1.

Climate Chaos

Mother Earth Under Threat

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CLIMATE CHANGE IS ALREADY UNDER WAY with unpredictable consequences. Evidence of changes to the earth's physical, chemical, and biological processes is obvious everywhere. Greenhouse gas emissions have increased the carbon dioxide concentration in the atmosphere. In the past, half of this carbon was stored in forests, while the other half was removed by oceans. Currently, as a result of global deforestation and warming oceans, oxygen is at its lowest breathable point. According to NASA and the National Oceanic and Atmospheric Administration ("NASA, NOAA Data"), "The planet's average surface temperature has risen about 2.0 degrees Fahrenheit (1.1 degree Celsius) since the late nineteenth century." For example, 2018 was the warmest year on record, smashing records set in, 2017, 2015, and 2014. In January 2017, Badlands National Park tweeted facts about climate change, despite gag orders from President Trump.

- "The pre-industrial concentration of carbon dioxide in the atmosphere was 280 parts per million (ppm). As of December 2016, 404.93 ppm."
- "Today, the amount of carbon dioxide in the atmosphere is higher than at any time in the last 650,000 years."
- "Ocean acidity has increased 30% since the Industrial Revolution."

Ecological degradation is devastating the planet and the earth is becoming increasingly inhospitable with unprecedented weather events. Changing temperatures alter the balance of communities and further degrade vulnerable ecosystems. For instance, as a result of temperatures dropping to –20°C, in Puno, Peru, between July and August 2015, seventeen children died; in addition, around 171,000 alpacas died

from hypothermia, diarrhea, pneumonia, and starvation. The Peruvian government is ill prepared for major crises; consequently, support was late and inadequate (Sanchez). Meanwhile in Canada, as a result of a drier winter combined with an unusually hot, dry air mass over Northern Alberta, the temperature climbed to 32.8°C (91°F) ("Daily Data Report"). Consequently, in May 2016, there were 49 simultaenous wildfires, with one fire in Fort McMurray that ran out of control and destroyed a significant portion of the twon. The wildfire covered an estimated 522,892 hectares, including 2,496 hectares in Saskatchewan. Mandatory evacuation orders were put in place for several towns. Battling fires across the province were 2,794 firefighters and support staff, 147 helicopters, 16 tankers and 233 pieces of heavy equipment ("Final Update"). During the subsequent summer of 2017, hundreds of wildfires spread through the provinces of British Columbia, Manitoba, and Saskatchewan.

Destructive events due to warmer ocean surface temperatures are also taking place. "Researchers were able to document how the dramatic shift in oxygen concentrations was characterized by disturbances in the global carbon cycle" (David). Warmer oceans hold less dissolved gases, including oxygen, which affects marine organisms, particularly mammals. In January 2014, in Peru's Pacific, more than 400 dead dolphins washed ashore (Foley); similarly, in New Zealand, in February 2017, more than 400 whales beached themselves to die ("Farewell Spit"). El Niño, which is a cold, low-salinity ocean current that runs along Ecuador, Peru, and Chile, has been heating and altering weather in all Pacific Rim countries. Each El Niño and La Niña cycle in the past 20 years has occurred with increased frequency and violence. In March 2017, Peru's northern coast's sea surface temperatures rose from 6° to 27° Celsius resulting in intense rain that produced historic flooding and mass destruction in four of the Northern regions (Climate Prediction Centre).

"The largest overall volume of oxygen was lost in the largest ocean—the Pacific—but as a percentage, the decline was sharpest in the Arctic Ocean, a region facing earth's starkest climate change" (Mooney). In the name of progress, a schizophrenic madness fueled by the primacy of industry, is trying to "save" the Arctic with geoengineering. As the Arctic ice is melting, a group of researchers from the University of Arizona are planning to refreeze it using around ten million wind-powered water pumps installed around the region (Martins). Meanwhile, the Canadian High Arctic Research Station (CHARS), a federal research organization, is doing an inventory of the resources contained in the Arctic to provide

permits for mining and oil projects, and thus legalize harm. Glaciers in Antarctica are also being destabilized. The ice shelves in Larcen A, B, and C collapsed in 1995, 2002, and July 2017. "When an ice shelf collapses, the glaciers behind it can accelerate toward the ocean." This has changed the landscape of the Antarctic Peninsula and the level of seawater, promoting the collapse of other vulnerable ice-shelves (Patel). Furthermore, as ice collapses, methane frozen deep underneath the ice is being released into the atmosphere, producing a powerful greenhouse gas with the potential to double global warming. Professor Guy McPherson, from the University of Arizona, sustains that the Artic ice will disappear in 2026, resulting in the end of the grain production as the basis of the "civilized society" ("Methane Unveiled").

