CREATION CARE CORNER- VOLUME 1 - ISSUE #1
SAN ANTONIO MENNONITE CHURCH- JOSEPH L. COOK

CLIMATE CHANGE AND ECOLOGICAL SPIRITUALITY

Chief Seattle- All things share the same breath – the beast, the tree, the man. The air shares its spirit with all the life it supports.

Human impacts on the earth get heavier and deeper with every passing day. Our species spews forth climate changing gases in ever growing amounts and the planet responds with increasing warmth, decreasing Arctic sea ice extent, warmer oceans and rising sea levels as some of the effects of a warming earth. John Stanley and David Loy stated, "Climate chaos represents an enormous threat to a host of human rights; the right to food, water and sanitation, to social and economic development (page 43, Spiritual Ecology- The Cry of the Earth, Editor- Llewellyn Vaughan-Lee The Golden Sufi Center, 2014).

We are experiencing not only an environmental crisis where the human person still in too many ways sees that we can dominate nature with too little concern for our actions impacts on our long term survival and habitation on planet earth. In this paper, I will explore how we got where we are at with climate change. I will limit my discussion to that of climate change, although there are many other ecological and environmental challenges we face as a species. I will explore what causes climate change (greenhouse gases), what the effects are of climate change, and how the world in the 2015 Paris Climate Agreement responded to the challenge of climate change and if the agreement is of timely and sufficient response to the climate crisis.

Climate change is not only an environmental issue but a spiritual issue as seen in Pope Francis's *Laudato Si'.* The United States Presidential Climate Change Advisor – James Gustave Speth said "I used to think that top environmental problems were biodiversity loss, ecosystem collapse, and climate change, I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a spiritual transformation" (see: Daniel Crockett, "Connection will be the next big human trend", Huffington Post, 22 August 2014). In light of Pope Francis's *Laudato Si'*, and the statement by James Gustave Speth I will explore the spiritual dimensions and creation care for climate change and in this exploration will use the writings of Thomas Berry in – a Cultural Historian in particular.

GREENHOUSE GASES CAUSING CLIMATE CHANGE

Psalm 19:1- The heavens declare the glory of God; the skies proclaim the work of his hands

Earths atmosphere (Table 1) has evolved to promote life. Too much carbon dioxide and the planet would be too hot and too little carbon dioxide and the planet would be too cold. Carbon dioxide is a small component of the overall atmospheric gases at around only 0.40 percent (%) of the total atmosphere- which equates to 400 parts per million (ppm). This level today is higher then what it historically was at around 280 ppm- or 0.28%. During the ice ages the level of carbon dioxide would go as low as 120 ppm but then rebound over time to warm the world again as it went up to around 280 ppm.

GASES IN EARTHS ATMOSPHERE	PERCENTAGE	GHG
Nitrogen	78.08%	No
Oxygen	20.95%	No
Water	0-4%	Yes
Argon	0.93%	No
Carbon Dioxide	0.40%	Yes
Neon	0.0018%	No
Helium	0.0005%	No
Methane	0.00017%	Yes
Hydrogen	0.00005%	No
Nitrous Oxide	0.00003%	Yes
Ozone	0.000004%	Yes

TABLE 1: ATMOSPHERIC GASES ON PLANET EARTH

Carbon dioxide is just one of several greenhouse gases (Table 2) but since it is persistent in the atmosphere as well as more abundant then the other greenhouse gases, it is the greenhouse gas of most concern- although others such as methane and nitrous oxides also can contribute to climate change and planetary warming. The statement that carbon dioxide lasts in the atmosphere for up to 200 years is an average duration for today's pulses of carbon dioxide being emitted but up to 20% of the carbon dioxide now being emitted will be in the atmosphere for tens of thousands of years (Yale Climate Connections, Zeke Hausfather, December 12, 2010).

Overview of Greenhouse Gases

Greenhouse Gas	Global Warming Potential (GWP) (over 100 years)	% of Total GHG Emissions (2010) and Life Expectancy in Atmosphere (years)
Carbon dioxide (CO_2)	1	76% (200 years)
Methane (CH_4)	25	16% (12 Years)
Nitrous oxide (N_2O)	298	6% (114 years)
Hydrofluorocarbons (HFCs) (refrigerants- to be phased out by 2013 agreement by G-20 nations)	124-14,800	< 2% (264 years)
Perfluorocarbons (PFCs) (major emission aluminium industry, minor semi-conductor production)	7,390-12,200	< 2% (1000s of years)
Sulphur hexafluoride (SF_6) (mainly electric industry as dielectric medium)	22,800	< 2% (3200)
Nitrogen trifluoride (NF_3) (plasma etching of silicon wafers, flat panel displays, thin film solar)	17,200	< 2% (740 years)

TABLE 2: GREENHOUSE GASES IN EARTHS ATMOSPHERE

The reason carbon dioxide warms the atmosphere is because it traps the infrared radiation that is radiated back into space from the earth's surface. Without this greenhouse gas effect the planet would be too cold to support life. But while a little greenhouse gas is good too much is bad since as levels rise temperatures will also rise because of the amplified effect of more carbon dioxide trapping more infra-red radiation and the greater the amount of radiation trapped the higher the earths temperatures.

Life on earth evolved in this delicate balance of carbon dioxide flux- during the ice ages as the climate cooled life struggled but yet survived but todays steady rise of carbon dioxide levels is causing arctic sea ice to recede and global temperatures to rise.

