CLIMATE PROBLEMS, REMEDIES, & STRATEGIC ACTIONS:

A STATEMENT OF CONVICTIONS BY

THE CLIMATE STEWARDS OF GREATER ANNAPOLIS*

August 2015

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* This position paper, we realize, is subject to improvements to be determined by advances in science, learning by experience, and the advice and counsel of colleagues. We regard it as a living document and welcome readers' comments and suggestions for improvements.

** Climate Stewards of Greater Annapolis is a local group of individuals deeply concerned about this issue. We believe that action and education are key elements in paving the road to a safe world for us, our children, and future generations.

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EXECUTIVE SUMMARY

By their efforts to industrialize their economies since the Mid 1700's, humans have been burning fossil fuels and thus have increased atmospheric carbon dioxide (CO_2) by over 40 percent, to more than 400 parts-per-million, higher than has been experienced on Earth for more than 800,000 years. As a greenhouse gas, CO_2 traps the Sun's heat in the Earth's atmosphere, thereby warming the globe and leading to changes in our planet's climate. We are increasingly at risk of passing a tipping point in **global warming** whereby amplifying-feedback effects create a situation of runaway heating and the triggering of catastrophic **climate changes** such as massive coastal flooding, the collapse of the world's food system, and severe storm events.

We have reached a point in time that calls not only for emergency reductions in CO_2 emissions, but because climate impacts result from the increased stock of atmospheric CO_2, we also need massive efforts to **draw down** atmospheric CO_2 and to cool the Earth. Currently, the sole (and largely ineffective) focus, on reducing CO_2 emissions, per se, threatens life on Earth because it does not address reducing the stock of CO_2. Public and private actions to avoid a climate catastrophe – such as increasing the price of carbon, restoring carbon to soils, and, in general, understanding our peril and seizing the opportunity of a healthy and more equitable future – are being thwarted because of ethical, political, and psychological barriers. For each barrier, however, there are strategies which people of good will and courage can use to overcome the absence of leadership that threatens us all.

We, the Climate Stewards of Greater Annapolis, call on political leaders, environmental groups, foundations, scientists, and ourselves to seize the diminishing opportunity to take immediate and effective actions, both individually and collectively, to reduce **global warming**.

INTRODUCTION

The Climate Stewards of Greater Annapolis (CSGA) is a grassroots group based in and around Annapolis, Maryland. We believe that humans are integrated with and dependent on a healthy Planet Earth. We also realize that humans are harming the Earth by our exploitive energy policies and behaviors. We believe, further, that as the only species on our planet able to plan and manage for the distant future, we have a special responsibility and obligation to be thoughtful and active stewards of our planetary home. We are increasingly alarmed, yet resiliently hopeful.

In this statement, we reference, and distinguish between, **global warming** and **climate change**. By burning fossil fuels, humans have added carbon to the Earth's carbon cycle. At the beginning of the Industrial Revolution, in the 18th Century, atmospheric CO_2 was at about 280 parts per million (ppm). By using fossil fuels to industrialize our economies, humans have now raised the level of CO_2 to more than 400 ppm, an increase of more than 40 percent. Because CO_2 is a "greenhouse gas" which allows the sun's energy to reach the Earth but blankets the planet's ability of radiate the resulting surface heat, **global warming** – the average warming of the Earth's atmosphere – is occurring. We may have had severe winters in Maryland recently, but the 10 warmest years in the 134-year climate record of our planet all have occurred since 2000. As the result of **global warming**, the Earth, and thus we, are experiencing a variety of impacts which we call **climate change**.

This statement of our convictions poses and answers seven question about energy policies and behaviors, **global warming**, and resulting **climate change**. We assert, in our answers to the seven questions, that:

- Because of the high and rising risk of a climate calamity stemming from the elevated level of atmospheric CO_2, the conventional definition of the correct response – reducing CO_2 emissions only – is a necessary but not sufficient answer. We also need to reduce atmospheric CO_2 and cool the Earth;
- Private actions should be encouraged, but public policies at all levels of government are necessary to avoid a climate catastrophe;
- The most effective and equitable governmental policies and private actions needed are:
    - Land-use practices and geoengineering methods to **reduce atmospheric CO_2**, cool the Earth, and protect vulnerable communities; and

- Simultaneously, a high and rising fee on fossil fuels, with redistribution of revenues obtained to ease acceptance and promote equity. We call this a "fee and dividend" policy;

- Six barriers to solving **global warming** are evident, but for each barrier there are strategic actions that CSGA, its individual members, and other organizations and individuals can and should take to overcome obstacles.