> In fact, the erosion of sea ice strikes at the very root of the Arctic ecosystem, for it provides a surface on which algae – the basic material on which the entire food chain in the region depends—can grow. "Algae lingers on the underside of sea ice and as spring begins there is a major increase in its growth," said Brown. "It is then eaten by tiny creatures called zooplankton, and they in turn are eaten by fish that are in turn eaten by seals, which are in turn consumed by polar bears. But if algae levels drop the whole food chain is disrupted." (McKie)

In sum, scientific evidence shows that carbon dioxide emissions in December 2017 surpassed 406.82 particles per million (ppm) in global carbon concentration (the maximum should be 300 ppm), and total methane CH4 (a major hothouse gas) has reached 1865 particles per billion (ppb) (the maximum should be 800) (NOAA). The Mauna Loa Observatory tells us that we are approaching climate catastrophe: the global average temperature is rising, and if another decade of business-as-usual fossil fuel emissions continues, we can reach +2°C, a dangerous warming threshold. Further, in the Arctic and Antarctica high temperatures are snowballing at rates twice the global average. The Artic and Antarctica are critical for climate stability because of the albedo effect, which is the ability of a surface to reflect sunlight. Ice- and snow-covered areas have high albedo, and an ice-covered Arctic reflects solar radiation that would otherwise be absorbed by the oceans and cause the Earth's surface to heat up. As global warming causes these ice- and snow-covered surfaces to melt, they become low-albedo areas, more heat is absorbed and sea levels rise exponentially, threatening island communities and low-lying coastal areas. Global warming is

also destabilizing the polar jet streams, meaning more extreme weather events. Some scientists argue that the northern hemisphere's jet stream had crossed the equator into the southern hemisphere, threatening global food supplies and an "end of winter" (Irfan, Barclay and Sukumar; Adams).

By this time, we all understand that the sun supplies energy that keeps the earth "alive"; at the same time, solar energy is reflected back to outer space, which helps in maintaining a global equilibrium. If this did not occur, the planet would keep getting hotter, destroying all life. Leading scientists have developed an analysis of nine "planetary boundaries" that are crucial to maintaining life on earth. Global warming is one of these. Others include ocean acidification, stratospheric ozone depletion, the nitrogen and the phosphorus cycles, global fresh water use, change in land use, biodiversity loss, atmospheric aerosol loading, and chemical pollution.

In general, climate change is a modification of global climate patterns. Many things can cause the climate to change, such as the earth's changing distance from the sun and oceanic changes when volcanoes erupts. However, most scientists agree that humans can change the climate too (Steffen, Crutzen and McNeill), because civilization is a heat engine, whether we use solar panels or fossil fuels. Currently, there is an overwhelming scientific consensus that global warming and climate change is due to our use of and dependence on fossil fuels. "Burning these things puts gases into the air. The gases cause the air to heat up. This can change the climate of a place. It also can change earth's climate" ("What is Climate Change?").

The response to climate change has been varied. The establishment, through the United Nations, has articulated its response through its publication, *Our Common Future* (1987), which identified three agents of global warming: "poverty, uneven development, and population growth" (Chapter 1). In fact, all of these are products of "economic growth" as it is currently defined and pursued. Yet, the Report offered "sustainable economic growth" as the solution, which means extending markets to Nature! Since the UN adopted this approach at the Earth Summit in 1992, the "survival of the planet" has become the justification for a new wave of intervention, where people and nature become a domain of politics (Sachs). My study, *The "Greening" of Costa Rica: Women, Peasants, Indigenous People and the Remaking of Nature* examines Costa Rica's experimentation in "innovative environmental governance" and reveals the United Nations' initiatives that support "green capitalism." Theirs is not a

war against climate change, but against subsistence in order to expand capital accumulation.

In this chapter, my goal is to understand why climate change is occurring so suddenly that it is shifting the state of the earth's systems. I focus on global warming as a consequence of disproportionate amounts of carbon dioxide (CO_2) in the atmosphere, as well as the economics and military developed by science and technology. First, I discus the reproduction crisis where capitalist commodity production and consumption based on science and technology are attacking humans' and nature's capacities to the point of distorting organic bodies. I explore the materialist ecofeminist perspective on the interlocking oppressions of diverse forms of exploitation of bodies—human and ecosystems. Second, I highlight ecosocialist debates on the fallacies, contradictions, and problems with economic growth-dependence, pointing out how energy used in commodity production (surplus) and consumption (waste) can affect the biospheric balance that has evolved over hundreds of millions of years. Third, I look at the military-industrial complex and its biophysical ramifications. Fourth, I present several perspectives for the way out of climate chaos. I conclude with the demand that the way out must include the equitable participation of women, peasants, and Indigenous people in local and international collective political responses and actions.