Enhanced greenhouse effect: an increase of carbon dioxide, methane, and nitrous oxides from human activities into the air traps more heat and raises the temperatures of the Earth's surface

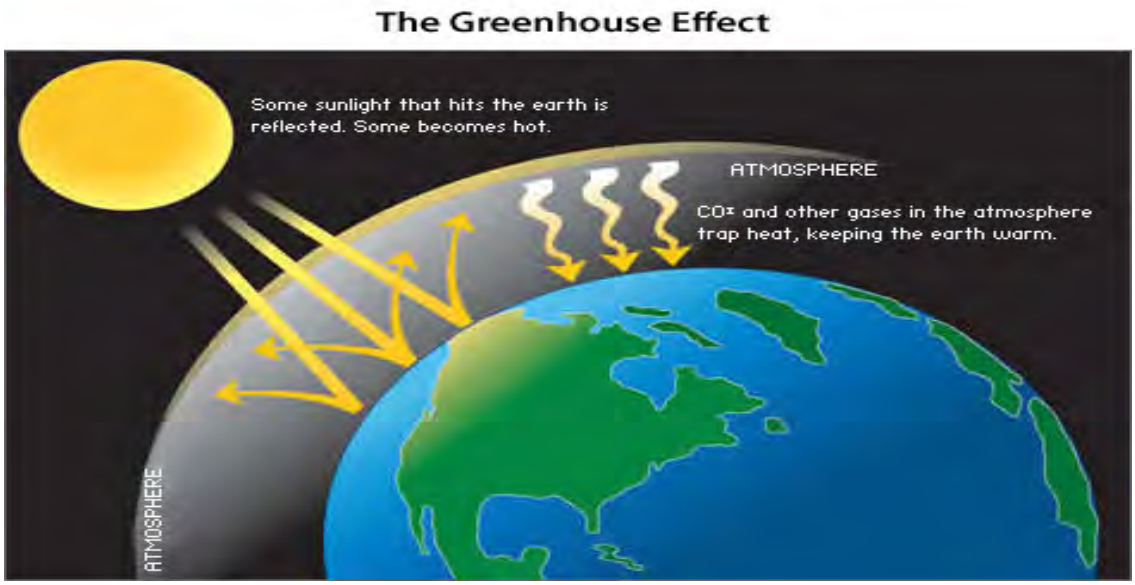

FIGURE 1: THE GREENHOUSE EFFECT

WHERE GREENHOUSE GASES ARE GENERATED

JacquesYves Cousteau – Water and air, the two essential fluids on which all life depends, have become global garbage cans

Greenhouse gases are primarily generated by the burning of fossil fuels whether that burning occurs to generate electricity through coal, oil or natural gas or for transportation using cars and trucks, trains, aircraft, ships or other modes of transport that uses gasoline, diesel fuel or electricity. All fossil fuels release carbon dioxide when burned (Table 3). The fuel of choice for generating energy worldwide continues to be coal (Figure 2). Despite promises by many nations to the effects of climate change on global warming the projection is that coal will continue to be a major fuel for energy generation. In fact, coal-burning plants continue to be built in many nations and consumption of coal will continue well into the future.

The number of motor vehicles worldwide has exploded over the last 25 years. Everyone when they are wealthy enough wants to own a motor vehicle and as countries become wealthier the number of all vehicles increases over time. Cities and countries struggle to build more roads, to handle increased bus, car and truck traffic and numerous transportation plans are written each year to project transportation needs and how to meet these needs into the future.

Energy Equivalents of Coal, Oil and Natural Gas and Carbon Dioxide Emission in pounds of Carbon Dioxide (CO2)
1. http://www.eia.gov/tools/faqs/faq.cfm?id=667&t=6

	COAL	OIL	Natural Gas
Energy Equivalents of different energy sources (See reference #1)	1 Short Ton (2000 pounds of Coal)	3.30 Barrels of Oil	18,901 cubic feet of Natural Gas
CO2 Emission for the Fuel	5,720 pounds of CO2	3148 pounds of CO2 (55% emissions of Coal)	2306 pounds of CO2 (40% emissions of Coal???)

TABLE 3- CARBON DIOXIDE EMITTED BY VARIOUS FOSSIL FUELS

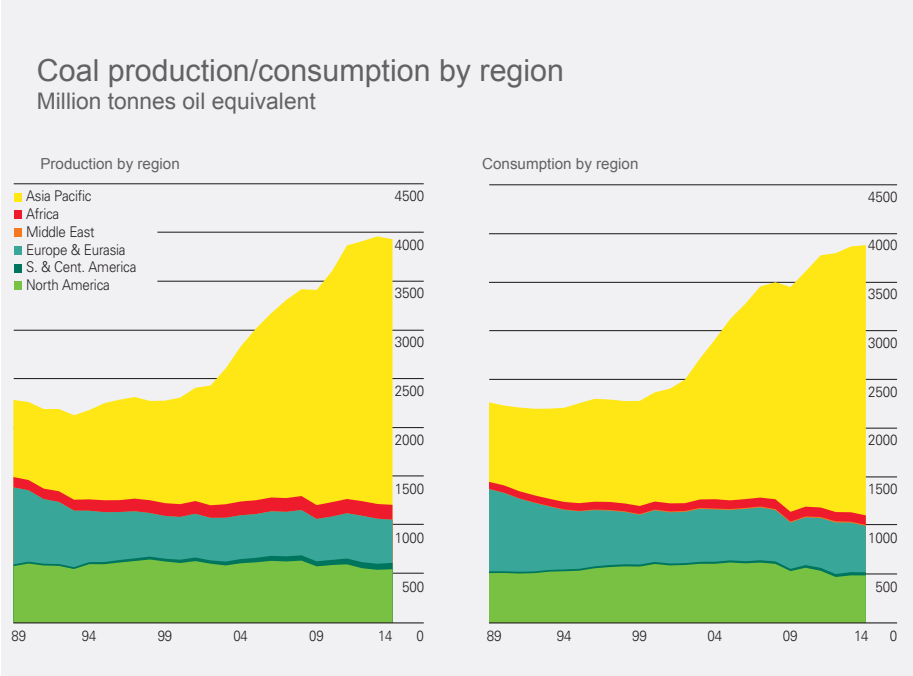

FIGURE 2- COAL PRODUCTION AND CONSUMPTION

Year	Number of Vehicle Worldwide
1960	126,888,000
1970	246,378,000
1980	410,982,000
1990	582,982,000
2000	751,830,000
2010	1,032,982,000
2011	1,099,159,000
2012	1,114,558,000
2013	1,183,212,000
2035	Projected 2,000,000,000

