back to some dismal feudal eternity and destroying everything in the process" (210), including the environment. While these are on one side, the attitude of the President and Dr. Strengloft upholds that costly investments are unnecessary as disasters have not yet begun. Charlie's climate consciousness clashes with these capitalist frames, whereas Robinson expects politicians to have this kind of consciousness that extends beyond both capitalism and neoliberal economic policies. Similarly, he asserts that scientists should participate in policymaking with the assistance of climate consciousness, as proposed by Frank during an NSF board meeting:

> . . . you make more efforts to increase the power of science in policy decisions everywhere. Organize all the scientific bodies on Earth into one larger body, a kind of UN of scientific organizations, which then would work together on the important issues, and would collectively insist they be funded, for the sake of all the future generations of humanity. (321)

Gerry Canavan et al. define Frank as one of the "scientists who decide they must involve themselves directly in the politics of their time" (203), and he tries to increase the number of scientists taking part in politics since it is necessary as "[t]here is no economic mechanism for dealing with catastrophe (Robinson, *Forty* 210). Frank is an embodiment of this aim. Frustrated by the inefficiency of NSF, Frank pens an angry letter to the head of NSF, Diane Chang. In his words,

> The world is in big trouble and NSF is one of the few organizations on Earth that could actually help get it out of trouble, and yet it's not. It should be charting worldwide scientific policy and forcing certain kinds of climate mitigation and biosphere management, insisting on them as emergency necessities, it should be working Congress like the fucking NRA to get the budget it deserves, which is a much bigger budget, as big as the Pentagon's, really those two budgets should be reversed to get them to their proper level of funding. (211)

Frank's letter displays his climate consciousness while criticizing NSF for their indifference to the emerging crisis. In Frank's perspective, NSF could break the neoliberal cycle in its own organization by focusing more on climate change science instead of fulfilling the capitalist goals of the American government. In Frank's views this could be enabled by "commission[ing] work that you [NSF Board of Directors] think needs to be done, rather than waiting for proposals and funding choices given to you by others" (321). Additionally, he suggests sparing half of the NSF's budget to "the biggest outstanding problem," i.e. abrupt climate change, to lead scientific society, "both public and private science" to act on it (321). This paradigm shift in American science through NSF could deal with the climate change crisis since NSF is the first federal agency to receive data showing distortion in natural environments. For instance, when scientific data reveals the stall of the Gulf Stream, NSF gets to be the first institution to discuss the potential outcomes. (319-320). Still, the most effective climate action occurs after the catastrophe. In the light of both the storm and the flood that hits Washington D.C., it is obvious that emergencies may prompt climate change action. Displayed at the end of the novel, even reluctant politicians could gain climate awareness after having faced an extreme environmental disaster of abrupt climate change, and get inclined for climate action. Such an extremity is depicted as below:

> The Watergate Building was indeed a curving water gate, like a remnant portion of a dam. The wave-tossed spate of the Potomac poured around its big bend looking as if it could knock the building down. Likewise the Kennedy Center just south of it. The Lincoln Memorial, despite its pedestal mound, appeared to be flooded up to about Lincoln's feet. Across the Potomac the water was going to inundate the lower levels of Arlington National Cemetery. Reagan Airport was completely gone. (365)

As the quotation displays, several nationally significant landmarks are flooded, which can be interpreted as posing a threat to the national identity. At the very end of the novel, Charlie asks Senator Chase amidst the flood if he is "going to do something about global warming *now*?," and he answers, "I'll see what I can do!" (393). Senator Phil Chase's final statement brings the novel to a close while also hinting at Robinson's optimism about climate change mitigation. The mood of optimism and hopefulness is bolstered by scientific data and political climate action in *Forty Signs of Rain*. Additionally, as Maleska notes, "[d]ealing with this (climate change) problem is very difficult and complex as it requires thorough changes in the capitalist system, as well as joint and coordinated action from all (or most) nations in the world" (328). Therefore, following emergent climate action, an ultimate transition from the capitalist system embedded in the neoliberal economies around the world is required since the lack of these components may result in irreversible climate collapse.

As a result, *Forty Signs of Rain* propounds the necessity of political action for a paradigm shift in mainstream economics in the light of science. The novel tracks the activities of politicians, their advisors, and scientists who are reinventing the connection between science and politics to mitigate the impacts of global climate change. Kim Stanley Robinson focuses primarily on politics in *Forty Signs of Rain* whereas his argument revolves around the fact that administrative policies must embrace the patterns of ecological economics to address the climate change crisis in *New York 2140* (2017). Offering collective action of the public, Kim Stanley Robinson's *New York 2140* portrays a future where necessary political and economic measures regarding the planet are not taken on time when there is still a chance for climate change mitigation. Therefore, the novel introduces a climate change-struck world and human population obsessed with economic growth, thus ignoring nature's health. All in all, "humanity's well-being depends on the well-being of the planet's biosphere" (Robinson, "Future Politics" 186).

# CHAPTER 2

## KIM STANLEY ROBINSON'S END OF NEOLIBERAL CAPITALISM IN *NEW YORK 2140*

*The momentum of the heating, and the momentum of the economy that powers it, can't be turned off quickly enough to prevent hideous damage. But we will keep fighting, in the hope that we can limit that damage.*

Bill McKibben, *Eaarth*

Human activity has been connected to worsening climatic crises, income inequality, rising unemployment, as well as the inescapable damage to nature and the environment. Kim Stanley Robinson's *New York 2140* (2017) encapsulates these cosmopolitan challenges while condemning neoliberalism, an ideology framework that has governed the global economy since the late twentieth century. Even though the major focus remains on climate change and global warming, *New York 2140* is primarily a critique of capitalist economics and global finance in flooded New York. In eight parts and from the perspective of a plethora of individuals, the novel illustrates another flood-stricken landscape inundated by the melting glaciers of Antarctica and Greenland, as well as an afterworld in which the 21st-century human population could not respond to climate change in time. Nonetheless, the novel narrates a future New York where the impacts of climate change have partly been mitigated, or humanity has adapted to the climate change with the assistance of science and technology, yet neither social nor environmental justice is maintained in the twenty-first century. The fundamental cause for this is the economic system, namely neoliberal economic praxis, which classifies individuals based on their income, thereby stigmatizing social strata for each of them. His

multiple protagonists consist of Mutt and Jeff, finance coders; Charlotte, a social worker, attorney, and a future politician; Franklin, a day trader; Amelia, a cloud-video star recording environmental documentaries; Gen, a police officer, and an inspector; Stephan and Roberto; orphans taken under protection by the protagonists of the novel, Mr. Hexter; an old man collecting maps; and Vlade, the superintendent of the Met Life Building, which unites all of these characters because the majority of them are residents of the building. There are also segments from an "anonymous citizen" who comments on market dynamics, climate change, and human nature while delivering historical information. Following Mutt and Jeff's disappearance, after they release a digital code that distorts the way global finance operates, the residents of Met Life team together to first solve the mystery of the coders' kidnapping and then act collectively against the highly neoliberal financial system of the twenty-second century U.S. As additional climate disasters endanger both biodiversity and the economic well-being and equality of New Yorkers, the protagonists launch a housing strike that is essentially reminiscent of the 2008 mortgage crisis, delivering an uplifting conclusion by initiating a new economic system. Correspondingly, socioeconomic equality and climate justice are envisioned to prevail in *New York 2140*. As a result, this chapter aims to analyze the novel to address Kim Stanley Robinson's discontent with the existing U.S. economic structure. The chapter will lay out his visions emphasizing the necessity of transitioning to more equitable and eco-centric economic alternatives for the benefit of all living and nonliving entities of the Earth.

## 2.1. EMERGENCE OF THE CAPITALOCENE

Kim Stanley Robinson earned his Ph.D. degree in English literature in 1982. Fredrick Jameson was one of the professors of Robinson and he suggested he write his dissertation on the works of science fiction novelist Philip K. Dick (Robinson, *The Novels*, vii). Jameson himself is a renowned American literary critic best recognized for his Marxist theories, and he has published several books on critical theory, postmodernism, and capitalism. Robinson's involvement in science fiction and capitalism may be traced back to his study in English studies, which was supervised by Fredrick Jameson.

His effect on Robinson was so profound that *The Ministry for the Future* (2020) was dedicated to him. Following the publication of the updated version of his dissertation, he has published several science fiction short stories, novellas, and novels. Some of Robinson's latest works are also classified as climate change fiction. *New York 2140* is a cli-fi novel that not only blends science fiction with environmental degradation but also proposes "a political revolution that creates postcapitalism to solve the ecological problem" (Robinson, "Angry Optimism"). However, a transition to postcapitalism alone is not enough to save the environment, because postcapitalism is an ideological set of norms designed to replace the capitalist system and transcend various kinds of systemic inequality caused by the market. How about the climate crisis, environmental inequality, and, more importantly, climate justice for all beings, not just for humans but also for animals, microorganisms, plants, earth, matters, and all beings in short? To provide justice for all of them, a different form of economic system is necessary, which will be discussed in Chapter III within the framework of ecological economics to offer a steady-state model in economic activity. Robinson elaborates on what he aspired to achieve with *New York 2140*, noting, "The truth is that we are already at that point of climate change and crisis. The political project that my novel addresses should be implemented right now, not 120 years from now. In the actual world, we have a requirement for our economic system to account for and compensate for damage to the ecology" ("Angry Optimism"). For his take on paying for the destruction of nature, Robinson showcases environmental emergencies in his works to propose feasible remedies and solutions about climate action options in the Anthropocene, or the Capitalocene.

As many have acknowledged, the Anthropocene, also known as the Human Age or the Age of Humans, is the epoch in which reversing the harm caused throughout planetary history seems impossible. The Anthropocene, which is also a “geological notion, . . . [also] refers to the most recent epoch in the Earth’s geological time in which various human activities, such as heavy industrialization, overpopulation, abuse of natural resources, and environmental pollution, cause global-scale environmental changes” (Aykanat viii). They together trigger environmental disasters and ecological collapse, risking the lives of all living beings on the Earth. In 2000, Paul J. Crutzen and Eugene F. Stoermer conceptualized the phrase, stating,

> Considering these and many other major and still growing impacts of human activities on earth and atmosphere, and at all, including global, scales, it seems to us more than appropriate to emphasize the central role of mankind in geology and ecology by proposing to use the term “anthropocene” for the current geological epoch. The impacts of current human activities will continue over long periods. (17)

Anthropogenic destruction has reached unprecedented levels, particularly in the last 300 years of the planet's history. Global crises, especially those connected to climate change, are fueled by growing population and economic progress. Environmental historian and sociologist Jason W. Moore has focused on the concept of the Capitalocene as a counter-narrative to the Anthropocene since 2013. He declares that the current era is molded by human activity rather than by human ontology. Moore does not entirely dismiss the concept of the Anthropocene but argues that it is inadequate to define our time and that the term stands for a "historical concept rather than [a] geological argument" (3). Moore continues by elucidating the Anthropocene's limits as follows:

> The Anthropocene perspective engages the really big questions of historical change: How do humans make natures, how do natures make humans, and how does that relation shape the long run of human history? These are questions that the Anthropocene can pose, but cannot answer. Why? Because the perspective retains—even as it seeks to transcend—the binary of Humanity and Nature. (80)

In response to these questions, he asks: “Are we really living in the Anthropocene? . . . Or are we living in the Capitalocene, the historical era shaped by relations privileging the endless accumulation of capital?”(94). This cumulative capital creates unequal and unjust forms of social order among nations and within nations. This is why Ian Angus rejects the idea of “sharing a common fate and a common responsibility” for the planet's health in Facing the Anthropocene, declaring, “In reality, a handful of Spaceship Earth’s passengers travel firstclass, in plush air-conditioned cabins with every safety feature, including reserved seats in the very best lifeboats. The majority are on wooden benches in third-class, exposed to the elements, with no lifeboats at all” (175). This statement makes a specific reference to income inequality, which is a pervasive and systemic problem in capitalist societies and neoliberal economies. As the headline of one of Rosi Braidotti's recent essays states, "We May Be in This Together, but We Are Not All

Human or One and the Same" (26), the global climate problem affects everyone and everything, at varying degrees though.