THE SEVEN QUESTIONS

Our questions are:

1. What will happen if current behaviors and public policies regarding **global warming** – that is, Business-as-Usual – are not changed?
2. What changes to behaviors and policies does scientific evidence indicate are needed?
3. Within the structure of current policies, what private actions can and should be encouraged?
4. Why is public action needed also?
5. What are the best public policy options for achieving the necessary changes to Business-as-Usual?
6. Why are effective private actions and public policies being blocked?
7. What strategies should CSGA, and others, take to overcome obstacles to progress?

Each of these questions is answered, in turn, in the seven sections that follow.

1. Current Business-as-Usual Behaviors and Public Policies Are Creating Negative Impacts and, if Not Changed, Will Result in a Climate Catastrophe.

If Business-as-Usual continues:

a. Humans will continue to burn fossil fuels;

b. This continued burning will cause already elevated atmospheric CO_2 to rise;

c. Current and rising atmospheric CO_2 levels will cause the average global temperature to increase; and

d. Increasing global temperature will create all sorts of negative impacts, including:

- Droughts and wildfires – which could cause the loss of rain forests, also known as the "Earth's Lungs";

- Agricultural collapse – which will result in mass refugee migrations and could result in violent conflict over food resources;
- Loss of Arctic ice – which will amplify our planet's warming;
- Melting glaciers – which will result in moderate sea-level rise and, perhaps, the end of warming ocean streams for lands away from the Equator;
- The possible collapse of the Western Antarctic Ice Shelf – which will cause substantial sea-level rise;
- Ocean acidification – which will result in the massive loss of aquatic life forms;
- Severe and rapid changes in the habitats of land-based species – which will result in the loss of animals and plants that are unable to adapt to such changes;
- Rapid release of methane, a potent greenhouse gas currently frozen in northern latitudes – which will speed temperature rise, amplifying all of the above; and
- Rising risks of the economic, political, and social collapse of human civilizations.

To a greater or lesser extent all these impacts are currently being felt.

e. At some point in time, **global warming** will pass, if it has not already done so, a tipping point whereby the planetary warming becomes rapidly self-amplifying and conditions become increasingly difficult for the preservation of human (or any) life on Earth. Paleo-historic ice-core analyses indicate the tipping point may be <u>abrupt</u>: (i) large; (ii) sudden; and (iii) out of proportion with our previous experience and capacity to adapt.