TABLE 4- NUMBER OF VEHICLES WORLDWIDE OVER TIME

The problem with ever increasing carbon dioxide emissions into the atmosphere is the potential triggering of runaway global warming caused by feedback loops that may occur if trapped carbon dioxide is released in arctic regions from permafrost.

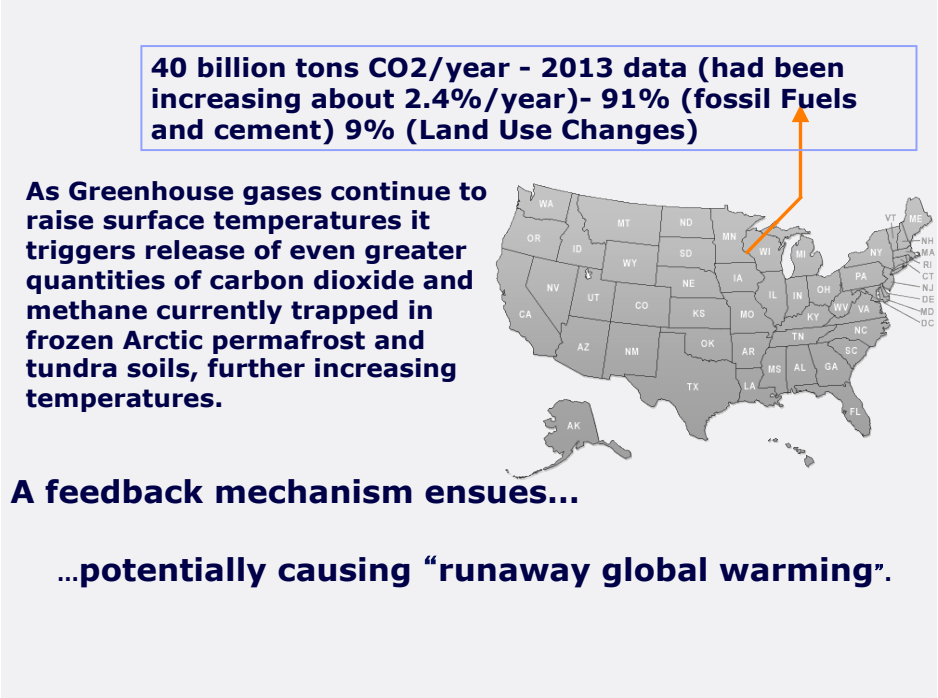

FIGURE 3- POTENTIAL FEEDBACK LOOPS AND GLOBAL WARMIN

EFFECTS OF GREENHOUSE GASES

Revelations 9:2- He opened the bottomless pit and smoke went up out of the pit, like the smoke of a great furnace, and the sun and the air were darkened by the smoke of the pit.

The release of carbon dioxide into the atmosphere has resulted in ever increasing measurements of carbon dioxide in the atmosphere. Earth Systems Research Laboratories like the one at Mount Mauna Loa in Hawaii have measured this increase of CO2 in the atmosphere (Figure 4). Historically the level of carbon dioxide in the atmosphere was no higher then about 280 parts per million (ppm) but since the late 1800s the level of carbon dioxide has increased over time. What is disturbing is that in the past few years the rate of increase in carbon dioxide has accelerated to over 3-4 ppm/year.

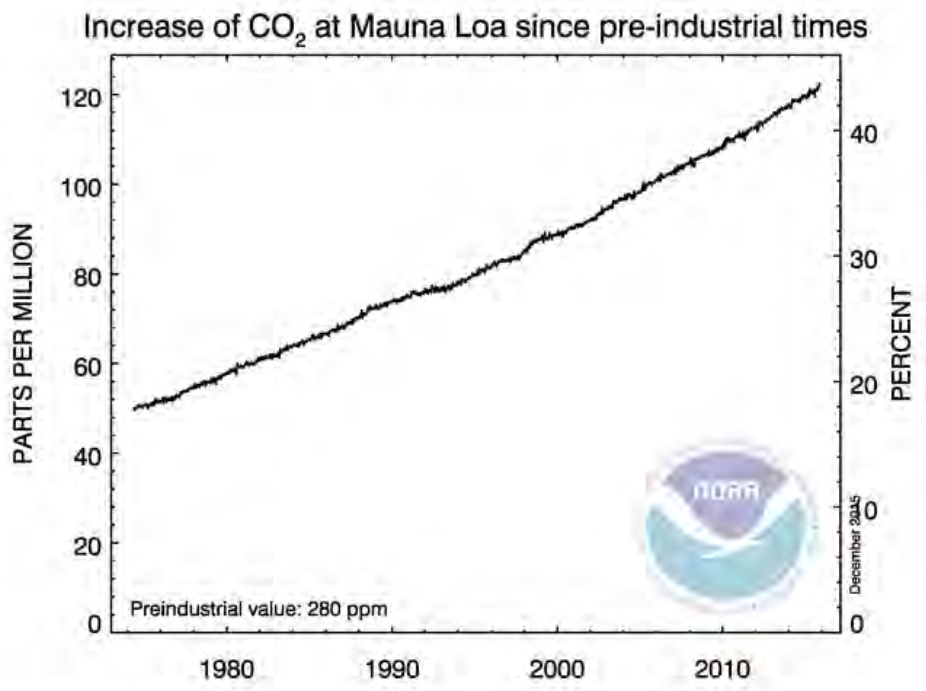

FIGURE 4- INCREASE OF CARBON DIXIDE OVER TIME AT MOUNT MAUNA LOA

Like carbon dioxide, methane gas has been increasing in the atmosphere (Figure 5). Methane is not as plentiful as carbon dioxide in the atmosphere and is not as persistent but is a much more effective greenhouse gas then carbon dioxide (Table 2).