ECOFEMINISM ON THE REPRODUCTION CRISIS: ATTACKING PEOPLE'S AND ECOSYSTEMS' ABILITY TO FUNCTION AS ORGANISMS

Ecofeminist theorists in particular have contributed to the analysis of male domination of women and nature. Reproduction became a political category in the 1970s during the rise of the Women's Liberation Movement. In their book, *The Power of Women and the Subversion of the Community,* Maria Rosa Dalla Costa and Selma James argued that "housework" was a precondition to capitalist production since it reproduced labour power and thus enabled the very process of capital accumulation. This reproductive labour was made invisible as work. Unpaid and performed in isolation, reproductive work has undermined women's physical integrity. The wages for housework political program thus demanded state remuneration.

Ecofeminists broadened the scope of feminist theory to include feminized bodies. They illuminated that it has been possible to sustain the illusion that economic growth is a positive and benign process

because the costs have been borne primarily by what has been devalued: women, peasants, Indigenous people, colonized countries, and nature. Maria Mies, Veronika Bennholdt-Thomsen, and Claudia von Werlhof, in *Women: The Last Colony,* describe women's labour as the archetype of global non-wage labour. They also point out how many Third World workers are engaged in non-waged forms of production that are based on family labour. They describe Third World men and women as the "world's housewives," whereby the relationship between husband and wife is repeated in the relationship between the First and the Third Worlds. In this way, they link First and Third World women's labour to patriarchy and imperialism. Silvia Federici, in *Caliban and the Witch: Women, the Body and Primitive Accumulation,* draws a long historical line from the enclosure of the commons and the witch trials in Europe to modern day prostitution and the monetization of nature globally. She theorizes the systematic subjugation and appropriation of women, nature, bodies, and labour. She demonstrates how capitalist social relations are enabled by patriarchal re-arrangements that separate production from reproduction, that use wages to command the labour of both waged and unwaged workers, and that devalue women's status. The criminalization of women's bodies was transposed to the colonies and generalized to all "non-whites." Federici revalorizes the work of reproduction and reconnects our relation with nature, with others, and with our bodies to regain a sense of wholeness in our lives.

Carolyn Merchant's *The Death of Nature* offers an interpretation of the male domination of Western science and industrial progress. In examining the scientific revolution, she made an essential argument that the rise of modern science, technology, and the economies they enabled, was the driving force behind the oppression of women and nature. She also argued that the masculinist takeover of reproduction during the witch-hunts resulted in the triumph of mechanism over organism and the relegation of caring labour to a devalued domestic sphere. In the same line of thinking, Vandana Shiva and Ingunn Moser, in their book *Biopolitics,* demonstrate that for the last 70 years the market economy has been taking control of the sustenance economy through science and technology, in turn attacking people's ability to function ecologically and as organisms embedded in ecosystems. They highlight the fact that the mechanistic paradigm of genetic engineering has reduced all behaviour of biological organisms, including humans, to the level of genes. As a result of this reductionist thinking, genetic engineering exchanges genes between different species and designs new genetic material that have not previously existed. Life on earth

is altered by these techniques, and the novelty contains negative ecological consequences, as knowledge developed under controlled conditions has limited validity in open systems.

Vandana Shiva also argues that food security comes from seed sovereignty. She illustrates further the assault on people and nature by genetic engineering. Shiva demonstrates that after World War II, particularly since the Green Revolution in the 1960s, chemicals used for warfare are now being used in agriculture as pesticides and herbicides. The industrial paradigm of agriculture that uses genetic engineering is centralized in large monoculture farms that exacerbate the rise of CO_2, displacing diversity to produce commodities oriented toward corporate control. The objective is to make the farmers pay for seed, soil, and climate data. Shiva exposes several myths of genetically modified organisms (GMO) including the myths that:

- "GMO are an 'invention' of corporations, and therefore can be patented and owned." In this way, it denies the innate self-organizing and self-reproducing capacity of living organisms, and it makes saving and sharing seeds among farmers illegal. As a result, the "industry is appropriating millions of years of 'nature's evolution', and thousands of years of farmers breeding." (xi-xii)
- "Genetic engineering is more accurate and precise than conventional breeding." Genetic engineering introduces genes from unrelated species into plants. Because it is not known that it will work, "GMO uses antibiotic-resistance genes that can mix with bacteria in the human gut and aggravate the crisis of antibiotic resistance we are currently facing." (xii)

Discussing the consequences of genetic engineering for humankind, Stephanie Seneff argues that chemicals used by the American agrochemical and agricultural biotechnology corporation, Monsanto, such as the herbicide Roundup, are implicated in new epidemics that are destroying people's bodies. Seneff shows that the autism epidemic today is a result of exposure to environmental toxicants, in particular to glyphosate (an active ingredient in Roundup). She explains that:

> the incidence of autism has risen alarmingly over the past two decades in the United States, exactly in step with the increased use of Roundup as an herbicide on corn and soy crops. While the autism rate was estimated to be 1 in 10,000 in 1970, the

> most recent number from the Centers for Disease Control and Prevention (CDC) was 1 in 68 for twelve-year-olds in 2014. This number reflects the age group who were born in 2002—the number would surely be much worse for children born today. (77)

Seneff concludes that glyphosate used on corn and soy:

> chelate the mineral manganese … [and] other minerals, including iron, zinc, cobalt and magnesium, making them unavailable to the plants, and therefore making the plants deficient in these minerals. People who eat the plants would also become deficient.… Mineral deficiencies are the key source of many of the ailments facing humans in the modern world. (81)

Considering the results of genetic engineering in nature, my study on the Kyoto Protocol shows that genetically-modified trees, planted to sell carbon credits, are implicated in forest ecosystem destruction, in particular in its inability to regenerate secondary forests, which conserve biodiversity and regulate hydrology. In the carbon credit framework, forests are recategorized as "natural capital" and communities that used to live in the forest are declared enemies of the rainforest. The Costa Rican government, through its Ministry of Environment and Energy (MINAE), assesses the ability of large-scale agriculture entrepreneurs, in association with international capital, to sell carbon credits. They promote genetically-modified forest species of high yield and great market value, such as gmelina (*Gmelina arborea*), eucalyptus (*Eucalyptus deglupta*) and teak (*Tectona grand*), trees that are native to South Asia and Australia. Mono-arboriculture has been defined in this system as "reforestation" even though these plantations constitute artificial ecosystems that use massive amounts of chemicals to growth and increase the levels of CO_2 emitted into the atmosphere. As a result, these trees are susceptible to fire, pests, and disease. Further exposing the myth that these projects are about "reforestation," corporations are allowed to cut the trees down after fifteen years of growth and transform them into wood for floors or paper, boxes for fruit export, and for making furniture.

The monoculture of tree species has become a time bomb for biodiversity in Costa Rica. For instance, teak plantations have resulted in the erosion of flatlands, since the teak root system grows deep into the soil, but in the rainforest, the systems of nutrient and water absorption

are at the surface. In general, nutrients and water are concentrated at a depth of between 70 and 100 centimetres. Consequently, teak trees are encircled by flaked soil. In addition, when it rains, the large-sized leaf accumulates great amounts of water that then pours violently onto the soil below. Water descending onto the soft surface destroys the soil. The far-reaching spread of the roots and the shade produced by the teak leaves obstruct the vegetative growth on the lower layers of the forest, which could otherwise prevent soil damage from the violent cascades. Under these trees, food for healthy bacteria, viruses, and people has disappeared. In contrast, the trees that are indigenous to the area are connected directly to each other through the multitude of creatures that relate to them as food, shelter, and nesting places; through their shared access to water, air, and sunlight; and through an underground system of fungi that links all the trees as a super-organism. By planting genetically-modified homogeneous forests, the Costa Rican rain forest ecosystems have been converted into sterile monocultures.

In summary, ecofeminists (Isla; Federici; Merchant; Mies and Bennholdt-Thomsen; Seneff; Shiva and Moser) have for years pointed out that the political economy of science and technology applied to commodity production and consumption is distorting the human and natural bodies of the planet. Next, this chapter discusses the political economy of the ecological crisis to explain climate change as a result of CO_2 increase. It looks at how the practices of commodity production and consumption combine with the physics, chemistry, and biology of our world. Ecosocialists (Altvater; Deleage; Malm) argue that in bioeconomic terms, every economic process must be seen from the point of the principles of thermodynamics, insisting that these principles apply both to natural systems as well as to social systems. Economic activity does not escape the laws of physics, and living beings are also subject to entropy.

ECOSOCIALISTS ON THE ECOLOGICAL CRISES ENGENDERED BY COMMODITY PRODUCTION (SURPLUS) AND CONSUMPTION (WASTE)

Industrial civilization in itself is a heat engine. Empirical analysis as well as historical data confirms the existence of a close connection between the quantities of fossil energy consumed, the state of wage work activity, and overall economic output. Growing primary material consumption affects the climate mainly because of the large amounts of energy involved in extraction, use, transport, and disposal, all of which create pollution.