Jason Moore responds to the view that the modern world originated in nineteenth-century England, explaining that the rationale behind the era was steam and coal; the drive to sustain them was the "Anthropos" (81). Anthropos stands for human in Greek. Regardless of its underlying meaning, Anthropos is a problematic term since it does not apply to all human beings as it is obvious that the term addresses western white men, not women, not children, or anybody of any other race. Having grounded his superiority in the Bible, and entrenching his place declaring any other being is created for his sake, western white man disregards races, genders, or nationalities, especially everyone different from him. Given the term Anthropocene, it takes these nuances for granted, unintentional though, hence generalizing all problems on Earth as human-induced, i.e., anthropogenic. Nonetheless, those who live in the Pacific island nations or the savannas and jungles of Africa have no stake in the climate crisis. Therefore, it is neither appropriate nor adequate to define the contemporary era as human-made. According to Moore, the flaw with the Anthropocene is that it is not inclusive, not enough since

> [t]he Anthropocene makes for an easy story. Easy, because it does not challenge the naturalized inequalities, alienation, and violence inscribed in modernity's strategic relations of power and production. It is an easy story to tell because it does not ask us to think about these relations at all. It reduces the mosaic of human activity in the web of life to an abstract, homogenous humanity. It removes inequality, commodification, imperialism, patriarchy, and much more from the problem of humanity-in nature. If sometimes acknowledged, at best these relations exist in the Anthropocene discourse as after-the-fact supplements. (82)

If it is required to point out a certain notion to have influenced the era so much so that it has inspired the name of a whole epoch, it is capital. The Capitalocene, in the words of Robinson, suggests that "it is not just humanity, it's capitalism that's making this impact." ("Angry Optimism"). For instance, most of the carbon in the atmosphere does not come from individuals traveling above the sky from one location to another, although they are substantial contributors. It comes from the manufacturing process. Human overpopulation, for example, which has been one of the most serious threats to the planet for ages throughout history, results in the need for additional energy and resources to

provide for the growing human population. Parallel to this, there has been a growth in the search for resources, as well as in the production and consumption of goods. These aforementioned increases are so immense that they are perhaps the most dangerous notions in the Capitalocene.

In 2020, the Weizmann Institute of Science collaborated with a number of environmental scientists to conduct a study. As a consequence of this research, it is anticipated that the overall weight of human production, referred to as anthropogenic mass, has reached 1.1 teratonnes (1.1 trillion tons) by 2020, which is more than the total weight of humans, plants, and animals in the planet (Elhacham et al. 442). By the 1900s, anthropogenic mass accounted for 3% of the earth's biomass. However, it is envisaged that the anthropogenic mass will exceed the total biomass by the end of the 2020s (Elhacham et al. 442-443). These findings may be interpreted as another pernicious effect of neoliberal freedom in market capitalism. Therefore, with the concept of the Capitalocene, the role and function of capitalism in world history, together with everything that it has brought and taken away, become open for discussion.

Consequently, the Capitalocene is a representation of political, cultural, and production systems, as well as an argument regarding the ecological situation. As Jason Moore writes in *Maize* "Ours is an era of capitalogenic [made by capital] climate crisis" (50), the ongoing climate issues are not only anthropogenic but also capitalogenic. It is possible to assert that Robinson criticizes the capitalogenic climate crisis in *New York 2140* rather than making a critique of global climate change and its repercussions. *New York 2140* is arguably a utopia; (Bellamy 418; Canavan; Kabo 252; Rothman) it lays bare how scientific knowledge as well as new technologies and engineering methods have enabled adaptation to climate change. Despite this, the novel still captures the image of a chaotic society. The state of chaos depicted by the novel is a result of deregulated neoliberal market activity, which is why *New York 2140* is a form of “resistance to neoliberal late capitalism” (Kabo 252). *New York 2140* is, therefore a cli-fi novel relating climate change and its relation with the mainstream economics, with an emphasis on neoliberal activities carried out by the US government.

## 2.2. REVISITING CLIMATE CHANGE ADAPTATION AND GLOBAL FINANCE IN *NEW YORK 2140*

Kim Stanley Robinson frequently discusses climate change and economics, emphasizing how they interact with each other. In most of his writings, he criticizes the "economic paradigm for its environmental and social destructiveness" (Otto "Science Fiction" 159). *New York 2140* (2017) is one of his recent novels that connects "anthropogenic global warming to deregulated financial markets—phenomena that have led some to label our epoch 'the Anthropocene' or 'the Capitalocene'" (Hamner 455). He has spent years contemplating plausible alternatives and proposing strategies to alleviate the impacts of climate change. These solutions range from local community actions to national and global regulations for the sake of a more egalitarian climate society, as he is likely to agree that "[e]nvironmental devastation will not be stopped in conference rooms and treaty negotiations: only mass action can make a difference" (Angus 208). This might be the reason why Robinson concludes *New York 2140* with a local strike that leads to national intervention in the heavily privatized market economy.

First published in 2017, and regarded as a "landmark work," *New York 2140* is an imagination of a future with severe impacts of climate crisis (Canavan et al. "Symposium" 420). Drowned by the 50-foot sea level rise, the new New York City is called "SuperVenice" (*New York* 51) in the year 2140. Kim Stanley Robinson showcases a Venice-like setting where canals are new streets with boats for transportation, "skybridges" streets, and "superscrapers" serve for housing. New York is "defined by the cataclysmic planetary effects of anthropogenic climate change and economic disaster" (Kabo 254), and the circumstances that have led to this definition are narrated by the omniscient 'citizen' sections of the novel. The Citizen provides information as an omniscient narrator[2] about the past, mostly regarding the two climate breakdowns that occurred during the 2050s and 2090s as well as their environmental, social, and economic

[2] It is interpreted by some critics that the Citizen is the voice of Kim Stanley Robinson in *New York 2140*.

consequences. The Citizen reveals that the reason behind these collapses is excessive carbon burn. S/he explains that,

> Carbon dioxide in the atmosphere traps heat in the atmosphere by way of the well-understood greenhouse effect; . . . that trapped heat in the atmosphere transfers very easily and naturally to the oceans, warming ocean water. Ocean water circulates and the warmed surface water gets pushed down eventually to lower levels. . . . The heat itself expands the water of the ocean a bit, raising sea level some, but that's not the important part. The important part is that those warmer ocean currents circulate all over, including around Antarctica, which sits down at the bottom of the world like a big cake of ice. . . . Melt all that ice . . . and sea level would go 270 feet higher than the old Holocene level. (Robinson, *New York* 141)

As a result, melting ice caused two major episodes of sea level rise, known as the First and Second Pulses. Each pulse inundated urban coasts, flooded islands and cities, and triggered a number of social and economic problems around the world. Each of these pulses denoted "a complete psychodrama decade, a meltdown in history, a breakdown in society, a refugee nightmare, an ecological catastrophe" (34). During the First Pulse, the sea level rose ten feet, enough to drown "the southern half, from about Fortieth Street right down to the Battery" and "the big flats of Harlem and the Bronx" on the east side (34). In ten years, the shipping trade was disrupted because the ports were also destroyed. The Second Pulse was significantly worse; the impacts felt like "ten thousand katrinas," whereas the First Pulse was only evaluated as "fifty katrinas" (139,144). The Second Pulse resulted in a fifty-foot rise in sea levels and permanently altered the world map, as well as the extinction of fifty thousand species. Furthermore, both pulses contributed to refugee crises since one-eighth of the human population lived in coastal zones where fishing and agriculture were also influenced. Moreover, the shipping trade got worse than it did during the previous pulse, "thus impacting world trade, the basis for that humming neoliberal global success story that had done so much for so few was also thrashed" (144). Nevertheless, it did not take long for humanity to mitigate the impacts of the pulses thanks to their ability to adapt to changes. As Everett Hamner explains the pulses "still failed to interrupt global capitalist business as usual. In the twenty-second century, half of Manhattan is permanently submerged but America still succumbs to unrepentant, unregulated profiteers" (452).

Although the landscape has changed dramatically over the last century, the classic economic schemes persist in the submerged New York. The novel demonstrates that the rich have kept on getting richer in the city center, which has been relocated to Washington Heights near The Cloisters, and Denver, the new center of American finance and culture. In the meantime, the poor reside in the flooded Lower Manhattan since the Second Pulse meant "more poverty for the poor" (Robinson, *New York* 141). Parallel to this socio-economic division, the novel establishes a connection between "climate change to centuries of destructive economic policy and the financial and social impact of climate change" (Liptak). As the citizen recalls, "This remarkable rise had been bad for people—most of them. But at this point the four hundred richest people on the planet owned half the planet's wealth, and the top one percent owned fully eighty percent of the world's wealth. For them it wasn't so bad" (Robinson, *New York* 205). In this regard, Manhattan is divided into two parts: the superscraper zone above 125$^{th}$ Street, completely dry; and the intertidal zone, mostly below water during high tide and partially dry at low tide. The precarity of the intertidal zone left the area abandoned at first, yet was quickly reoccupied by desperate scavengers and squatters and fisherpeople and so on, the water rats as they were called" (145).

Just like *Forty Signs of Rain*, *New York 2140* revolves around a variety of protagonists. Most of the novel's central characters live in Met Life Tower, which is now one of the housing cooperatives in Lower Manhattan. The novel opens by introducing two of the most significant and effective protagonists, Mutt and Jeff. Although they are referred as coders, their profession is software programming. They live on the farm floor of Met Life and get kidnapped after releasing a bug to distort global finance. Inspector Gen Octaviasdottir, a respected resident of the tower and a New York City police officer, investigates the coders' disappearance. Managing hedge funds, Franklin Garr is a day trader who profits from the real estate bubble in Lower Manhattan. Charlotte Armstrong, one of the key figures, is an attorney in law, the chairperson of Met Life, and later a politician who runs for Congress. Together with Amelia Black, a cloud video blogger who documents damaged natural environments, she starts the Householders' Union strike that wrecks neoliberal social and economic systems. Meanwhile, 12-year-old orphans and water rats, Stefan and Roberto search the depths of the Bronx waters to find sunken

treasures, and they are assisted by an old map collector, Mr. Hexter. Finally, the superintendent of the Met co-op Vlade is the one who locates where Mutt and Jeff are kept hostage and finds out the sabotage to harm Met Life's foundation. According to Michael Berry, global capitalism affects all the characters adversely in one way or another. For instance, there is an anonymous offer has been made to purchase the MetLife building for "twice what the building was last assessed at" (Robinson, *New York* 52-53) since Lower Manhattan is now a profitable investment opportunity due to increased demand. In addition to demand growth, Lower Manhattan is appealing again, "with proliferation of cooperatives, neighborhood associations, communes, unions, submarine technoculture, including aeration and aquafarming" as well as "free open universities, free trade schools, and free art school" (209). The citizen states that "Lower Manhattan became a veritable hotbed of theory and practice, like it always used to say it was, but this time for real" (209), and adds,

> And with things going as well as they were in lower Manhattan, such that some people even complained it was getting back to the same old shabby garbled expensive bourgeois wannabe mess that it had been before the floods, there began to rise into visibility a newly viable infrastructure and canalculture—the intertidal, the SuperVenice, occupied and performed by energetic people who were hungry for more. In other words, taken all in all, a place that might make for a very high rate of return on investment! So a situation was developing. Push was coming to shove. And when push comes to shove—well, who knows? Anything can happen. (210)

One may wonder if it is safe to reside in a flood zone. There, Robinson elucidates how advances in technology and engineering practice help mitigate the challenges of climate change. Most buildings are depicted as self-sufficient. For example, the MetLife Tower has a farm floor on top of the building where crops are harvested, and its "photovoltaic paint generate[s] most of the electricity" (52) needed. Although most meat is produced in vats, becomes free range on the farm floors. In Robinson's partially flooded New York, carbon neutral technologies have replaced the old, traditional carbon-emitting ones. As detailed in the novel, "[c]arbon-burning cars having become a thing of the past, little electric cars took advantage of the world's very extensive road systems, but these roads were now also occupied by train tracks and biking humans" (380). These technologies and the invention of the diamond spray "to [hold] out the subterranean waters" (182) include but are not limited to the quotation below:

> biofuel carbon was dragged out of the air, collected, burned back into the air, then dragged down again. . . . Cement itself was mostly replaced by the various graphenated composites, . . . carbon was sucked out of the air and turned into graphene, which was fixed into composites by 3-D printing and used in building materials, thus sequestering it and keeping it from returning to the atmosphere. So now even building infrastructure could be carbon negative (meaning more carbon removed from the atmosphere than added). (381)

Therefore, skyvillages with superscrapers hovering above the earth, serve as the new living spaces. For all the risks posed by the liquidity of the intertidal zone, Robinson reimagines the urban landscape of the lower Manhattan and technologies to support it as:

> . . . All the blocks would then float up and down on the tides and currents together. Underwater framing to keep the canals between them open and navigable, bumpers to keep the outer ones from bumping too hard into stationary neighbors in a storm. Saltproof and rustproof. Photovoltaic paint, farms on the roofs, water capture systems, water tanks on the roofs in the traditional NYC style, lifestraw purification filters, all standard operating procedure everywhere in lower Manhattan. (418)

These technological advancements in climate change mitigation lead to the conclusion that *New York 2140* offers a "decidedly utopian trajectory" (Bellamy 418) in terms of climate change, yet the novel does not stand for a whole utopian society due to the "market system that consistently underestimates the environmental costs of economic growth" (Rothman), which is revealed when a megastorm, Hurricane Fyodor, hits New York near the end of the novel. Robinson stated in an interview with Michael Berry that he wanted to write about global finance because global capitalism is “a system that is wrecking the planet and people’s lives, and it’s unsustainable in the pure sense of physics” (“Kim Stanley”). *New York 2140* speaks of a future in which unfettered capitalism destroys social, economic, and environmental systems. In this regard, Jeff grouches at the opening of the novel that the environmental problem, which includes sea level rise, extinction, food scarcity, and climate change, are all inevitable outcomes of the market. He goes on complaining, “the problem is capitalism, . . . a set of stupid laws . . . [a]nd it’s global! It extends all over the Earth, there’s no escaping it, we’re all in it, and no matter what you do, the system rules!” (Robinson, *New York* 5). Jeff's rage stems from the reality that capitalism, as a set of rules to rule the system, creates perpetual wealth disparity and a corresponding vulnerability to climate calamities, which is why Robinson reflects on climate change through global finance since it is regulated by the capitalist ideals.

Therefore, no matter how fiercely the environmental crises break down, capitalism prevails. As Franklin asserts, “The floods, the worst catastrophe in human history, equivalent or greater to the twentieth century’s wars in their devastation, were actually good for capitalism? Yes.” (118). Advancing technology and endless house bubble allowing investors to make a profit out of real estate all contribute to the progression of capitalism, but more importantly, it fuels neoliberal ownership, which disrupts the social and economic equilibrium.

### 2.3. DECONSTRUCTION OF NEOLIBERAL CAPITALISM IN *NEW YORK YORK 2140*

When asked if capitalism could be transcended or not, Robinson responds, underlining capitalism’s unsustainable nature “Since it can’t go on forever, it’s going to change at some point. We might as well change it sooner, so that it doesn’t create as much damage” (“Kim Stanley”). Sustainable or not, the idea that capitalist praxis will alter someday is what gives Robinson hope for the future. He envisions postcapitalist worlds that will see the end of neoliberalism with optimistic predictions. His predictions on the future are grounded in more than decade-long research into sustainable futures and economics. In a 2017 interview, he stated that he had been studying economics extensively for over ten years, he even spent two months researching to be able to write six pages about investment finance while writing *New York 2140* (“Kim Stanley”). The part he mentioned is actually where Franklin, the day trader, explains his “Intertidal Property Pricing Index” (IPPI), which assists investors while pricing assets in the Intertidal. IPPI helps “orient investments” (Robinson, *New York* 19) in the liminal areas of Lower Manhattan and coastal regions all over the world where the real estate is prone to submerge at low tide. The IPPI principally depends on the global rise in sea levels, yet also checks climate events daily to provide accurate and current data on price estimation for both major and minor investors, thereby creating fair competition. Quite simply, Franklin explains the way the IPPI functions as follows:

> . . . if I wanted to buy anything on offer, and checking on exchange rates, I was also looking for ways to bolster the accuracy of the index. Sea level in the Philippines up

> two centimeters, huge, people panicking, but not noticing the typhoon developing a thousand kilometers to the south: take a moment to buy their fear, before tweaking the index to register the explanation. High-frequency geofinance, the greatest game! (19)

It is true that Robinson's fiction is partly speculative. Still, having examined the climate bill of *Forty Signs of Rain*, it is clear that he does not just imagine speculative futures but comes up with plausible and applicable alternatives, so "Robinson's protagonists deploy a range of tactics to oppose neoliberalism" (Kabo 264). For instance, Mark Stapp, director of Arizona State University's Center for Real Estate Theory and Practise, comments on Franklin's IPPI and states that it "doesn't seem far-fetched at all" (Eschrich).

Franklin is not the only character who opposes the neoliberal economic practices of late capitalism. Mutt and Jeff have a central role in resisting global finance. As aforementioned, they disappear after unleashing a software code to distort the worldwide financial system, which causes a glitch in the way global finance works. Jeff is deeply concerned about the neoliberal system; he believes it is unjust and exploitive, thus the world is in crisis for centuries and it the crisis seems to remain for many more years. In his perspective, it is the ones "who think they can steal everything and get away with it" (400) that make the world a mess. Having realized this and been suffering immensely from this crooked and corrupted system of rules, he aspires to justice and revenge; not only for himself but for all beings, which is an idea that Mutt shares as well. In a way, Jeff looks for environmental justice since this mindset has brought up the extinction of fifty thousand species by 2140s (259). As a result of an analysis he conducted before, he detects that there are sixteen laws that run the whole world through "[f]inancial transactions, currency exchange, trade law, corporate law, [and] tax law" (5). Therefore, he believes revising those laws means changing the whole current finance "from bad to good" with sixteen revisions enabled by his replacement code (6). Although Jeff aims to attack the whole financial system, his digital bug targets two great American institutions; the SEC[3] and the CME Group. In fact, his code set up a shunt to transfer money to the

[3] The U.S. Securities and Exchange Commission (SEC) is one of the independent agencies of the federal government. Established after the Stock Market Crash of 1929, the SEC aims to "protect

SEC from each transaction made over the CME[4]. In this way, each transaction made through the Chicago Mercantile Exchange sends a point to the SEC's fund. Each point equal to one percent of the transaction means "a few billion" tapping into the SEC's fun "per hour" (150). In addition to this transaction leak, Jeff's code aims to destroy tax havens by blocking transactions. Talking to Mutt, he explains:

> "I tweaked the list of countries it's illegal to send funds to. You know how there's about ten terror sponsor countries that you can't wire money to? I added all the tax havens to that list."
>
> "You mean like England?"
>
> "All of them." (151)

Generally speaking, a tax haven is a country or region in which taxes are either non-existent or exceptionally low. According to some estimates, the country's tax rates may be too low to compete fairly with other nations. In doing so, Jeff aims to block the financial flow between tax havens, since the concept of tax havens generates income and wealth inequality at its core. Simply put, tax havens serve for the neoliberal finance of capitalism, which Jeff discerningly opposes. Last, by not least, his code aims at rearranging the American tax system; in his words, Jeff "pikettied the U.S. tax code" (151). This revision Jeff conducted is based on French economist Thomas Piketty's theories on economic inequality. Thomas Piketty believes that capitalism increases inequality in various dimensions, and he is best known for his wealth tax proposal to have a more equitable future. In principle, Piketty's wealth tax suggests overtaxing the upper-income taxpayers, which would "impose a tax rate of 1 percent on net worth of $1.3 million and $6.5 million and 2 percent on net worth above $6.5 million" (Schuyler 1). Piketty contends that this kind of revision in the U. S. tax code would provide numerous advantages for the poor and middle class since the government would receive more tax revenue enabling it to save up more for social spending for the betterment of the disadvantaged. Following Piketty's lead, Jeff's code imposed a "sharp progressive tax on

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investors; maintain fair, orderly, and efficient markets; and facilitate capital formation" (United States).

[4] Founded in 1848, CME Group Inc. is a Chicago-based American global financial markets company. The CME aims to "enable market participants to manage risk and capture opportunity" (CME Group).

capital assets. All capital assets in the United States, taxed at a progressive rate that goes to ninety percent of any holdings over one hundred million" (151). Parallel to Piketty's wealth tax, what Jeff did would potentially lower the wealth of the upper-income taxpayers, which is a scheme that mainstream economics strongly disapprove of and criticize. The wealth tax is assumed to lower the number of assets in investment and wages, which would ultimately end up in unemployment and national output. Consequently, the U.S. "as a whole would be poorer" (Schuyler 14) if Piketty's wealth code was applied. As a result, both Piketty's and Jeff's models of tax revision pave the path to degrowth, which is a social, but mostly economic paradigm that neoliberal economies object to.

New evidence of the correlation between economic growth and ecological degradation emerges day by day. At a conference held in Brussels in 2018 with the participation of a total of 238 scientists and academics, it was demanded to abandon the growth target and focus on equality of human well-being and ecological stability. Additionally, the participants called on the European Union, suggesting, "Establish a ministry for economic transition in each member state. A new economy that focuses directly on human and ecological wellbeing could offer a much better future than one that is structurally dependent on economic growth" ("The EU needs"). The call for economic transition with the aim of both ecological and economic stability addresses to Herman Daly's steady-state model in ecological economics, which is linked with the revisions of Jeff's code. The wealthy are accountable for instability in neoliberal nations as well as ecological degradation due to their persistent and escalating desire for growth. A study in 2020 revealed that between 1990 and 2015 "[t]he richest 1% (c.63 million people) alone were responsible for 15% of cumulative emissions . . . [whereas] [t]he poorest 50% (c.3.1 billion people) were responsible for just 7% of cumulative emissions" (Gore 2). It means that the total amount of carbon emissions of the richest in twenty five years was twice as much when compared to the poorest of the whole population. These statistics alone could explain Jeff's discontent with the entire system. Given all three distortions conducted by Jeff's code, his individual stand-out against economic violation and exploitation eventually causes worldwide repercussions in terms of both American and global finance.