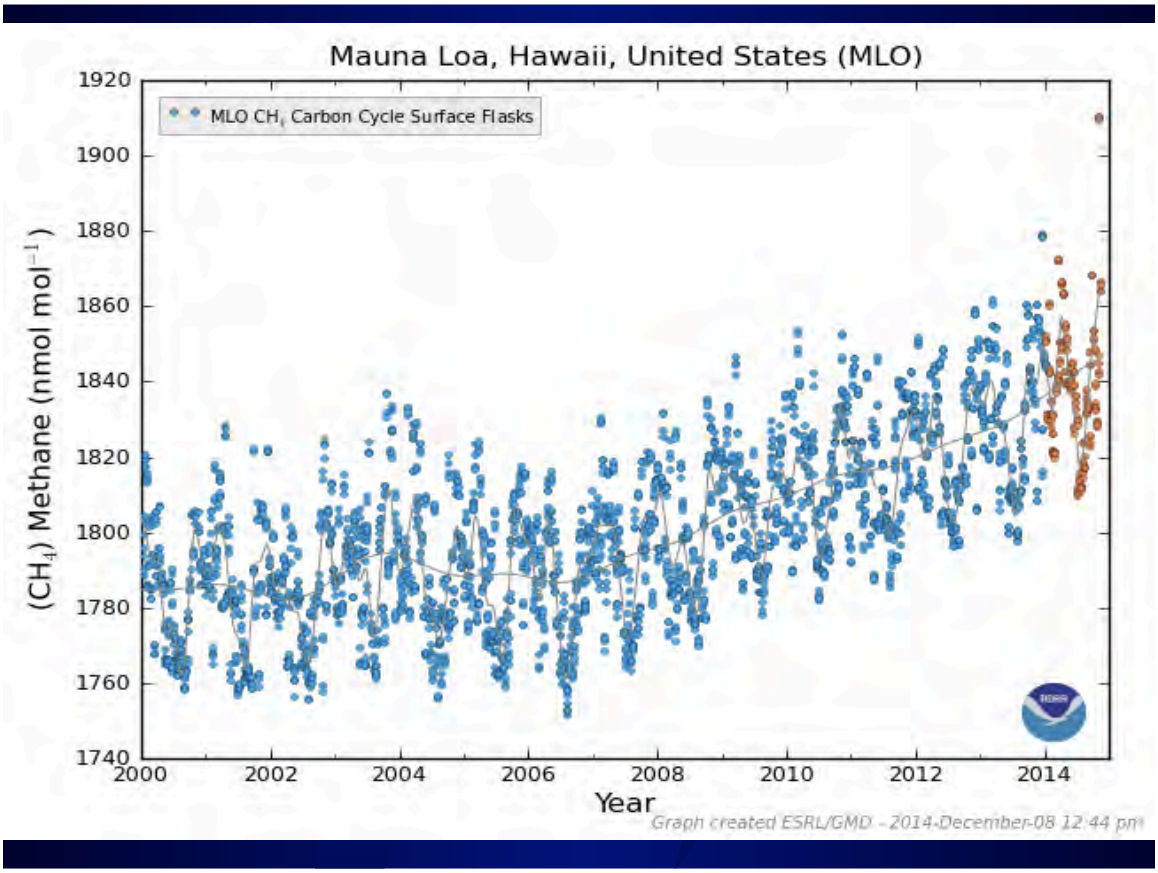

FIGURE 5- INCREASE ON METHANE IN THE ATMOSPERE OVER TIME AT MOUNT MAUNA LOA

ARCTIC EFFECTS FROM CLIMATE CHANGE

Will Steger- Arctic Explorer- As an eyewitness to the changing topography of the Arctic; I was stunned to see the rapid repercussions of global warming for the region, its wildlife habitat and indigenous culture

The Arctic temperatures are becoming higher then normal over time and Arctic sea ice volume and sea ice extent is decreasing (Figures 6 and 7). This is important since the Arctic Serves as a major influence on global temperatures, An Arctic with less sea ice and more open blue water areas will increase temperatures worldwide, will lead to more heat being absorbed by the Arctic ocean and has the potential to become a source of more methane being emitted as the Arctic areas warm. The question arises as to the extent of a feedback loop between a warmer Arctic, less sea ice, and more methane emissions from permafrost that will cause further warming since methane is a very efficient greenhouse gas as we have seen in the discussion on greenhouse gases.

The graph below shows a significant trend in decreasing sea ice volume over time.