Jean-Paul Deleage argues that the planet is being destroyed by the functioning of production and consumption begun a long time ago, accelerated by the capitalist system, and in particular by capital globalization and its military-industrial complex. He argues that capitalism has always treated nature as unlimited, therefore it has accelerated the entropic irreversibility of the planet. He sustains that in "bioeconomic terms, the extraction of raw materials and their elimination in the form of waste constitute the first and last phase of all economic activity" (39). Consequently, social and ecological problems are twofold: 1) they arise at the beginning of production, the first phase of all economic activity, when the raw materials are extracted and consumed; and 2) at the end when they are unloaded in the environment in the form of waste, the last phase of all economic activity.

Andreas Malm argues that the historical homeland of global warming is England. The British access to colonies and the textile factory system based on water power produced unprecedented quantities of commodities. However, everything changed when the handicraft worker was replaced by an engine as the central power of the factory. The engine required constant attachment to energy. Coal as a source of energy, with high carbon content as the mechanical prime mover, fostered the industrial revolution. The release of methane from fossil fuels increased entropy to threatening levels. Andreas Malm argues that "[W]ith coal placed right under the driving fire of capital accumulation, as the fuel transmitting motion to the labour process, a spiral of growing fossil fuel combustion was, for the first time, integrated into the spiraling growth of commodity production" (292). He associates "fossil capital" with the burning of fossil fuels (the main source of human-induced climate change) and capitalism's development of industrial production.

Following Marx's general formula of capital, Malm writes that the general formula of fossil capital is as follows:

> M – C (labour + Means of Production (F))… P (CO_2)…C' – M'
> M = Money as capital;
> C = Capital buys commodities (labour + raw material + machinery) including F (energy or fossil fuel);
> P = Production burns fossil energy and dissipates carbon dioxide;
> C' = Final Commodity;
> M' = Increased money as capital; i.e., profit.

Malm argues that:

> …fossil fuels are now subject to productive consumption…the combustion of fossil fuels in their solid form and the consequent release of CO_2 do not in themselves generate any value for the capitalist, but they are material requirements for value creation (profits)…. But fossil capital is also a process. It is an endless flow of successive valorizations of value, at every stage claiming a larger body of fossil energy to burn. (289, 290)

The growth of fossil fuels in commodity production has fed on a succession of disruptions of ancient local and regional ecological balances. For instance, by 1952, London was affected by severe air-pollution arising from the use of coal (Davis, Bell and Fletcher).

Elmer Altvater found major sources of contradiction in the functioning of capitalism through identifying the natural process of time and space, described as "ecological modality," as well as the attempt by capital to codify and control time and space with the aim of speeding up the process of capital accumulation, defined as "economic modality." He argues that two different modalities of space and time conflict upon a territorial-social reality, as biological time and reproduction are slower than economic time or commodity production. As capitalism is a system that only understands value in terms of money capital, the perpetual drive toward short-time, or "t" (economic time) accumulation, is in direct conflict with the ecological limits of "T" (historical time) that allow and provide for life on this planet. By applying the principles of entropy in the use of energy in production and consumption where no transformation of energy or matter is perfectly efficient, Altvater concludes that recycling is thermodynamically impossible, thus energy and raw materials are used only once. As a result of this ecological and economic conflict, the extinction rate has accelerated since the escalation and spread of industrial capitalist development, and has created the sixth mass extinction of biodiversity event currently under way that eliminates at least 150 species a day. Gerardo Ceballos, Paul Ehrlich, and Rodolfo Dirzo "indicate that beyond global species extinctions Earth is experiencing a huge episode of population declines and extirpations, which will have negative cascading consequences on ecosystem functioning and services vital to sustaining civilization.… [W]e emphasize that the sixth mass extinction is already here" (7).

The next section argues that climate change could not have increased as fast as it did in the last 70 years without the military-industrial complex's dominance, which has been undertaking counter-insurgency

warfare (Pursell), terrorizing populations (Castaneda), repressing internal dissent (Dahi), and destroying the atmospheric layer (Bertell *Planet Earth*).

THE MILITARY-INDUSTRIAL COMPLEX AND ITS BIOPHYSICAL RAMIFICATIONS

Indicating contempt for the value of life, the ruthless worldwide expansion of neo-colonial and neo-liberal capitalist politics was organized with the support of the military-industrial complex. It is defined by Carroll Pursell as:

> an informal and changing coalition of groups with vested psychological, moral, and material interest in the continuous development and maintenance of high levels of weaponry, in preservation of colonial markets and in military-strategic conceptions of international affairs. The groups include … congressmen, labor leaders, corporation executives, church spokesmen, university professors, and professional soldiers…. At the center of the complex … is the unique relationship between the Pentagon as buyer and the war industries as seller. (ix)

Pursell shows that after WWII, a decision was made to fit the war program into the existing economic structure to support trade. "A peaceful world secure for trade was henceforth to be guaranteed by a standing military establishment backed up by a war economy prepared to offer massive support to foreign interventions" (7). Since the 1960s, the military-industrial complex has been key to the new imperialism as it enhances the war-making capability of the U.S. and it dominates people and nature. "This increases the likelihood of recourse to 'solutions' based upon military power" (Melman 290). Currently, global capital, led by the United States, and through war, has seized oil from Iraq and Libya in the Middle East, and minerals from Afghanistan.