Jeff's individual resistance against the neoliberal system eventually merges with collective action initiated by Charlotte and Amelia in *New York 2140*. The trigger event for this collective action is the refugee crisis that broke in the aftermath of Hurricane Fyodor, which displaced thousands of urban residents and forced them to reside in the refugee camps located in Central Park. Wandering around the wreckage of Central Park, Charlotte feels overwhelmed, because

> The devastation was so complete it was hard to believe. It felt like she was dreaming, stuck in one of those jagged nightmares in which a montage of terrible unrealities etch themselves one after another on the eyeball of the helpless dreamer. Where there had been trees there were now people, so that the park looked both bigger and lower, like a giant piece of prairie expanding out of the space where the park had used to be. . . . Most of the downed trees were decades old, some of them hundreds of years old. It would be many years, or decades maybe, before the park would look anything like itself again. (Robinson, *New York* 499)

For all the crowd in Central Park, the superscrapers above 125th Street are ironically empty, as they are real estate investments owned by the neoliberal investors living somewhere else, "vacation place[s] (526). Prior to initiating the mass rent and debt strike, Charlotte attempts to talk the mayor into declaring martial law to take the inhabited estate for climate refugees. Because the mayor is reluctant to intervene with the private housing, Charlotte decides to "crash the system" (504). As one of the attorneys of the Householder's Union, which is a semi privatized office for immigration and intertidal, she contacts the Union to organize a national rent and debt strike. The principal is that people stop paying debts; mortgage, student loans, bills, credit card interest, and insurance all at the same time. This collective refusal of payment would theoretically precipitate a financial crash in the American markets, even with the participation of only one-fifth of the debtors. To get the public's attention and issue a call for collective action, Charlotte allies with Amelia as she is a worldwide known internet blogger. Meanwhile, Amelia is already frustrated with what she has witnessed flying her airship, Assisted Migration, over Central Park. Devastated by the sight of climate refugees occupying the park, and "animal bodies piled like bonfire wood" (525) while the superscrapers are mostly vacant, she cries out on-air:

> I'm sick of the rich. I just am. I'm sick of them running this whole planet for themselves. They're wrecking it! So I think we should take it back, and take care of it. And take care of each other as part of that. . . . You know that Householders' Union that I was telling you about? I think it's time for everyone to join that union, and for that union to go on strike. An everybody strike. I think there should be an everybody strike. (526)

Calling on people all around the world, she explains what the strike is expected to lead to as follows:

> The union is declaring all those to be odious debts, like some kind of blackmail on us, and we're demanding they be renegotiated … So, we stop paying and call that the Jubilee? … That's an old name for this kind of thing. After we start this Jubilee, until there's a restructuring that forgives a lot of our debt, we aren't paying anything. "You might think that not paying your mortgage would get you in trouble, and it's true that if it was just you, that might happen. But when everyone does it, that makes it a strike. Civil disobedience. A revolution. So everyone needs to join in. Won't be that hard. Just don't pay your bills! . . . What will happen then is that the absence of those payments of ours will cause the banks to crash fast. (527)

Amelia's call triggered a domino effect, resulting in a global financial collapse similar to the 2008 Financial Crisis, and the Great Recession As the novel concludes the strike was accomplished with multiple revolutions. One of them was the nationalization of the banks as a bailout, which means a crush on the system of privatization (601). In the aftermath of the nationalization of the private banks, "any profits the banks make from then on go to the government, to pay back what they borrowed from it. So they [banks] turn into like federal credit unions" (562). In addition to the U.S. federal government's takeover of the banks, Congress passed a kind of Piketty tax followed by a "capital flight penalty [to] prevent capital from fleeing to tax havens" (602). Furthermore, the new "absentee tax" forced the investors of 125th Street superscrapers to either inhabit or sell their estate (596). Congress' intervention with the WTO (World Trade Organization) also included "tight currency controls, increased labor support, and environmental protections" (602). All in all, the outcomes of the Householders' Union Strike are practically what Jeff wished for in the first place, or they are the visions of Kim Stanley Robinson's dreams' come true. In Anna Kornbluh terms, "*New York 2140* makes art out of the too late, wielding the tension between content and form to effect good humored can-do-ness for modest remedies" (115). Robinson's aforementioned remedies conclude the novel with a

sense of hopefulness. Throughout the novel, Robinson elaborates on the ways to mitigate the impacts of climate change, or adjust to climactic changes with the assistance of technological advances and climate consciousness. In addition to the geoengineering technologies, he emphasizes how climate consciousness enables citizens to have a wider perspective to reevaluate social strata in terms of neoliberal economics. As a result of collective action, citizens' financial noncompliance, and multiple acts of disobedience, "[t]he neoliberal global order was thus overturned right in its own wheelhouse" (Robinson, *New York* 602).

# CHAPTER 3

## THE REVELATION OF ECOLOGICAL ECONOMICS IN *THE MINISTRY FOR THE FUTURE*

*Who will read this*
*in the next economy, the one that comes after the one that kills us?*
*What lessons will we take from the side of the road?*

Susan Briante, "13 Questions for the Next Economy"

*We do not know how long we have, but we do know that the fight simply cannot wait. And we know that just fighting isn't enough: to succeed, we must simultaneously work for immediate changes and advance a vision of the world we want to build.*

Ian Angus, *Facing the Anthropocene*

Kim Stanley Robinson's latest novel, *The Ministry for the Future* (2020) analyzes the effects of climate change emergencies through the lenses of ecological economics, climate trauma, ecoterrorism, and geoengineering. Following the establishment of the Ministry for the Future, the novel introduces Robinson's new monetary currency, the carbon coin, as an alternative to current cryptocurrencies to decarbonize global finance. Led by a former Irish politician, Mary Murphy, the Ministry is founded as a subsidiary body of the United Nations during COP29 in 2025 as authorized by the Paris Climate Agreement. The Ministry for the Future seeks to protect the rights of future generations

who have yet to be born to stand out for their interests in the face of the disastrous effects of climate change. As a result, the Ministry for the Future's principal duty is to speak for future generations, animals, plants, and all living and nonliving species on Earth while advocating for environmental justice for those who are vulnerable to both wealth and economic disparity. Unlike the novels analyzed in the previous chapters, *The Ministry for the Future* centers on two protagonists, Mary Murphy, a former Irish politician who is now the head of the Ministry for the Future and Frank May, an American charity worker. Frank suffers from PTSD and survivor syndrome after being the sole survivor of India's devastating heatwave, which killed twenty million people. He subsequently becomes involved with eco-terrorism. Following the heatwave, an eco-terrorist group known as the Children of Kali emerges, assassinating fossil fuel industries ranging from ship trade to airlines, and later holding the world's leading business and political figures hostage at the World Economic Forum in Davos for about a week to draw attention to the environmental injustice. The captives are exposed to slide shows and short clips of how their actions harm a wide range of natural ecosystems to achieve their neoliberal economic goals. Meanwhile, India's new coalition government is transforming its economy to use renewable, carbon-negative energy sources and regenerative agriculture, as well as other socialist reforms and reorientations. Kim Stanley Robinson presents two geoengineering projects intending to reduce the disastrous effects of global warming in *The Ministry for the Future*. One of these projects is carried out by the Indian government and its air force to generate a cooling effect by releasing aerosols in the atmosphere to avert future heatwaves, which is a copy effect of the Pinatubo volcanic explosion after which the temperatures dropped considerably. The other project is conducted to prevent glaciers from sliding into oceans by pumping meltwater from under glaciers to the Antarctic ice. In addition to these climate change-related actions and revolutions, the novel depicts a gradual rise in opposition to neoliberal capitalism, including but not limited to Swiss banks being hacked and borrowers refusing to pay their debts to the lenders. Robinson's most groundbreaking idea in the novel, however, is the introduction of the carbon coin, a type of digital money, to decarbonize the current economy since a carbon coin is obtained when a ton of carbon is removed from the atmosphere from manufacturing processes or when carbon-emitting sources are kept on earth. The premise is that an alliance of central banks will create money backed by averted carbon emissions.

In exchange, public expenditure is redirected toward carbon reduction and environmental restoration. As a result, the purpose of this chapter is to evaluate how Kim Stanley Robinson's projections on a decarbonized economy relate to ecological economics within the framework of Herman Daly's steady-state economy.

## 3.1. THE PARIS AGREEMENT, GEOENGINEERING, AND ECOTERRORISM IN *THE MINISTRY FOR THE FUTURE*

The opening line of Kim Stanley Robinson's latest fiction, *The Ministry for the Future*, reads, "It was getting hotter" (1). Whether it is human-induced or caused by natural orderly cycles, there is one and only fundamental reality; a core fact revealing that the Earth is warming. Global warming poses serious threats to a worldwide spectrum of environments from various perspectives but the majority of the world is still pursuing constant growth aims. However, "progress" or "prosperity" cannot be provided for the whole eight billion people of the world's population due to the plenatary limitations of natural sources (57). Fortunately, this reality of environmental limits and climate threats has been taken into consideration on the global basis not only by vulnerable nations also by the countries contributing to climate change thanks to Paris Climate Agreement. The Paris Agreement on climate change mitigation, adaptation, and financing was revised in 2015 and signed the following year by the Parties. The agreement embodies the worldwide effort to reduce the effects of climate change. The Paris Climate Agreement seeks to leave future generations with a more stable and healthier planet, fairer society, and more functioning economy, which is also the main objective of Robinson's *The Ministry for the Future*.

The Paris Agreement is the first international climate change agreement that encompasses almost all global emissions. It emphasizes that greenhouse gas emissions have peaked and that the climate crisis should be handled in the second half of the century, and it proposes a worldwide action plan that should be adopted as soon as possible. The Paris Agreement's long-term temperature aim is to restrict global average temperature rise to

2°C over pre-industrial levels, even 1.5°C is considered an efficient effort. To achieve this, the aim is to reduce emissions as soon as possible and balance greenhouse gas emissions, and capture them until the second part of the twenty-first century. The agreement also intends to strengthen the Parties' capacity to adapt to the adverse consequences of climate change and to ensure "[m]aking finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (22). According to the Paris Agreement, each nation must identify a plan, and report on its contribution to lowering global warming regularly. No mechanism requires a nation to adopt a particular emissions target by a given date, but each objective must go above and beyond the predetermined targets and must also submit emission reduction plans. As a result, the Paris accord attempts to create a schedule for addressing the climate crisis, which is a global threat owing to greenhouse gas emissions, as well as a global action plan to guarantee that the recommended solutions are implemented as soon as possible. The Paris Agreement marks a turning point in climate change mitigation as, for the first time, nations have agreed on a legally enforceable climate change deal. Following the founding of the IPCC in 1989, the first formal environmental awareness of climate change began in 1997 with the Kyoto Protocol. It is still going on today with the Paris Climate Agreement. Countries that do not join the Paris Agreement and firms that do not meet their pledges despite signing it are to face sanctions. These sanctions include additional charges such as carbon taxes, prohibiting goods that do not meet the Agreement's requirements, and limiting free commerce. The restrictions on the agenda for countries that do not sign the Agreement and do not comply with it include not signing a new free trade agreement with these countries, carbon taxes; additional tax for companies that do not meet the requirements, and new standards and an eco-labeling system for tradable products. Treasury funds generated by the implementation of the carbon price, on the other hand, may be allocated to low-carbon incentive instruments. Significant reductions in emissions may be obtained if these incentive mechanisms are properly planned and implemented. At this stage, the critical balance is in recovering these collected revenues for emission reduction without jeopardizing societal welfare with the relevant sanctions.

To decrease CO2 emissions, the carbon tax is a sales and emissions tax depending on the carbon content of the fossil fuel consumed. Emissions taxes are levied based on per unit of

greenhouse gas emissions emitted. However, since the amount of emissions is difficult to measure accurately, such taxes fall into three broad categories in practice: Carbon taxes charged per fossil fuel, equal to the number of carbon emissions emitted when burnt; CO2 taxes levied per ton of CO2 emissions released into the atmosphere; and energy taxes per a specific energy unit (terajoule, British Thermal Unit-BTU, or kilowatt-hour) (Baranzini et al. 396-397). Carbon taxes are classified as unilateral or global carbon taxes based on the region they cover. National carbon taxes involve unilateral actions taken by nation-states within the borders of the country. In contrast to the carbon taxes imposed unilaterally by nations, the global carbon tax is an indirect tax that is intended to be collected at the global level based on the carbon content of oil, coal, and natural gas. As a result, a worldwide carbon tax necessitates global tax regulation. In practice, many taxes have effects in line to be achieved with the carbon tax. In other words, carbon emissions are taxed in many countries with practices other than the carbon tax. Any tax on energy products, including indirect taxation, may be thought of as a kind of hidden carbon tax. Because no nation can solve the climate catastrophe alone, each country must contribute to the solution in proportion to its responsibility. The Paris Agreement is not the absolute solution, but it is seemingly the sole instrument to develop international collaboration for global climate action. The commitments made so far by the nations that have signed the Paris Agreement are calculated to result in a world that is 2.6°C warmer than it is now. To keep climate change under control, limiting the rise in average surface temperature to 1.5°C, and at worst, keeping it below 2°C is crucial. As a result, the party governments should improve their commitments. Kim Stanley Robinson claims that "This is what the Paris Agreement was written to do, and this is why 197 nations signed and began working together. Now we have to make it happen, and finance is key. The petrostates that rely on income from fossil fuel will have to be compensated for not burning it. That will be hard but not impossible" ("Kim Stanley Robinson: Why"). As he discusses the significance of finance in climate change mitigation and meeting the Paris Agreement's criteria, he adds, "Often, at this point, many people in policy roles say, 'We can't pass carbon taxes. People don't like them.' Yes, you can. You can just reframe it rhetorically and push it legislatively, showing that you pay the true cost, avoiding ripping off the future generations. This is the cost of burning carbon, and we're not paying it" ("Kim Stanley Robinson on Science Fiction"). Because the carbon tax is a controversial and

delicate issue, Robinson recommends a more acceptable, moderate, and beneficial regulation, which is the carbon coin. The carbon coin is an essential milestone in the shift from neoliberalism to ecological economics since it is guaranteed by central banks worldwide. In other words, the distribution of the carbon coin and the tracking of its circulation are supplied and controlled by government authorities rather than private enterprises.