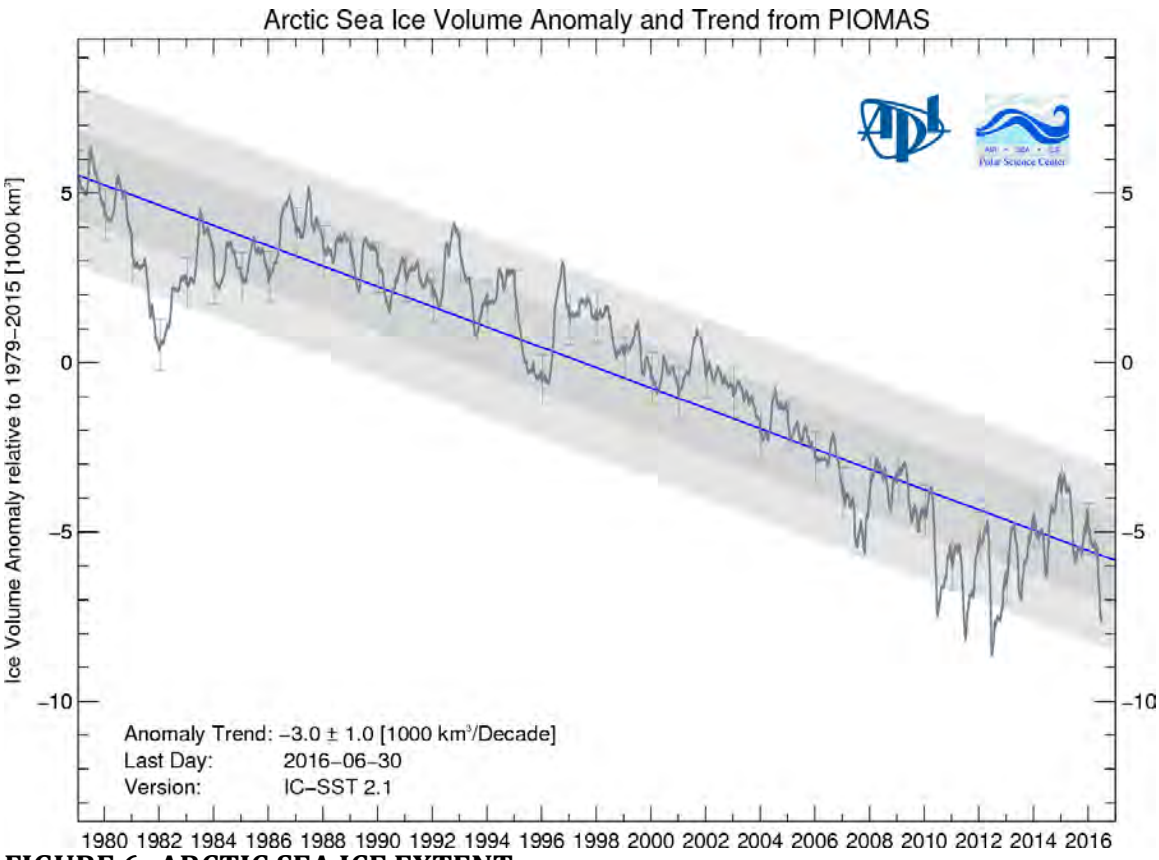

FIGURE 6- ARCTIC SEA ICE EXTENT

The graph below shows how daily Arctic sea ice extent has also been decreasing (Figure 7). It was feared early in the year that this decrease of ice extent was so severe that the artic may be free of sea ice in September of 2016- it does appear now that this will not occur but sea ice volume may be one of the lowest if not the lowest level ever.

The graph below shows Arctic Sea ice extent on July 22, 2016 when I wrote this section of this paper. Typically Arctic sea ice reaches its high point in late March to early April and its lowest extent by the middle of September. This decrease of sea ice is also leading to geo-political effects. These effects include potential militarization of the Arctic with more military bases, more military training exercises and more political claims on areas of the Arctic, which will probably rise to potential conflicts as nations race to exploit the oil, natural gas and mineral resources of the region. In addition the area become more open for international shipping lanes and already tour cruise ships are looking at using this area.

Effects are now apparent on marine and land life in the Arctic. Species such as the polar bear evolved in a close relationship with sea ice and as the sea ice disappears this species faces risks for species survival.

ARCTIC SEA ICE EXTENT- JULY 2016 (7,127,676 KM^2)