The biophysical ramifications of capitalist military[1] alienation is discussed by Rosalie Bertell (*Planet Earth; No Immediate Danger*). Bertell's *No Immediate Danger: Prognosis for a Radioactive Earth* critiques war and the nuclear industry of the military-industrial complex that starts in the research lab but ends in the atmosphere. She maintains that during the Cold War, the UK, the U.S., France, and the Soviets explored the atmosphere with war intentions. Bertell provides evidence

of the U.S. nuclear atmospheric testing in the Pacific Ocean since 1946. In ten years, the U.S. set off more than 86 nuclear bombs, and since 1983 have also fired missiles in the Marshall Islands of Micronesia (Pacific Ocean). She also details that between 1966 and 1974, France's Centre d'Expérimentation du Pacifique detonated seven nuclear tests in the Pacific Ocean. She argues that as a result of these nuclear bombs, the magnetic field of the earth, the Van Allen Belts,[2] which protect the earth from destructive solar wind charged particles, has been damaged. Disturbance in the electromagnetic field may also explain the current contamination and reduced oxygen levels of the Pacific Ocean that now is disgorging dead mammals (see my introduction). She describes that in 1974, Peru denounced the radiation fallout at the United Nations and broke diplomatic relations with France because the tests poisoned its fisheries and citizens. Since then, "El Niño" or the Humboldt Current, which is a cold, low-salinity ocean current that runs along Ecuador, Peru and Chile, has been heating and altering weather in all Pacific Rim countries, affecting Australia, New Zealand, and Fiji (Bertell 102).

Furthermore, in *Planet Earth: The Latest Weapon of War,* Bertell argues that the "U.S. military's aim of dominance extends to atmospheric heating" (125) in the ionosphere, and that it is experimenting with weather and climate manipulation that distorts the organic bodies. After WWII, the military researched and applied atmospheric modifications with chemicals introduced in the atmosphere, and its manipulation could create rain, and direct hurricanes, tornados, and monsoons. Lowell Ponte, in *The Cooling: Has the Next Ice Age Already Begun,* provides evidence that weather modification started during the Vietnam War, when the U.S. investigated ways of using artificial lightning as a weapon in Project Skyfire and hurricanes in Project Stormfury. The military also investigated the possibility of destroying the ozone layer over North Vietnam with lasers or chemicals, causing damage to crops and humans. Bertell adds that "[t]wenty million gallons (of Agent Orange) were sprayed over 10 per cent of Vietnam, reducing dense jungles and mangrove forests to barren wasteland. Many children in the polluted areas were born with learning difficulties or severe impairments" (Bertell *Planet Earth* 158).

Bertell also demonstrates that the military researched and applied atmospheric modifications with waves, heat, or electromagnetic force introduced in the upper atmosphere, to interrupt or distort the normal wave motions. Bertell uncovers a military network of ionospheric heaters, The High-Frequency Active Auroral Research Program (HAARP), that fires electromagnetic waves that can seriously damage the

ecosystem, particularly the Artic. HAARP modifies the ionosphere for a military dominance agenda. Its prime goal is the manipulation of the atmospheric electrojet as a weapon, capable of redirecting significant amounts of electromagnetic energy toward the enemy; its additional usage is for the generation of low-frequency waves for communication, such as radio, Internet, cell phones, satellite television, and submarines. HAARP's massive transmitters produce incisions in the ionosphere that are repaired naturally by the sun. However, Bertell states that these man-made incisions "may destabilize a system that has maintained its own cycle for millions of years" (*Planet Earth* 123). She presents the Federal Environmental Impact Statement filed by the air force for HAARP that its transmissions "can raise the internal body temperature of nearby people, ignite road flares in the trunks of cars, detonate aerial munitions used in electronic fuses and scramble aircraft communications, navigation and flight control systems" (*Planet Earth* 126). HAARP low-frequency waves, which are reflected back to the earth by the ionosphere, create vibrations at great distances through the earth. This could be used to induce effects such as earthquakes (Bertell *Planet Earth* 130) as well as generate direct weather effects. Around HAARP there are other military networks, such as SuperDARNS that monitors ionospheric heaters in the lower atmosphere; and GWEN (Ground Wave Emergency Network) a storm making system and also weapon and drone guiding system.