The Ministry for the Future is authorized by the Paris Agreement's Articles 16 and 18, which allow the establishment of "Subsidiary Bodies for Implementation of the Agreement" (qtd. in Robinson, *Ministry* 15) and it was established as a Subsidiary Body of United Nations at COP29 in 2015. Further measures, actions, and restrictions were found necessary because Parties to the Paris Agreement were not keeping up with the Agreement's schedule and their commitments. Meeting the targets of the Paris Agreement in the 2020s was significant because further climate emergencies were swiftly approaching and the climate limits were not close to being accomplished. As Robinson states,

> Humans are burning about 40 gigatons (a gigaton is a billion tons) of fossil carbon per year. Scientists have calculated that we can burn about 500 more gigatons of fossil carbon before we push the average global temperature over 2 degrees Celcius higher than it was when the industrial revolution began; this is as high as we can push it, they calculate, before really dangerous effects will follow for most of Earth's bioregions, meaning also food production for people. (30)

Given the current situation, Robinson expands on the Parties' response to the Paris Agreement as follows:

> Article 14 of the Paris Agreement Under the United Nations Framework Convention on Climate Change called for a periodic taking stock of all the signatory nations' carbon emissions, which meant in effect the total global carbon burn for the year in question. . . . That first global stocktake didn't go well. Reporting was inconsistent and incomplete, and yet still it was very clear that carbon emissions were far higher than the Parties to the Agreement had promised each other they would be, . . . Very few nations had hit the targets they had set for themselves, even though they had set soft targets. Aware of the shortfall even before the 2023 stocktake, 108 countries had promised to strengthen their pledges; but these were smaller countries, amounting together to about 15 percent of global total emissions. (15)

As a result, the Ministry for the Future is founded in January 2025 with its central office in Zurich. A former politician from Ireland, Mary Murphy was appointed as the first head of the Ministry to "advocate for the world's future generations of citizens, whose rights, as defined in the Universal Declaration of Human Rights, are as valid as our own" (16). In addition, the Ministry was tasked with "defending all living creatures present and future who cannot speak for themselves, by promoting their legal standing and physical protection" (16). Still, the primary goal to leave a better planet for future generations does not mean that the actions to be taken and measures to be implemented now are only for the well-being of future generations. Every step in climate change mitigation under the Ministry for the Future acts for the betterment of the contemporary human and nonhuman conditions on the planet. Ironically, the world faces a deadly climate catastrophe followed by a great tragedy before the newly established Ministry for the Future could even start its revisional activities.

This harsh climate reality of the 2020s is problematized by Kim Stanley Robinson at the very beginning of his novel. In line with the rising temperatures, *The Ministry for the Future* begins with the depiction of one of the deadliest heat waves that kills twenty million people in a week in India (24). Weeks after the establishment of the Ministry for the Future, India is struck by extreme temperatures over 38°C with humidity over 60 percent, which is almost 33°C in wet-bulb temperature. The wet-bulb index accounts for humidity in the air, and rising wet-bulb temperatures pose critical threats to the survival of humans. When the wet-bulb temperature is over 30°C, it is advised to minimize the exposure to direct sunlight and to drink plenty of water to avoid dehydration and hyperthermia. Columbia University Earth Institute declares that a wet-bulb temperature of 35°C, which is equal to 70 °C on the dry-bulb weather temperature scale, is the theoretical upper limit for humans to survive in the shade only for a couple of hours even with plenty of drinking water intake. Robinson claims that the combination of heat and a wet-bulb index of 35°C makes it impossible to survive humans even in the shade (29). In India's condition, both high temperatures and the scarcity of drinking water make it extremely difficult to survive the heatwave. Frank, the only survivor of the week-long heatwave, survives thanks to a jug of clean water he spared for himself earlier, which actually adds up to his survivor's guilt later on. In a final effort to stay alive, villagers

desperately rush to the lake nearby to keep their bodies cool, yet even the water is almost "only a few degrees from boiling" (11). Therefore, the heatwave results in the death of twenty million people in India, mostly children and the old.

Seeking solutions to avoid further calamities after the heatwave disaster, the Indian government comes up with an action plan to decrease high temperatures in the atmosphere. With the assistance of its air forces, the Indian government pumps aerosols comprised of mostly sulphur dioxide and other chemicals into the atmosphere for seven months. They attempt to mimic the cooling effect of major volcanic eruptions, specifically the Pinatubo eruption of 1991, after which the earth cooled down for about two years (18). After the Pinatubo, the ash cloud filled with sulphur dioxide brought about a dimming effect, which is the aim of the Indian government. The plan is expected to be conducted with the assistance of the Indian air force to avoid further deadly heatwaves. Nevertheless, their plan is not initially welcomed and approved since atmospheric interventions are bound to global consultation and agreement due to the Paris Agreement. Fed up with the indifference to the local climate catastrophes, the Indian government declares, "Everyone knows, but no one acts. So we are taking matters into our own hands" adding, "It was Europe and America and China who caused this heatwave" (19-20). If the plan worked, global temperatures would eventually drop, even if temporarily, it would be for everybody's good, and it works. The accomplishment of India's cool-down project is the first geoengineering success depicted in the novel. Another major geoengineering project conducted in the novel is named "Project Slowdown." As the name suggests, scientists attempt to slow down the melting of glaciers and the Arctic ice cap and prevent their movement into oceans, which may cause sea-level rise. The consequences of melting ice are not limited to the threat of rising sea levels. The function of the Arctic ice cap and the risks the melting pose are explained in the following quotation:

> The Arctic ice cap, which at its first measurement in the 1950s was more than ten meters thick, had been a big part of the Earth's albedo; during northern summers it had reflected as much as two or three percent of the sun's incoming insolation back into space. Now that light was instead spearing into the ocean and heating it up. This meant also that the permafrost . . .was melting faster and faster; which meant the release of a great deal of permafrost carbon, and also methane, a greenhouse gas twenty times stronger than CO2 in its ability to capture heat in the atmosphere. Arctic

> permafrost contained as much stored methane . . . and this giant burp, if released, would almost certainly push Earth over an irreversible tipping point . . . completely ice-free; at which point sea level would be 110 meters higher than at present, with global average temperatures at least 5 or 6 degrees Celsius higher and probably more, rendering great stretches of the Earth uninhabitable by humans. (147)

Since it is not technically and naturally possible to cure melting ice all at once, the Slowdown Project stands for initial attempts at glacier and ice cap restoration. Due to the increase in ocean temperatures, ice caps melt more rapidly than they do during seasonal cycles. It is reported that the entire Arctic Ocean's ice sheet melted by the end of summer in 2032 (147). As a result, the Slowdown Project is planned as a response to the urgency of melting ice. The project essentially functions by pumping melted water out from under the ice caps and spraying it back up onto the top to thicken the ice since the sprayed water is to freeze before it comes down. In this way, the weight of the ice caps increases, and they no longer slide swiftly into to ocean after they bottom out. The modeling of the Slowdown Project is surely controversial and speculative since it is proposed in speculative fiction. Nevertheless, as Robinson grounds his ideas on scientific research and contemporary improvements, his geoengineering ideas "isn't always just a fantasy" (122). As it is revealed toward the end of the novel, the project functions efficiently, which represents ice cap restoration.

Meanwhile, another heatwave hits Arizona this time killing two and three hundred thousand people. The temperature and humidity index is measured "around wet-bulb 35, with temperatures around 110 F and humidity 60 percent" (348). Still, both the casualties and temperatures measured are not as large as the Indian heatwave. The fact that it is the Americans this time, the US puts aside its indifference to the extreme catastrophes and starts looking for further initiatives to respond to climate change. However, extreme climate events are not the only threats to the human life depicted in the novel. The emergence of ecoterror attacks specifically targetting at neoliberal companies burning carbon extensively accounts for the American change of heart in terms of climate action. Declaring "they are fighting for the Earth itself," these ecoterrorist groups are called "Gaia's Shock Troops, Children of Kali, Defenders of the Mother Earth, Earth First" (368), and so on. Their attacks include crushing private jets, coal-fired power plants, and trading ships as well as mines and cement factories. Moreover, the Children of Kali from

India attack World Economic Forum in Davos and keep them hostage for a week to raise awareness of the climate reality. Surely, these are highly aggressive ways to trigger climate action since most of them result in mass killings. However, it is obvious that before national interference to mitigate climate change, the collective activities of local groups initiate first climate actions to alter current economic and social habits just as they do in the *New York 2140*. These ecoterrorist attacks indirectly trigger shifts in carbon-burning industries and the decarbonization of the economic activity, which in a way relates to the patterns of ecological economics. Because

> [t]he shipping industries, under the duress of their ships being sunk if they didn't shift, had shifted already to wind and electrics and hydrogen. Aviation, under the same annihilating pressure, was shifting to electric planes, and mainly, airships. Ground transport was going entirely electric, and where it still used liquid fuels, was completely committed to renewable biofuels that bypassed fossil sources. (345)

As a result of the tragedies caused by climate catastrophes and ecoterrorism, larger-scale transformations are required to avoid further calamities since the current practices described in *The Ministry for the Future* do not seem enough to solve climate issues. Despite the committed efforts and restrictions, neither the Paris Agreement nor the Ministry for the Future has not responded efficiently to global climate change. After the great Indian heatwave, the Ministry for the Future declares,

> The Paris Agreement was created to avoid tragedies like this one. We are all in a single global village now. We share the same air and water, and so this disaster has happened to all of us. Since we can't undo it, we have to turn it to the good somehow, or two things will happen; the crimes in it will go unatoned, and more such disasters will happen. So we have to act. At long last, we have to take the climate situation seriously, as the reality that overrides everything else. We have to act on what we know. (24)

With an aim to act, Kim Stanley Robinson points to a paradigm shift in economics since economic activities have a direct impact on the environment and socio-economic equilibrium. Just as he attacks the growth-obsessed economic targets in *Forty Signs of Rain* and *New York 2140* and offers ways to transcend neoliberal capitalist economies, he introduces the carbon coin in *The Ministry for the Future*. The innovation of carbon coins

represents a practice that can decarbonize global finance and world economies. The decarbonization of mainstream economics naturally paves the way for more ecocentric economic activities. In other words, Kim Stanley Robinson suggests a transition to ecological economics with the promotion of the carbon coin.

### 3.2. ECOLOGICAL ECONOMICS AND THE CARBON COIN IN *THE MINISTRY FOR THE FUTURE*

When it comes to finding economic and ecological balance in any society, economists and other multidisciplinary experts such as environmentalists, ecologists, sociologists, and anthropologists draw on the principles of economics. Their efforts lead to the foundation of ecological economics. American economist Herman Daly is one of the initial founders of the discipline (Ghista 1). Herman Daly's ecological economics proclaims a shift away from mainstream economics, which focuses on cost-benefit analysis, economic efficiency, and declining returns. Ecological economics, instead, focuses on an ethical worldview, which by its nature imposes ecological principles into economics. Nature and justice are the focal points of ecological economics (Malte 2), which echoes in Kim Stanley Robinson's fiction with his criticism of the neoliberal distribution of resources. He underlines this inequity in the distribution of resources by stating, "if the Earth's available resources were divided up equally among all eight billion humans, everyone would be fine" (*Ministry* 57). In an interview with Gary Canavan et al., Robinson expands on his thoughts on justice and its relationship with the environment as follows:

> Justice stabilizes population growth, and reduces the discrepancies between rich and poor, which extremes are both very environmentally destructive among their other bad qualities. Real justice would alleviate the poverty that has desperate people stripping away forests and soil in much of the world, and it would reduce the hyper-consumption of the rich, which is equally or even more destructive of resources and excessive in carbon burn. The only possible road to sustainability's necessary carbon neutrality involves justice (212).