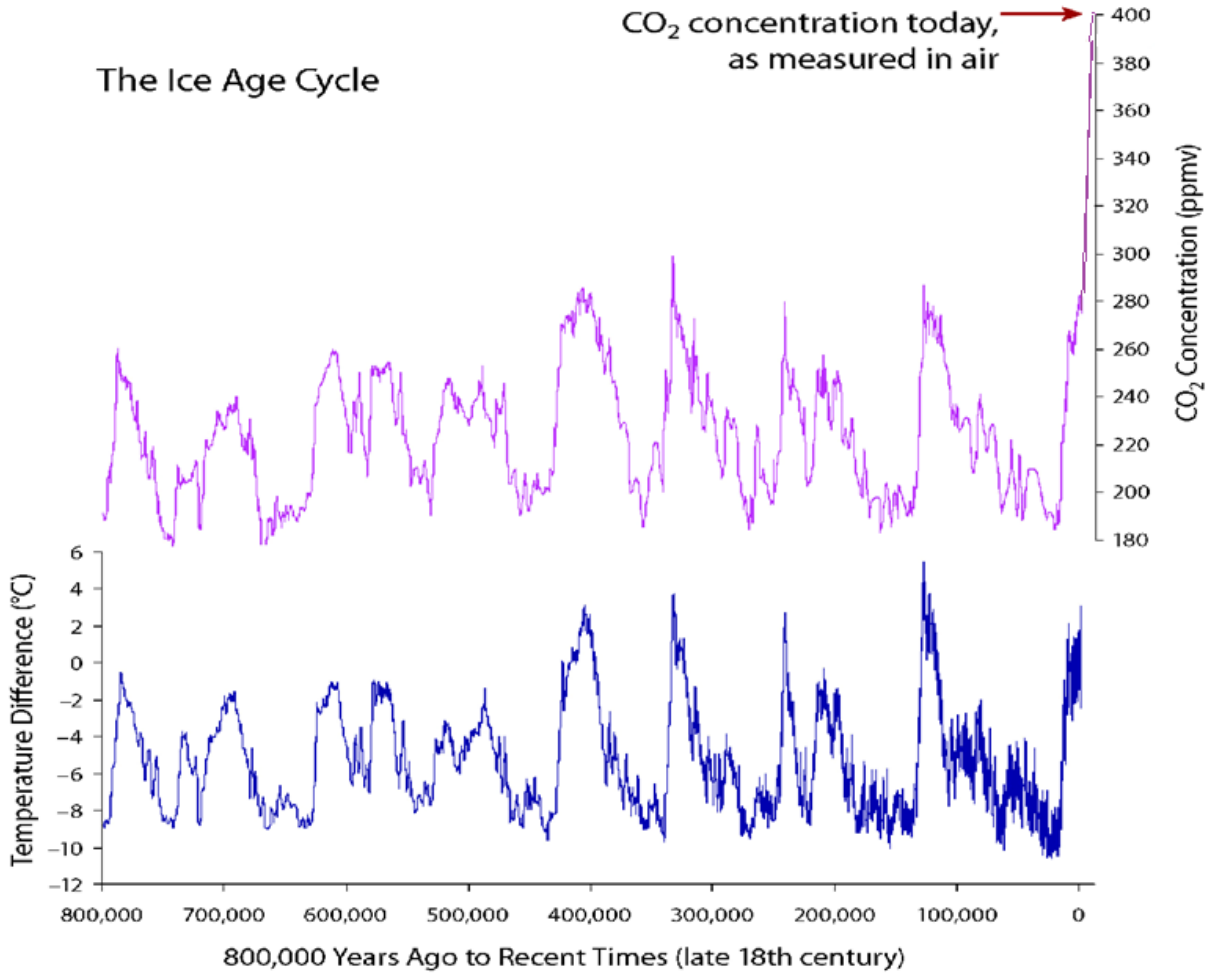
Key questions resulting from our analysis of a business-as-usual approach to **global warming** are:

- Have we passed the tipping point? If not:
- How quickly will the tipping point occur?
- Are we talking years, decades, centuries, or millennia?

While the answers to these questions are still subject to additional research, what science findings to date clearly indicate are that:

a. From more than 800,000 years ago until the industrial revolution, atmospheric CO_2 has been in the range of 180 to 300 parts per million (ppm), but it is currently greater than

400 ppm and climbing two or three ppm per year;



b. There are powerful and not well understood positive (amplifying) and negative (diminishing) feed-back mechanisms in **global warming**. They include, for example, increased methane gas (amplifying) and heat absorption by the ocean (diminishing). A rapid increase in an amplifying mechanism or a rapid decline in a diminishing mechanism is the likely cause of abrupt **climate changes** as revealed in analyses of glacial-ice cores – the best method to determine the chemical composition of the Earth's atmosphere in the planet's paleo-history;

c. Annual burning of fossil fuels determines the **flow rate** of emissions of carbon that were previously sequestered underground and thus not adding to atmospheric CO_2. The warming effect of the added CO_2 depends, however, on the **cumulative stock** of carbon in the atmosphere. This is because when CO_2 is added to the Earth's carbon cycle by burning fossil fuels, and unless it is removed by human intervention, it remains there, for all practical purposes, indefinitely. Thus, at its base, the problem of **global warming** is one of stock accumulation and not merely of flow of carbon emissions. **To reduce the**

flow of fossil-fuel emissions is necessary but not sufficient to solve the problem of global warming. Also necessary are efforts to: (1) reduce atmospheric CO_2 to 350ppm or less; and (2) cool the Earth; and

d. Emerging evidence suggests that the loss of sea ice and snow cover in the Arctic region, which creates an amplifying feedback known as the "albedo effect," is underway and is triggering other amplifying feedback effects, most importantly the release of methane gas from permafrost and sea-beds. This is an alarming turn of events because a large amount of methane is currently frozen in place, but were it to be released as a vapor, the resulting methane gas, which is more than 20 times as powerful a green-house gas as CO_2, would rapidly increase the Earth's temperature even more.