Furthermore, Bertell found that since the 1990s, the U.S. and its allies deliberately polluted the environment as a strategy of war in Kosovo and Iraq to test the newest military weapons based on depleted uranium (DU) ordnance (*Planet Earth* 28). In the Kosovo war, NATO used DU bombs and missiles. When fired, DU burns at over 3000 degrees Celsius and becomes uranium aerosol containing microscopic radioactive particles that contaminate all life (land, air and water) and continue to harm long after the end of the war. The dependence of the powers on Gulf oil caused NATO to drop 88,000 tons of explosives (seven times the force of the Hiroshima bomb) on Iraq. The U.S. used "heat weapons" with solar energy to burn the country. Between the U.S. military attacks and Iraqi forces, tankers, pipelines, oil wells, refineries, and storage tanks were destroyed. Bertell reported that enormous clouds of toxic smoke from millions of barrels going up in flames each day, and at least 40 tons of radioactive dust on the battlefield of Kuwait and Iraq (*Planet Earth* 36) impacted the atmosphere, and produced fierce storms, typhoons, flooding, and acid rain all over that part of the world. Bertell's prognosis is that the military is preparing for a weather war that will lead to warlike conditions on our planet and militarization

on a global scale. Further, "weaponization" of all our life conditions through weather manipulation has also been confirmed by the Action Group on Erosion, Technology and Concentration (ETC Group).

The productivist economy of the colonizers and settlers proposes to take control of the global thermostat, this time through "civil" geoengineering. According to ETC group "civil" geoengineering is a technological approach involving intentional large-scale intervention in the earth's oceans, soils and/or atmosphere to "reduce CO_2." It can refer to a wide range of schemes that are already a reality without public notification, including: blasting sulphate particles into the stratosphere to reflect the sun's rays; dumping iron particles in the oceans to nurture CO_2 absorbing plankton; firing silver iodide into clouds to produce rain and genetically engineering crops so their foliage can better reflect sunlight (ETC Group). For example,

> [O]n April 15, 2017, the largest mainstream geoengineering program to date officially kicked off at Harvard University. The program has raised over $7 million so far, aiming for $20 million over 7 years. It will include a field test phase in which scientists will spray tiny, highly reflective particles at altitudes of greater than 7 miles above the Arizona desert, in order to test the efficacy of one of the most widely-known geoengineering methods, called solar radiation management. (Freedman)

Actors leading the advance geoengineering are the military, universities, the United Kingdom's Royal Society, and the U.S. National Academy of Sciences, joined by Canada, Germany and Russia (Freedman). Geoengineering continues despite the fact that the U.S. National Academy of Sciences has said "Geoengineering is not a viable response" (Hamilton).

What an organism (human animals and non-human animals) needs to survive is a habitat that nurtures and protects life. In the next section, I present a way out of climate chaos that demands and includes the voices of those who have been silenced.

THE WAY OUT OF CLIMATE CHAOS FROM THREE PERSPECTIVES: ECOCENTRIC, SUBSISTENCE, AND PACHAMAMA

The claim of the three perspectives presented here is that "we need to move out of the commodity production frame as well as from patriarchy" (Mies and Bennholdt-Thomsen; Salleh *Global Alternatives,*

"Eco-Sufficiency; Basadre; Marañon-Pimentel; Kovel) to see the way out of climate chaos in order to ensure the survival of the planet and all its living systems. Joel Kovel, in *The Enemy of Nature*, suggests a restructuring of society based on an ecocentric mode of production that includes a new value theory, which he calls intrinsic values. He argues on the need to free use-value from exchange-value and open up the appropriation of intrinsic value to build ecosystem integrity; that is, to change property relations so that the earth, viewed as the source of all use-values and all ecosystems, is appropriated by "associated producers." He says that *prefiguration*, understood as a way to organize society, "is intrinsic to ecological production, rendering the *provisioning* of ecofeminism as the *previsioning* of a Utopian moment" (218). He leans on Indigenous cosmovision and ecofeminist provisioning to direct the way out of the ecological and social crises.

The ecofeminist subsistence perspective sees local subsistence economies as alternative models of social, economic, gender, and ecological justice. For example, Maria Mies and Veronika Bennholdt-Thomsen propose a subsistence perspective that is based on production that includes all work expended in the creation and maintenance of immediate life and which has no other purpose. They present this subsistence perspective as a form of resistance against the effects of global capitalism and colonialism. Subsistence producers all over the world—the majority of whom are women and/or feminized—should be seen as experts who can lead the way to recovering autonomous ways of living, starting from territorial and bodily autonomy, food security in small farms and energy efficiency. Ariel Salleh (*Global Alternatives*) developed the concept of meta-industrial workers—understood as the unpaid or poorly paid members of households, peasants, and Indigenous peoples—with the unique capacity for *provisioning*, meaning that their labour satisfies their ecological and cultural needs. The notion of meta-industrial labour as a regenerative and metabolic fit provides the critical mass for change that sustain metabolic relations with nature, and is interconnected and politically inclusive. The meta-industrial workers reproduce labour power, biological infrastructure for all economic systems and lay knowledge. Moreover, Salleh ("Eco-Sufficiency") maintains that the socio-cultural economy (the sustenance economy) is an eco-sufficient sphere of regenerative labour and use value, and is more important for economics than the sphere of production for exchange (300).