It is possible to interpret his ideas on justice as he defends a transition towards ecological economics. Because economic theories such as those promoted by mainstream

economists such as cost-benefit analysis, economic efficiency, and declining returns all fail to consider nature and justice as they should (Malte 2). Principally, ecological economics must have these two features to advise both governments and societies on concerns such as time, sustainability, natural environments, and economic progress. Ecological economics differs from mainstream economics in that it considerably covers the environment as well as the biological ecosystems. Mainstream economics, on the other hand, views nature as just a component or a subsystem of the economy that must be managed by humans (Constanza et al. 6). Since the mainstream economies are market-oriented, natural resources are often seen as a source of capital and profit, but in reality, nature plays an even more important role in maintaining the planet's balance of living and nonliving. As a result, ecological economics plays a crucial role in ensuring a healthy balance between environmental and economic sustainability. A major difference between ecological economics and mainstream economics is that ecological economics emphasizes the need of working within natural processes rather than manipulating them from outside. Environmental considerations in economics help distinguish between financial growth and nonquantitative development, which is evident in people's daily lives and their gradually rising quality of living. To put it differently, "[e]cological economics seeks to ground economic thinking in the dual realities and constraints of our biophysical and moral environments" (Daly and Farley xxi). It addresses the "the most pressing problems we face today arise from the interaction between two highly complex systems: the human system and ecological system that sustains it" (Daly and Farley xxii). Therefore, an ecologically healthy environment influences the economics of ecological sustainability.

The steady-state economy is a concept derived from environmental economist Herman Daly's principles of ecological economics. A steady-state economic model refers to an economy of constant size with only slight fluctuations. The Daly model suggests that each generation should pass on to the following generation the same quantity of resources as was utilized by the previous generation. According to Daly, ecological economics and a steady-state economy should be applied as a model for the economy on a national scale. Despite this, it is conceivable to promote ecological economics and steady-state economies on a local, regional, or global scale. A steady-state economy is stated to

be reached after an extended period of economic growth, followed by a period of downsizing or degrowth, then it "undergoes neither growth nor recession," ultimately creating a socio-economic equilibrium (Czech and Daly 598). As sustainability is one of the main concerns of ecological economics, physical ecological limits are always to be considered since "in a finite world nothing physical can grow forever" ("In Defense" 945). In Robinson's words, the planet is "incapable of sustaining everyone alive at Western levels," which is growth-oriented and exploitive (*Ministry* 57). As a result, a steady-state economy requires stable rates of population and consumption. Thus, birth and death rates are equal while production rates equate with consumption and depreciation rates. Additionally, minimum waste and recycling are fundamentals of a steady-state economy. The gross domestic product[5] remains relatively stable or experiences slight fluctuations in value in an economy operating within a steady-state. Therefore, a steady-state economy is "an economy with constant stocks of people and artifacts, maintained at some desired, sufficient levels by low rates of maintenance 'throughput'" (Daly, *Steady State* 17).

Kim Stanley Robinson holds the 2,000 Watt Society up as a form of stability and a constant stock of energy to be consumed equally by each individual. Founded in Zurich in 1998, the foundation has calculated the 'desired' and 'sufficient' amount of energy input that enables maintaining life. It is revealed that "if all the energy consumed by households were divided by the total number of humans alive, each would have the use of about 2,000 watts of power [annually], meaning about 48 kilowatt-hours per day" (Robinson, *Ministry* 58). 2,000 watts per person is suggested to be allocated proportionately to food, traveling, heating, electricity, and public infrastructure. As the members of the society try reducing their energy costs to 2,000, it is revealed that the calculated amount is "just fine" (58). Meanwhile, Robinson conveys that current energy usage per person in different countries differs from each other dramatically. He further lists that the energy usage of the Swiss cost about 5,000 watts, for the United States it is 12,000 watts while 1,500 watts in India and 1,000 watts in China (196). At this point, Robinson criticizes the neoliberal order by pointing at the massive differences between

[5] GDP is defined as the "total value of goods and services produced by a country in a year" ("Gross Domestic Product").

energy costs. He certainly challenges the neoliberal indifference, "*après moi le déluge*[6]" as he believes everyone should take responsibility, and that equality and sustainability for all can only be achieved in this way. With the example of the steady amount of 2,000 watts, Robinson claims,

> So, is there energy enough for all? Yes. Is there food enough for all? Yes. . . . So all the necessities for a good life are abundant enough that everyone alive could have them. Food, water, shelter, clothing, health care, education. . . . To be clear, concluding in brief: there is enough for all. So there should be no more people living in poverty. And there should be no more billionaires. Enough should be a human right, a floor below which no one can fall; also a ceiling above which no one can rise. Enough is a good as a feast— or better. (58)

With this sense of 'enough' and stability of per capita consumption Robinson addresses Herman Daly's ecological economics, in which "man's behavior should be governed by values of enoughness" (*Steady State* 48). Given the environment-oriented alternatives, Kim Stanley Robinson harshly criticizes mainstream economics since it does not respond to the climate-related and socio-economics issues. As the narrator of the novel, he states,

> The whole field and discipline of economics, by which we plan and justify what we do as a society, is simply riddled with absences, contradictions, logical flaws, and . . . false goals. We must fix that if we can. It would require going deep and restructuring that entire field of thought. If economics is a method for optimizing various objective functions subject to constraints, then the focus of change would need to look again at those "objective functions." Not profit, but biosphere health, should be the function solved for; and this would change many things, . . . Why do we do things? . . . What would be fair? . . . Our current economics has not yet answered any of these questions. (166)

In order to "get the economics right" (166) Robinson proposes the carbon coin. The idea of the carbon coin is the outcome of Robinson's discontent with the current economy and the neoliberal order disrupting environmental and social harmony. Additionally, Scott

[6] The French phrase "aprés moi le déluge" means "after me the flood." It is used to demonstrate absolute indifference to what may occur after one's death. The statement is attributed to Madame de Pompadour, the beloved of King Louis XV of France. It is believed that Madame de Pompadour uttered those words with complete indifference to the misery of the people following the Battle of Rassbach 1757. Quoting this expression, Herman Daly argues that this act of turning a blind eye to the injustice in socio-economic conditions and environmental degradation is a component of "growthmania" (48).

Patterson states that the carbon coin is a financial invention to "pull the world back from the edge of a global ecological meltdown." In other words, the carbon coin is a way of responding to global climate change. Backed by the world's central banks as Mary Murhpy talk them into the application of the carbon coin, this new cryptocurrency is deployed around the globe to pay fossil-fuel companies and petrostates to leave their reserves in the ground. At the same time, it is used to reward businesses and individuals for sequestering carbon, therefore "enticing loose global capital into virtuous actions on carbon burn reduction" (172). By the end of the novel, the global economy is largely run on carbon coins, with projects around the world rapidly drawing carbon out of the atmosphere. The initial aim of promoting the carbon coin is that "if a lot of carbon coins [are] created, . . . that will be a sign of biosphere health that will increase confidence in the system" (174). Robinson borrowed the idea of carbon coins from Delton Chen, an Australian civil engineer. Founder of the Global Carbon Reward initiative, he aims to create financial incentives to drive down carbon emissions while providing a financial reward for reducing carbon emissions. In addition to cutting emissions, a carbon coin is earned when carbon is removed from the atmosphere. Chen states that his carbon coin agreement ensures that "one unit of the carbon currency is issued for one metric ton of carbon dioxide equivalent that has been mitigated for the long-term, such as a 100-year duration." Therefore, Chen's carbon coins are earned first by cleaner energy initiatives, then developing cleaner business schemes, and last by removing carbon from the atmosphere. He suggests that the carbon currency should become a permanent feature of the world economy, and becomes a global currency in *The Ministry for the Future*. The carbon coin impacts global finance because it is a kind of quantitative easing which is a financial policy of central banks to introduce a new supply of money during a financial crisis. Kim Stanley Robinson suggests that Chen's carbon currency can be thought of as "carbon quantitative easing" because it is employed to "save the biosphere" while quantitative easing by the central banks saves the economy ("Making the Fed's"). Similarly, Robinson's carbon coin stands for a reward for reducing carbon emissions, thus restoring biospheric health. In a way, it is the money "given to people for doing good things" (Robinson, *Ministry* 173). The carbon coin is a trackable cryptocurrency and is earned when a ton of carbon is eliminated from the atmosphere- when for example, oil companies leave their reserves in the ground, reestablish forests, or carbon is removed

from the atmosphere. It can be traded for any other currency on the currency exchange rates, thus, one carbon currency is worth a set quantity of other fiat currencies (174). Unlike other currencies "floating against each other in the exchange market," the carbon coin is much more valuable to investors because it is guaranteed to "rise in value over time no matter what" (176) by central banks creating "a floor so it [won't] crush" (174). Following the climate catastrophes, ecoterrorist attacks, and financial crises, the carbon coin is introduced to the economy as "a way to invest in survival" (288). Since there is a reckless indifference to the climate collapses striking vulnerable nations, global financial crushes influence the adaptation of the carbon coin positively. Robinson's fictional financial crush of 2034 occurred as a result of a serious water scarcity after twelve years of continuous worldwide drought. Since "nothing came out of the taps" and "there was no longer any water to buy," the water shortage turned out to be a global crisis (167). Another one came after American students stopped paying their student loan debts, which is reminiscent of the debt strike depicted in *New York 2140*. Initiated by the National Students' Union, the fiscal strike caused a sudden crush on the US economy since "student debt was a trillion-dollar annual income stream for the banks" (375). As a result, the banks asked for a bail-out, and the Federal Reserve accepted bailing them out "in exchange for ownership shares in every bank" (375). This attempt was a huge strike on the neoliberal enterprise because bailouts led to the nationalization of the banks this time. Robinson clarifies the current situation as follows: "This was either nationalizing finance or financializing the nation, in that now it was clearer than ever that the country was in effect run by the Fed. And since Congress ran the Fed, and people voted in members of Congress, maybe it was all beginning to work, somehow, because of this strike. Definancialization of a sort. End of neoliberalism" (376). Following the student debt strike, unions in Africa and China declared debt strikes one by one shrinking down the global economy. The Super Depression marked a time in world history when "people began to look for ways to earn a carbon coin or two" (380). The reason was that central banks were running global finance after the nationalization of private banks, and central banks were promoting the carbon coin. In this way, carbon has become a highly-demanded currency all over the world.

Nevertheless, preserving wealth equality is crucial to prevent the neoliberal order flourish again. In this regard, Robinson comes up with new ways of limitation as well. Since every company gets paid one carbon coin per ton of carbon sequestration, it seems easier for the rich to get richer on carbon coins. To avoid this,

> pay-outs above a certain amount were being amortized over time, and would be paid out, when the time came, at zero interest . . . and with guarantees, thus becoming a kind of bond. And then the companies were required by law and international treaty to do carbon-negative work with the initial use of the carbon coins they were given, in order to keep qualifying for their pay-outs, because if they merely invested in other biosphere-destroying production, especially carbon-burning production, then they wouldn't be sequestering carbon at all in the larger scheme of things. (479-480)

As a result of the regulations on carbon coin circulation, the terms of the Paris Agreement are indirectly met. In this regard, the carbon coin reconstructs the balance between economics and the environment by decarbonizing economic activities just as ecological economics aims. Additionally, as the carbon coin is a cryptocurrency, the circulation of carbon coins is easily trackable, and avoiding taxes via tax havens is prevented. Similarly, the carbon coin limits uncontrolled growth, thus hindering neoliberal capitalism. Therefore, Robinson's monetary innovation results in reorienting mainstream economics towards ecological economics.