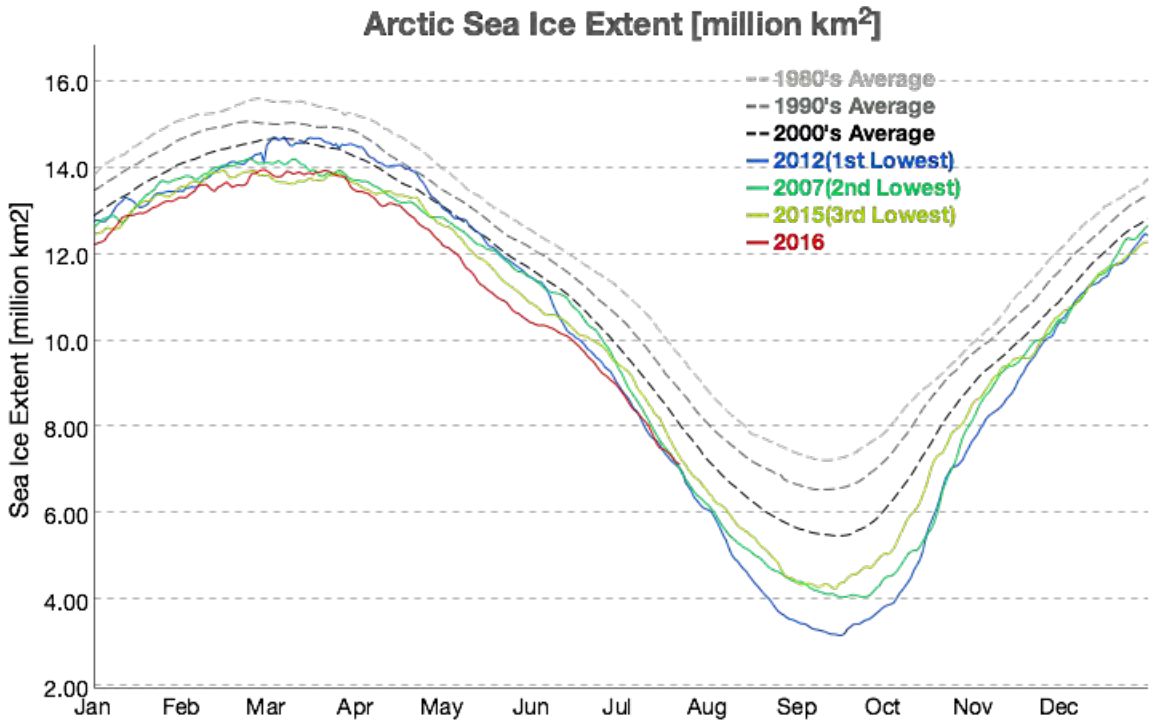

FIGURE 7- ARCTIC SEA ICE EXTENT

Likewise in Greenland there has been unprecedented melt of the ice sheet above normal average: however to date, the melt rate is a bit lower then in 2012 (Figure 8). Some folks welcome the melting of the ice sheet on Greenland to open up areas for easier exploitation of Greenland resources. But as the ice sheet melts there is concern for sea level rise and impacts on ocean currents as fresh warm water enters the ocean around Greenland.

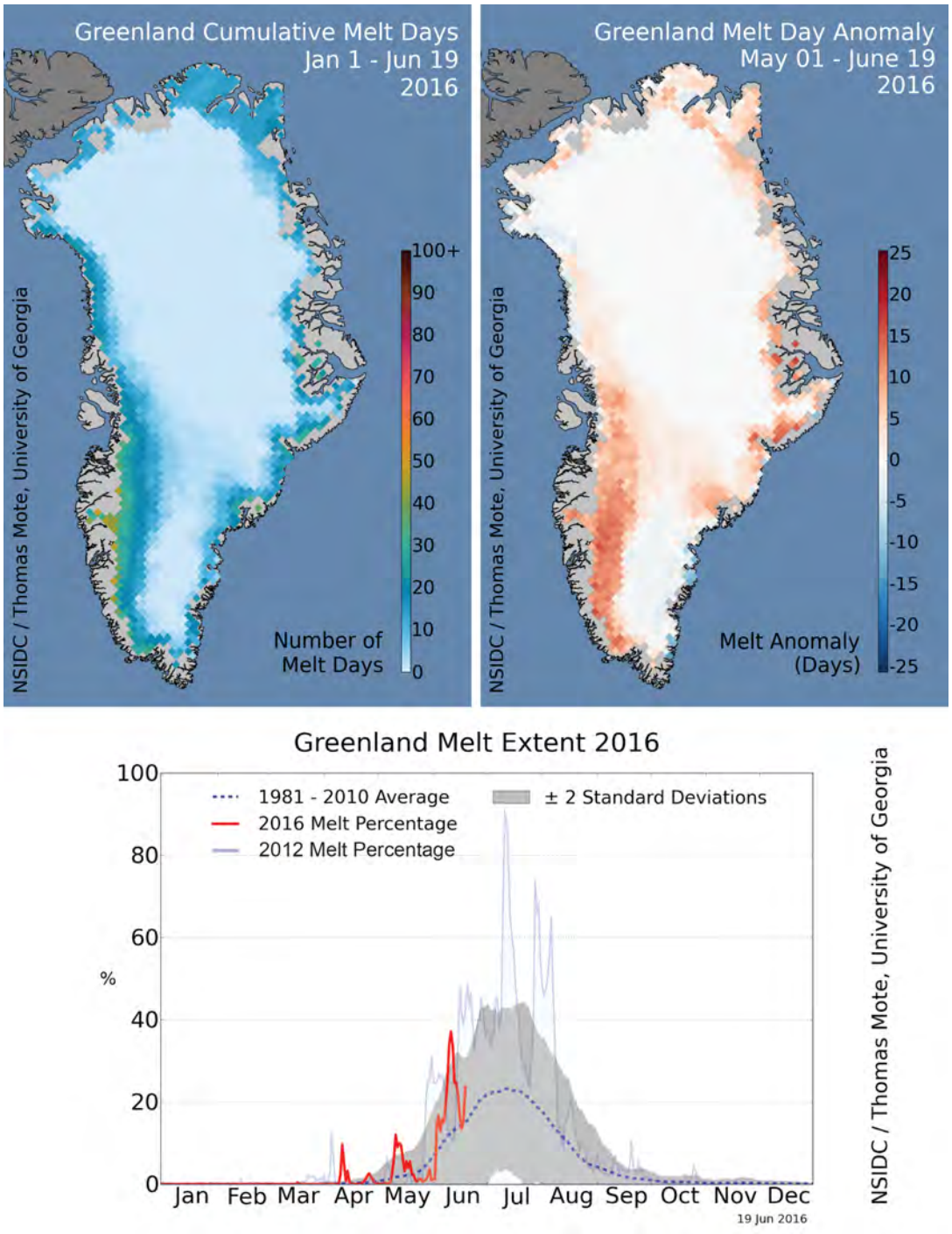

FIGURE 8 – GREENLAND ICE MELT EXTENT

Temperatures worldwide in the ocean and on land has relentlessly increased from the early 1900s (Figure 9)

Annual global energy consumption is approximately 0.5 Zettajoules. The world's oceans absorbed approximately 150 zettajoules of energy from 1865 to 1997, and then absorbed about another 150 in the next 18 years, according to a study

published Monday in the journal *Nature Climate Change*. To put that in perspective, if you exploded one atomic bomb the size of the one that dropped on Hiroshima every second for a year, the total energy released would be 2 zettajoules. So since 1997, Earth's oceans have absorbed man-made heat energy equivalent to a Hiroshima-style bomb being exploded every second for 75 straight years. Industrial-era global ocean heat uptake doubles in recent decades **(Peter J. Gleckler, Paul J. Durack, Ronald J. Stouffer, Gregory C. Johnson & Chris E. Forest** *Nature Climate Change*, 18 January 2016).