Within the anticolonial perspective, Pachamama is the Andean way of unifying terrestrial ecosystems and the living things that inhabit

them (Basadre). Pacha is universe, world, time, place, while Mama is mother; in this way, the term translates as "Mother Earth." During 500 years of oppression, communities in the Andes resisted and survived by their precise and detailed knowledge of the history, language, culture, vegetation, mountains, and other physical and socio-cultural attributes of the region. In times of heightened risk and uncertainty, they are falling back on tested and familiar methods of mutual aid, where community denotes a sense of shared ownership, and production is for satisfaction and pleasure. Boris Marañon-Pimentel argues that in the Andean peoples' cosmovision, everything is related and everything depends on a fair balance, "good living," or "*Buen Vivir.*" Their perception of solidarity, reciprocity, and collective labour is so strong that Indigenous peoples in Peru, Bolivia, and Ecuador return to the commons as *Buen Vivir* every time they are able to do so. For instance, the government of Peru has re-established in many places the institutions of the commons, such as Ronderos in Cajamarca. The commons idea has been established in the Constitution of Ecuador (2008), which is expressed as *Buen Vivir* or *Sumak Kawsay* in Kichwa, while in the Constitution of Bolivia (2009), it is invoked as *Vivir Bien, Sum Qamaña* in Aymara, and *Ñande Reko* in Guaraní. In the construction of *Buen Vivir,* the errors and limitations of so-called development are visualized, its fundamental bases anchored in the idea of progress are questioned, and at the same time the doors are opened to alternative options. *El Buen Vivir* disseminates a spirit oriented to decolonize our own thoughts and to break the chains that have for so long subordinated Indigenous knowledge. Currently, Indigenous peoples are able to foresee possibilities to reverse dispossession and enclosure, having been empowered by the rebellions of Movimento dos Trabalhadores Rurais Sem Terra in Brazil; the Zapatistas in Mexico; Los Derechos de la Madre Tierra in Ecuador; Vivir Bien in Bolivia; Conga No Va! in Peru; Berta Caceres Vive in Honduras; Idle No More in Canada; and the Water Protectors in the U.S. These movements have been creating spaces in which the voices and histories of people deeply impacted by climate chaos can been heard.

CONCLUSION

The crises described in this chapter are fruits of patriarchal-capital's economic rationality that has concentrated on increasing wealth and political power while ignoring the finiteness of resources and the decline of Planet Earth, and the oppression and exploitation of feminized labour and bodies. As capital's accumulation system has now

expanded its operations to embrace the entire planet, it has disrupted the biogeochemical processes of the Earth itself, expressed most dramatically in the form of climate chaos. The way out must include all the voices that have traditionally been silenced: women, peasants, Indigenous people, and people living in colonized countries. The only solution climate chaos today is a broad-based social and ecological revolution in which we all mobilize together to protect the future of humanity and our home, the Earth.

ENDNOTES

[1]The "invisible hand" of the market has been expanded on a global scale by tU.S. militarization. David Vine describes the U.S. as a military-base nation that extends militarization around the world. According to the Pentagon, there are now around 800 U.S. "base sites" in around 80 countries: 174 in Germany, 113 in Japan, and 83 in South Korea. Bases are also in Aruba and Australia, Bahrain and Bulgaria, Colombia, Kenya, and Qatar, among many other places. In addition, "there are U.S. troops or other military personnel in about 160 foreign countries and territories, including small numbers of marines guarding embassies and larger deployments of trainers and advisors like the roughly 3,500 now working with the Iraqi Army. And don't forget the Navy's 11 aircraft carriers. Each should be considered a kind of floating base, or as the Navy tellingly refers to them, "four and a half acres of sovereign U.S. territory." Finally, above the seas, one finds a growing military presence in space" (Vine).

[2]The Van Allen Belts are two energy fields that surround the earth: The interior one, between 1,000 and 5,000 kilometres of land surface, and the exterior one, between 15,000 and 20,000 kilometres of surface. They begin about 1,000 kilometres above the Earth's surface and are subject to sun radiation that influences their expansion and contraction.

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