### 3.3. THE TRACES OF HERMAN DALY'S STEADY-STATE ECONOMY IN *THE MINISTRY FOR THE FUTURE*

Hopeful endings with optimistic views depict a typical characteristic for Kim Stanley Robinson's novels. *Forty Signs of Rain* ends with a hint of forthcoming climate actions to be considered and taken immediately as a result of experiencing a climate catastrophe that ruins Washington D.C. Although it does not depict what these actions will be in the future, Senator Phil Chase's willingness to respond to the crisis displays a hopeful impression in terms of politics. *New York 2140* shows a crash on the neoliberal capitalist economy of the U.S. after the Householder's Union's debt and rent strike. With the nationalization of banks, new taxes to protect the socio-economic equilibrium, and tight

controls on economic activities, Robinson claims that neoliberal economics can be transcended, which leads to a kind of transition to ecological economics since environmental restoration and protection are now taken into consideration while allocating the capital and new tax revenue. In common with the last two novels, *The Ministry for the Future* has a promising ending owing to Robinson's proposals to revise the neoliberal economy. These revisions in global finance indicate a transition to ecological economics with the principles of the steady-state economic model, and "a reorganization of American economic thought" (Özdağ 129). As Herman Daly explains, "a steady-state economy is a necessary and desirable future state of affairs and that its attainment requires quite major changes in values, as well as radical, but nonrevolutionary, institutional reforms" (*Steady State* 2). What is more, Robinson's proposals on changes and reforms in the current economy are envisioned as "entirely plausible" to be implemented in the real world (Shaviro 111). This potentially explains the reason why Kim Stanley Robinson was invited to United Nations Climate Change Conference (COP26) in 2021 as a science fiction writer. Nigel Topping, United Nation's high-level climate action champion for the UK expressed that Robinson's futures are not only plausible but also outcomes of an extensive research (Alter). Kim Stanley Robinson is not a scientist, nor is he an economist but with extensive research, he comes up with approvable ideas that can be utilized by these disciplines. Obviously, his novels cannot cure global climate change, yet the echoes of his commitment to the environment may initiate climate actions and assist them as well. His imagined futures may even trigger further developments in economics, social order, and science as scientific knowledge itself is attained thanks to imagination.

Towards the end of *The Ministry for the Future*, Kim Stanley Robinson depicts both socio-economic and environmental outcomes of the Paris Agreement and the Ministry for the Future. The regulations and restrictions initiated by the Paris Agreement mark a "turning point in human history" which paves the way to "the birth of a good Anthropocene" (475) while the Ministry for the Future promotes the carbon coin to decarbonize both the atmosphere and the economy. The use of carbon coins not only encourages cuts in carbon emissions but also assists the progress of geoengineering projects since fewer emissions help the environment heal faster while increasing the

success rate of the geoengineering projects conducted to mitigate the impacts of climate change. Robinson first starts with the results of the Project Slowdown. After a decade-long effort to slow down melting and recover glaciers, geoengineers, and glaciologist working in Antarctica receive their first successful results as they figure out one of the glaciers has bottomed out, which means there is no more water to pump from the bottom of the glacier and it will no longer slide into the seas (473). Besides, another "glorious prospect" (474) of the project will be new job opportunities because now that the project is proven to be working, more workers will be needed to take part in the Project Slowdown as there are still many more glaciers waiting to be healed from melting. The success of the project is not solely dependent on science and geoengineering. Robinson further declares that during that ten-year-long period following the launch of the carbon coin, less carbon was burnt, which has actually been helpful for the Project Meltdown. Additionally, the "greatest" drop in carbon emissions is observed also during that decade (455). It is reported to be global, "a real drop" in $CO_2$ figures, and "$CO_2$ was going down at last; not just growing more slowly, or leveling off, which itself had been a hugely celebrated achievement seven years before, but actually dropping, and even dropping fast. That had to be the result of sequestration. It could only be anthropogenic. Meaning they had done it, and on purpose" (445). In a way, the long-waited radical drop in $CO_2$ celebrates the human efforts to mitigate the destroying impacts of carbon emissions. Together with carbon sequestration, other attempts of decarbonization seem to have worked efficiently in the case of the drop in carbon figures. As Robinson explains,

> The majority was being drawn down by reforestation, biochar, agroforestry, kelp bed and other seaweed growth, regenerative agriculture, reduced and improved ranching, direct CO2 capture from the air, and so on. All these efforts were paid for, or rather rewarded beyond the expense of doing them, in carbon coins, . . . in some senses the carbon coins were like dollars created by the sequestering of carbon. (454)

As revealed by the quotation above, the carbon coin turns out to be a paramount success. The carbon coin provides profitable income and savings, thus it becomes so strong and prevalent that the carbon coin is thought to replace the US dollar, which is the key currency in global finance (454). The quotation also displays that the carbon coin is used to fund restoration projects such as reforestation and innovations in agriculture practices. In Robinson's words, "What the success of the carbon coin meant was a huge amount of

money was now going to landscape restoration, regenerative ag, reforestation, biochar and kelp beds, direct air capture and storage, and all the rest of the efforts described elsewhere in the hall" (480). The ecological restoration depicted in the novel is not limited to landscape restoration. Animal habitats start recovering just as land does. In this sense, animal habitats' restoration indirectly depends on land restoration. Since animals need healthy habitats, a healthy landscape support animals. Thanks to landscape restoration in Siberia, all of which is "now being returned to health," for instance, "[t]he reindeer have been coming back there, along with all the rest of the Siberian creatures, musk oxen, elk, bears, wolves, even Siberian tigers" (501). Miles-wide habitat corridors for wild animals have also been effective in habitat restoration. The recovery of the animal condition is expressed as follows:

> Earth was still occupied and used by humans, nevertheless, broad swathes of each continent had been repurposed as wild land, and to a large extent emptied of people and their most disruptive structures, and left to the animals and plants. There were more wild animals alive on Earth than at any time in the past two centuries at least, and also there were fewer domestic beasts grown for human food, occupying far less land. Ecosystems on every continent were therefore returning to some new kind of health. (477)

The fact that there are now more wild animals than there were in the past two hundred years correlates with the human population. Just as Herman Daly suggests via his steady-state condition with population, *The Ministry for the Future* reflects a reduction in the demographic index. Correlatively, global birth rates have dropped notably. It is stated that "the global human replacement rate was now estimated to come to about 1.8 children per woman. As a level replacement rate was hit at about 2.15 children per woman, the total human population on Earth was therefore going down, slowly but surely" (477). Nevertheless, the decline in human population is problematized by some capitalist economists claiming the economy cannot deal with this degrowth in human population since there is a high chance decreasing numbers in human population will disrupt economic activity and growth. Still, some others are already present to support the degrowth patterns in both economic and demographic indexes and to find new ways to adapt to this new version of society. Even this debate alone relates to the conflicts between mainstream economists and Herman Daly's steady-state economy. When all is said and done, economic disruption or degrowth in economic activity is a temporal condition

according to the steady-state scheme. Robinson supports this kind of disruption to restore the balance between human and natural environments by stating, “social and economic disruption . . . had actually been a good thing in terms of carbon burn and biosphere health” (476). Still, the measurements of economic activity indicate a hundred trillion US dollars circulating per year, which is an amount that is “still big” but does not “run on carbon anymore” (479). For this reason, the novel does not describe a deteriorating situation in the welfare of society. On the contrary, there is a situation of complete improvement for both society and the environment.

In the light of all these developments, Robinson points at “a whole new economics [that] was springing up” and adds, “because economics was above a system of quantified ethics and political power that depended on measurement” (479). This new economy challenges the mainstream economic perception defending individuals’ desires as the supreme measure of the world. Thanks to the promotion of carbon coins and taxes to limit carbon emissions and raise climate awareness, *The Ministry for the Future* concludes with a sense of regained balance comprised of economic and environmental harmony. This new future setting of Robinson points to what Herman Daly wishes to achieve with steady-state economics as there is less economic activity that is planned to be stabilized soon while these activities are longer disturbing natural environments, fewer carbon emissions, declining numbers of the human population, and environmental recovery and restoration. All in all, people are finally aware of the fact that it is a finite world and no growth can be infinite, thus certain limitations in consumption habits are necessary to maintain the presence of both living and nonliving beings. Robinson describes the new social order as follows:

> There are fewer humans than before. The demographic peak is in the past, we are a little fewer than we were before, and on a trajectory for that to continue. People speak now of an optimum number of humans; some say two billion, others four; no one really knows. It will be an experiment. All of us in balance, we the people, meaning we the living beings, in a single ecosystem which is the planet. Fewer people, more wild animals. (502)

The optimum number of population Robinson mentions relates to Herman Daly's first decreasing, then stabilized population that is not to fluctuate dramatically. Unfortunately, climate catastrophes that killed millions of people all over the world, and ecoterrorist attacks have a role in the decline in the human population. It is possible to state that due to this awareness, nations start seeking ways to mitigate the impacts of climate change and initiate carbon-neutral lifestyles to avoid further loss of life and ecoattacks, which will ultimately end up in a stabilized human population. As birth rates have already dropped, and when death rates fall decline, the population can stabilize on its own, highlighting a steady-state demographic index. Additionally, the wealth and income injustice is stated as disappearing. Robinson shows the declining figures of the Gini Index, which measures the income and wealth inequality in nations. Decreasing Gini Index figures indicate a decrease in inequality patterns and a more equal socio-economic order. In Robinson's words,

> In this same period, the Gini index figures for the world at large had flattened considerably. . . . The pay justice movements, the wage ratio movements, and the central banks' recommended tax plans, plus political movements everywhere supporting job guarantees and progressive taxation . . . had had powerful effects everywhere. Setting a generous definition of a universal necessary income, guaranteeing jobs to all, and capping personal annual income at ten times that minimum amount, as they had done in many countries, had immediately crushed Gini figures down. (478)

The flattening in Gini figures is also contingent upon increasing purchasing power parity. With the promotion of clean energy innovations powered by renewable resources such as solar energy and wind power, it has become cheaper to access and purchase energy sources. As nations obtain carbon coins with clean energy production, the demand for nonrenewable energy resources fades. Additional carbon taxes are a disincentive to the carbon-emitting energy processes. The current situation on the energy purchase is explained in the following:

> Oil was rarer now, therefore more expensive, which meant that clean renewable energy was now cheaper than oil by an even larger margin than before. And as the new carbon taxes . . . were also scheduled to rise year by year by an increasing percentage, price signals were now all pointing toward clean renewables as the cheapest way to power the world. The social cost of carbon was finally getting injected into the price of fossil fuels, and that old saying, ridiculed by the fossil fuels

> industry for decades, was suddenly becoming the obvious thing: . . . *Keep it in the ground*. (342)

All these innovations, improvements, their revolutionary outcomes are achieved thanks to the carbon coin as Robinson puts it, "The carbon coin had played its part in all of this" (479). The carbon coin project initiated the first step away from quitting carbon-emitting processes by leaving their carbon reserves in the ground as companies get paid for not emitting carbon. As signatory nations to the Paris Agreement are obliged to initiate not only carbon neutral but also carbon negative innovations, these companies start to invest in carbon sequestration projects and fund underdeveloped and developing countries to mitigate global impacts of climate change, which also prevents neoliberal progression. The economic activity, therefore, is stabilized and seems to maintain its steady-state, which is described as follows:

> The new carbon coin had stimulated many short-term investments in carbon sequestration projects, and many longer-term investments in the coin itself. It had caused some of the biggest carbon owners to cash out and keep fossil carbon in the ground, or use it for plastics if they could. Coal had become just a black rock you could turn into money by leaving it alone. They had created and paid out trillions of carbon coins, and yet had seen no signs of inflation, or deflation, for those who held that theory; no noticeable price change." (420)

As a result of the economic, social, and environmental remediation displayed at the end of *The Ministry for the Future*, "[r]evolutions don't involve guillotines anymore" (506). Therefore, collective awareness and will that have the potential to trigger multidimensional changes, both economic and environmental injustice can be corrected for the sake of a better future.