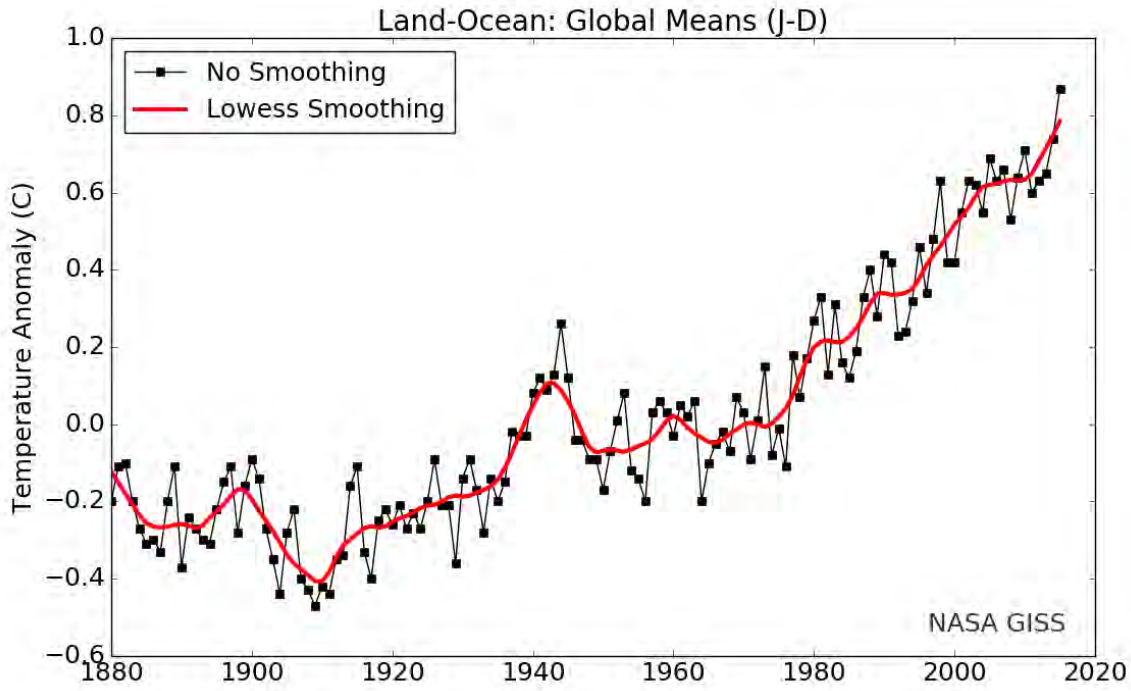

FIGURE 9- LAND-OCEAN GLOBAL MEAN TEMPERATURE INCREASE FROM THE EARLY 1900s TO PRESENT

GLOBAL RESPONSE TO CLIMATE CHANGE AND A SPIRITUAL ECOLOGY

Isaiah 24:4-6- The earth dries up and withers, the world languishes and withers, the heavens languish with the earth. The earth is defiled by its people; they have disobeyed the laws, violated the statutes and broken the everlasting covenant. Therefore a curse consumes the earth; its people must bear the guilt. Therefore earth's inhabitants are burned up, and very few are left.

PARIS CLIMATE AGREEMENT

The world since the 1992 United Nations Framework Convention on Climate Change and the1997 Kyoto Protocol has tried to address the issue of global warming in

prior meetings. Finally on December 12 of 2015 over 174 Nations and the European Union gathered in Paris France to come to an agreement to limit global warming by 2100. Initially the idea was to limit warming to a global average increase of no more then two (2) degrees Celsius from pre-industrial times. Island nations fearing that a two degree Celsius limit would subject their nations to being swamped by rising seas achieved a statement that the world would try to limit the increase to 1.5 degrees Celsius from pre-industrial times. The five largest emitters of greenhouse gases agreed to limit their emissions as stated as follows:

- China – 24% of global GHG emissions. - Peak emissions "by around" 2030, and reducing CO2 emitted/unit of gross domestic product by 60-65% by 2030 and will boost share of non-fossil fuel in primary energy consumption from 11.2% in 2014 to 20%, and boost the volume forests by about 4.5 billion cubic meters.
- United States - 15.5%. Pledged a 26-28% reduction in emissions by 2025. Power plants are to cut carbon dioxide by 32% from 2005 levels by 2030.
- European Union - 10.8%. The 28-member EU intends to cut emissions by at least 40% by 2030 over 1990 levels, and has set 27% targets for renewable energy supply and efficiency gains.
- India - 6.4%- plans to reduce carbon intensity by 35% and to generate 40% of its electricity from renewable sources by 2030.
- Russia - 4.9%- proposed cutting emissions by 25-30% by 2030 from 1990 levels, conditional on the pledges of other "major emitters". Russia's Environmental Ministry announced on December 25, 2015 that Russia had warmed by 0.42 degrees Celsius per decade since 1976, or 2.5 times quicker than the global warming trend of 0.17 degrees.

The problem is that in 2016 global temperatures have already increased over 1 degree Celsius from the pre-industrial average of global temperatures and many scientists have written or stated that the global temperatures will increase anywhere from the goal of two to six degrees overshooting the Paris Climate Agreements goals of limiting global temperatures if possible to no more then 1.5 degrees Celsius.

ECOLOGICAL SPIIRITUALITY AND CLIMATE CHANGE

Karl Rahner- In the days ahead you will either be a mystic, or nothing at all

The bible says that humanity should "fill the earth and subdue it- (Genesis 1:28). There has been much commenting done on this bible passage and I will not enter into the debate or biblical interpretations of this verse since many others have done that. A concise interpretation of this can be found at the HUFFPOST BLOG of February 8, 2016 by Robert Gottfried- titled- Dominion Over Nature and Environmental Crises- Time and Another Look.

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Historically, Francis Bacon (1561-1626) said "human labor as the only way to give value to the land"; Rene Descartes (1596-1650) and John Locke (1632-1704) promoted the separation of the conscious self from the world of matter; and Adam Smith (1723-1790) promoted economic dominance over the natural world (page 18, Thomas Berry in Spiritual Ecology- The Cry of the Earth, Editor- Llewellyn Vaughan-Lee The Golden Sufi Center, 2014). All these philosophical ideas saw humanity as separate from nature to the extent that when Europeans encountered native tribes in the America's who had a different view of nature and took only what was needed and lived lives embedded in nature- the Europeans killed, enslaved or pushed native indigenous people aside. Nature was seen as needing to be conquered so that the victor subdued it for the sake of progress and enrichment where items such as gold and silver were of more value then human life. As European descendants conquered the world and enslaved peoples, the land and destroyed for economic benefit natural resources, there reached a point where some such as Theodore Roosevelt felt we had gone too far and started a series of National Parks to preserve nature.

Yet this idea of nature letting us conquer it persists where we feel we can emit carbon dioxide and other greenhouse gases without limits into the atmosphere an any threat to this economic right is seen by many as limiting their freedoms. But nature does have a limit as we have outlined in this paper and many people now see this idea of limitless use of nature without consequences as putting our future at risk.

Today we here in juxtaposition people like Thomas Berry stating that there is a "savage assault on the earth" (page 41, The Dream of the Earth, Counterpoint Press, Berkeley, CA 1988) and that "By developing the planet, we have been reducing the earth to a new type of barrenness" (page 16, Thomas Berry in Spiritual Ecology- The Cry of the Earth, Editor- Llewellyn Vaughan-Lee The Golden Sufi Center, 2014).
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The problem is that we want to have all the good things that the earth and human efforts can provide such as food, shelter and human connections. The problem is how do we achieve this for all humanity without damaging the planet and putting humanities future at risk. Thomas Berry would say this should involve where "We need to move from our human centered to an earth centered norm of reality and value (page 56. The Great Work- Our Way into the Future, Three Rivers Press, New York, 1999). But where does this lead us in our spiritual approach to fully addressing the climate crisis, our institutional churches may make statements on Creation Care but do we really live from these statements, have we ever heard them and are we interested in implementing them in our personal life as we proceed daily living as we think best for us, for our family and for creation. I think Sister Miriam MacGillis is right in stating "Typically the religious meanings we hold are still based on our separation from nature – the pursuit of God is- equally separated from nature…" (Page 68, Spiritual Ecology- The Cry of the Earth, Editor- Llewellyn Vaughan-Lee The Golden Sufi Center, 2014).

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I feel the problem of climate change is not only scientific but primarily spiritual, the response to climate change must involve the "I" of science an "I" of faith in God and the "Not I" with my neighbor in faith and spiritual connectedness to solve the problem. The scientific can provide needed technical information but the problem involves a transformation of the people of the world and the organizations of the world to make changes of what we do about solving the problem. A transcendental transformation of the hearts of creation is needed and required to really solve the issue- the problem is we are dealing with a rapidly changing world that is being impacted by climate change. I am afraid that the suffering of many people and of other aspects of creation may occur- and many will die or have to become climate refugees with all that entails as we see now in Europe.

The nothingness of Rahner in the example above is the potential of a real nothingness. The mystic as described by Rahner would combine the Majesty of God with Action. To transform the world and solve real issues, we can either trudge along as we do day-to-day ignoring the suffering around us going about earning our daily bread not thinking of our neighbor or we can keep the suffering of our neighbor and creation as a full expression of the majesty of God and of our oneness in creation. The transformation that is needed is both at an individual level and at the community level. For instance, an impact on the problems of the world calls for a church acting under the majesty of God in Action with its members, its leadership and other societal institutions. The problem is some issues like climate change may not wait for the transformation of the individual and the church to occur- but perhaps as crises occur and the world becomes aware of the implications of the crisis a more rapid transformation will start and progress.

Pope Francis's Encyclical Letter ***On Care for Our Common Home- Laudato Si'*** is an important revelation that I fully welcomed as necessary to make the world realize modern folks are creating a ***Garbage Heap*** of our world. The moral and creative authority of the pope made many listen and I cannot help think it had influence on the Paris Climate Agreement in late 2015.

Just as Ignatius of Loyola stated that God dwells in all of creation' (p58, Susan Rakoczy, Great Mystics and Social Justice, Paulus Press, New York 2006); I feel that humanity is embedded in all creation and we do not have a dominion or lordship over that creation given to us by the creator but we are co-authors with God to ensure that we are stewards of that creation such that as a Native American Proverb says "***Tread the earth well. It was not given to you by your parents- it was loaned to you by your children"***

I have no idea where my future days and the Spirit of God may lead me but I do believe if humanity continues on the present path we will face as Lakota Chief John Hollow Horn said "***Some day the earth will weep, she will beg for her life, she will cry with tears of blood. You will make a choice, if you will help her or let her die, and when she dies, you too will die."***