# CONCLUSION

*Ultimately, what we call 'the economy' is our material relationship with each other and with the rest of the living world. We must ask ourselves: what do we want that relationship to be like? Do we want it to be about domination and extraction? Or do we want it to be about reciprocity and care?*

Jason Hickel, *Less is More*

Climate change is undoubtedly one of the most critical issues of our time. Every year, thousands of people are affected by changing climate trends and major environmental calamities. Human activity has an undeniable impact on anthropogenic climate change. As a sci-fi and cli-fi novelist, Kim Stanley Robinson explores climate change themes in his novels. Since such issues are thematized in literary works, thousands of readers worldwide are exposed to climate issues, even if they have not yet personally encountered any extreme effects of climate change. In this way, his works' use of multiple settings, characters, and voices appears to be his literary approach to reach individuals from various regions and socioeconomic backgrounds. This multiplicity of settings and literary personas creates a multitude of voices in Kim Stanley Robinson's novels. As a result, his works portray a diverse range of individuals and all that exists on the world. Furthermore, Robinson applies this strategy of multiplicity systematically in his work. All three novels examined in this study feature multiple protagonists from various origins. This diverse cast of characters, ranging from scientists to politicians, social workers to officers, and ordinary residents regardless of socioeconomic conditions, emphasizes the fact that everyone is affected by climate change and, in some way, contributes to environmental decline. Thus, the wealthy and the impoverished, traders and coders, politicians and scientists, or attorneys and celebrities should all act together. Furthermore, Robinson's description of various places and landmarks in the novels examined in this study demonstrates that from the most remote corners of the planet to huge megacities, every place whether people set foot or not is vulnerable to climate disasters. The novels even vary in the times at which Robinson constructs his fiction. Although *Forty Signs of Rain*

is set in the present day, *New York 2140* and *The Ministry for the Future* are set in the near future. Nonetheless, his use of varying futures suggests the necessity for drastic reforms to mitigate climate change. His novels show that even technological developments to adapt to the climate crisis will not be adequate unless effective solutions are applied in terms of climate change mitigation. Therefore, Robinson continuously portrays multiple visions, characters, places, and futures to indicate the urgency and necessity of actual climate actions that can potentially be effective. And, these actions require collective efforts to create a sense of unity that can eventually spark radical and deep changes at the most problematic areas of human activity. His novels illustrate that even technological advancements to adapt to the climate catastrophe would be insufficient unless effective climate change mitigation strategies are implemented. As a result, Robinson constantly depicts numerous visions, persons, locations, and futures to emphasize the urgency and necessity of actual climate actions that can potentially be effective. Moreover, to stimulate radicachanges in the most problematic areas of human activity, and these actions necessitate collective efforts to foster a sense of unity. Only with this unity can economic reformations be made possible.

It is observed that the disasters in Kim Stanley Robinson's novels have an economic basis. In each novel, Robinson underlines a paradigm shift to postcapitalism while also presenting increasingly catastrophic climate catastrophe scenarios. He claims that capitalism and its byproducts go beyond exploiting natural resources and contribute to climate calamities. In this regard, neoliberal economic goals and practices cause global climate collapse. As a result, he suggests that the world should enter postcapitalist processes and offers solutions in this context. In *Forty Signs of Rain*, he criticizes economic growthmania in politics and recommends that economic priorities should shift for the sake of climate change mitigation and that science should play a more active role. Despite advances in science and technology in *New York 2140*, it has been demonstrated that the negative consequences of climate change cannot be fully alleviated because human activity is still heavily influenced by capitalist thinking even in the 2140s. In this context, the debt strike he recounts, the bank collapse, and tax code distortions designed to destroy the neoliberal system all hint at postcapitalism. Similarly, *The Ministry for the*

*Future*'s carbon coin application illustrates both the struggle against climate change and a postcapitalist system based on ecological economics.

Furthermore, as evidenced by all three novels, the severity of extreme weather events is increasing. While *Forty Signs of Rain* features a devastating storm and subsequent flood, the world map alters in *New York 2140* due to rising sea levels. Even a single heatwave, although relatively short-lived, kills 20 million individuals in The Ministry for the Future. Analyzing the novels, it is asserted that neoliberal economic activities have an impact on rapid climate change and climate disasters. Consequently, Kim Stanley Robinson openly criticizes capitalism and its derivative economies, claiming that they must be transcended. Considering Kim Stanley Robinson's proposals, this thesis claims that transitioning to an ecological economy, especially a steady-state one, can be an effective strategy to combat climate change. Because, as Herman Daly also puts forward, ecological economics-based activities cannot only mitigate the environmental damage caused by the neoliberal economy but also restore the socioeconomic equilibrium among and within nations. Therefore, an economic transition may result in several societal improvements. However, this transition can only be made possible via collaborative action. The accomplishments acquired by community effort, particularly in *New York 2140* and *The Ministry for the Future*, may be applicable in the real world. It can, thus, be seen that literature, at this juncture, plays a role in disseminating potential options, even solutions, to large numbers of readers all across the world. As a result, Kim Stanley Robinson's novels may popularize the notion of hopefulness in climate futures.

Within this context, Robinson offers plausible and potentially effective solutions to deal with the climate change crisis rather than simply laying out dystopic future settings. His novels do not promise sudden and easy visions of change, healing, and restoration, which reminds Bill McKibben’s famous statement in *Eaarth* claiming, “The momentum of the heating, and the momentum of the economy that powers it, can't be turned off quickly enough to prevent hideous damage. But we will keep fighting, in the hope that we can limit that damage” (212). To limit the damage and encourage climate action to prevent further calamities, Robinson establishes climate futures with optimistic views. In a world

where changing climate and subsequent global disasters become reminiscent of dystopian scenarios, it would not be utterly wrong to claim that living in times of global climate deterioration blurs the line between fiction and reality, bringing about hopelessness. Nevertheless, Kim Stanley Robinson classifies himself as a utopian novelist ("Future Politics" 185). Many of his works reflect his optimism about climate futures, which is grounded in scientific and technological knowledge as well as the collaboration between science, technology, and political action to reorient carbon economies. Observed in *Forty Signs of Rain*, *New York 2140*, and *The Ministry for the Future*, Robinson rejects dystopian thoughts on the future, and advocates relying on advancing carbon neutral and carbon negative technologies to take climate action regarding mainstream economics. Because optimism in climate reality leads to climate actions to deal with the climate crisis and hopefully, reverse climate change in the long run. Kim Stanley Robinson elaborates on his climate optimism and hopefulness as follows:

> So we ask this question about our present situation on Earth, Is it too late?, because we wonder: Has humanity already overshot the carrying capacity of Earth so badly that we are doomed to a horrible crash after oil, or freshwater, or topsoil, or fish, or the ozone layer, or many other things—after one or all of them run out? So that no matter what we do in the meantime, it's a foregone conclusion that we're in for a fall? No. In that sense, it is not yet too late. So there is reason for hope. ("Is it too Late 374-75)

In the light of the quotation above, Robinson's optimist vision relies on climate-conscious human activity to mitigate the climate change crisis. He further emphasizes in the essay that even ecological restorations can be made if everything is done "right" continuously (375). Robert Markley concludes that "Robinson is a utopian writer if we understand that utopia is not an endgame but an ongoing struggle for a more just and sustainable society." Therefore, continuous efforts to establish an environmentally just society can create a sense of utopia in the climate futures. In this regard, "he offers not an easy vision of utopia, but a hopeful alternative that still confronts the ecological devastation specifically wrought by capitalism" (Markley). That is why he is most known for his distinctive criticism of addressing the detrimental impacts of a multitude of capitalist praxes on various natural environments in the Age of the Capitalocene. Furthermore, the number of young scholars engaged in environmental humanities and ecocriticism is steadily

increasing, and Robinson's ecocritic persona reaches out to them through his novels. As more academics turn to climate/environmental issues and address them within academic circles, the audiences grow, and more individuals can become involved in attempts to create a better future, which "gives a reason for hope" (Slovic, "'We're Doomed'"). This sense of hope may even terminate the Capitalocene, or at least dilute the impacts of its dogmas. Therefore, climate optimism, or a sense of hopefulness, plays an essential role in further climate actions. On the state of hopefulness, Scott Slovic declares,

> we don't really know where the world is heading, and it's actually quite possible that the future is grim—at least from an anthropocentric perspective—and may even entail the extinction of our own species. But it's still better to live in a hopeful, helpful state of mind—to do one's best to make a positive contribution to one's community and to the planet. ("'We're Doomed'")

In *Forty Signs of Rain*, *New York 2140*, and *The Ministry for the Future* Kim Stanley Robinson emphasizes the efficient role of science, technology, politics, and ecological economics as well as collective actions initiated by citizens to address climate change since the unity of these constituents both form and trigger government-sponsored climate actions to transform societies and economies into eco-friendly institutions. Consequently, Robinson's climate optimism is rooted in this idea of unity and transformation, thus his work uncovers that climate change can be mitigated once collective and governmental actions are taken to deal with climate change. Additionally, the results may also reverse the devastating effects of neoliberal capitalism despite common sense that "it is easier to imagine the end of the world than the end of capitalism" (Fisher 1). Still, in Kim Stanley Robinson's optimism, the end of the world, too, does not seem to come easily thanks to the alternative climate policies, economic activities, and advancements in science, technology, and geoengineering. As a result, together with all these units, the climate change crisis can be negotiated as observed in this thesis through selected novels. Optimism, therefore, is a "political position, to be wielded like a club. . . . It's a choice made to insist that things could be better if we worked at it. Gramsci suggested this with his motto, 'Pessimism of the intellect, optimism of the will.'" ("'New York 2140'"). In other words, as suggested by Patrick Murphy, "Earth will remain a mess. In sum, a reader finds increasing pessimism about curbing global warming before disaster, but glimmers of optimism remain that humanity will eventually experience a sufficient catalyst to

assume responsibility for the damage it has done to the biosphere (162). The reason is that the ultimate trigger to claim responsibility grounds in Leopoldian land ethic as Robinson frequently reminds that, "what's good is what's good for the land" (*The Ministry* 166, 502; *New York* 560; *Sixty Days* 72).

In conclusion, this study analyzes the impact of neoliberal capitalism on global climate change to address the necessity of a transition from mainstream economics to ecological economics in Kim Stanley Robinson's selected novels. It is suggested that Kim Stanley Robinson's alternative modes of economics point at Herman Daly's steady-state economy, which enunciates limiting economic growth and resource consumption to keep total resource use within ecological limits. In *Forty Signs of Rain* extreme climate events hinting at further catastrophes are examined to address the destructive impacts of neoliberal policies of the U.S. government and the importance of relying on science and technology in emergency management. In *New York 2140*, a future portrayal of New York City is analyzed to describe how advancements in science, technology, and geoengineering can assist adjustment to climate change yet, an alteration in the current economics is still necessary to establish environmental and socio-economic justice for both living and nonliving beings as well as landscape restoration after catastrophes. In *The Ministry for the Future*, Kim Stanley Robinson's ecological economics-related alternatives are evaluated within the concept of steady-state economy by Herman Daly to underline the fact that a steady-state economy both creates environmental and socio-economic justice by transcending neoliberal capitalism, and functions effectively to decarbonize the current economy while limiting economic growth and its damage on the environment. Herman Daly claims that

> The prevailing obsession with economic growth puts us on the path to ecological collapse, sacrificing the very sustenance of our well-being and survival. To reverse this ominous trajectory, we must transition toward a steady-state economy focused on qualitative development, as opposed to quantitative growth, and the interdependence of the human economy and global ecosphere. ("Economics")

As a result, this thesis examines Kim Stanley Robinson's criticisms of the relationship between climate change and neoliberal capitalist economy in his selected novels. Given

these criticisms, it is claimed that the economic alternatives introduced by the author are based on the ecological economics model, and government-supported steady-state economy practices have an effective role in mitigating the impacts of the climate crisis and dealing with climate change as well as enabling landscape restoration and creating environmental justice.

To sum up, as Kim Stanley Robinson once claimed, “there is no planet B.” (“There is”), and this planet must maintain its health. It is obvious that there is still time to limit the damage, to change habits, revolutionize the economy, and save the Earth. As Robinson claims, “If, however, we change our technologies and our economic system to better match the physical and biological realities of life on Earth, the resulting history could be quite amazing, what some are calling ‘a good Anthropocene’” (“There is”). New technologies can be developed, adjustment to climate change can be achieved, vulnerability against climate crisis can be managed and reduced, and even Mars can be terraformed but there is only one “pale blue dot” (Sagan 27) as home to who we were, are, will ever be. Therefore, with the help of economic reforms, the Capitalocene may come to an end and a better Anthropocene may flourish.

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