Linking cause to effect in the case of any particular weather event or even a multi-year weather trend, such as the current drought in California, is a matter of probabilities. For example, in the case of California's drought, Stanford University climate scientist Noah Diffenbaugh stated in a research paper published in 2014 that atmospheric conditions associated with the drought are "very likely" linked to human-caused **climate change**. ("Very likely" is defined by climate scientists as a confidence level of a probability greater than 90 percent.)

Although the answer to the question, "How quickly will impacts occur?" is not known with certainty, what is known is that with each passing day that atmospheric CO_2 continues to rise further above 400 ppm, the risk that we have passed or are passing the tipping point increases. Major **climate changes** – the loss of Arctic ice, acidification of the oceans, and mass extinction of land and water based species – are already underway, and we are raising the risks of creating additional, more abrupt changes in sea level, drought, flooding, food production, and species loss, with attendant calamitous impacts on human civilization as we know it.

2. <u>Changes that Are Needed Are Evident and Straight Forward.</u>

In brief, scientific evidence indicates that changes are needed to:

a. Stop burning fossil fuels;

b. Withdraw CO_2 from the ocean and atmosphere; and,

c. Cool our planet.

In addition economic common sense suggests that all fossil fuel subsidies be eliminated.

We should also carefully monitor amplifying climate feedback effects to better understand the growing risk of reaching a global-warming tipping point. As the risk increases, efforts to reduce emissions could become only a distraction, while withdrawing CO_2 from the atmosphere and cooling our planet become essential to the survival of human civilization. At this time, however, technologies for carbon sequestration and for cooling the Earth should not be framed as substitutes for increased efforts to reduce emissions. Carbon sequestration, cooling the earth and reducing CO_2 emissions are complementary efforts, and should be undertaken simultaneously.

3. Private Actions Are Essential.

Individuals and private organizations can do much, under current policy conditions, to reduce the burning of fossil fuels and withdraw CO_2 from our atmosphere. During the past decade, prices for clean energy sources – especially for solar and wind energy – have fallen significantly, relative to prices for fossil fuels. We know also that fossil fuels have been priced too cheaply because their prices do not reflect costs they impose on our climate and global health. Cheap fossil fuels have led to wasteful and short-sighted behaviors. We can, thus, educate, advocate, and demonstrate the effectiveness of:

a. Continued rapid growth in solar, wind, geothermal, biofuel, and other emerging clean energy sources;
b. Electrification of local transportation, which is 90 percent of all transportation;
c. More energy-efficient structures;
d. The phase out of home heating oil and natural gas and the substitution of electric heat-pumps to warm building spaces and to heat water;
e. Mixed-use development that results in walkable communities;
f. Improved agricultural and forestry practices that sequester carbon in soils and plants, so as to reduce atmospheric CO_2; and
g. Reduction of individual's use of electricity and long distance travel.

4. Private Actions Are Not Enough: People Must Also Demand Government Actions.

Because the benefits of reducing fossil-fuel-based atmospheric CO_2 would be available to all people, whether or not they contributed to such reductions, to achieve the behavioral changes that are needed, incentives for private, individual behavioral changes are currently insufficient. With insufficient incentives, people are willing to "ride free" and wait for others to bear the burden of change. While private actions to counter **global warming** are commendable, we cannot rely on private, individual good deeds, in the current policy framework, to achieve what is needed. Collective actions, via new governmental policies and programs to change incentives for burning fossil fuels and reduce the rate of growth in and the level of atmospheric CO_2, are also needed at this time.

5. Effective and Equitable Policy Options Exist to Achieve the Needed Changes.

The most effective governmental actions to achieve the changes needed are as follows:

a. To quickly phase out fossil fuels:

   i. Remove all subsidies and impose a high and rising fee on them;

   ii. Stop making or importing gasoline-powered cars, and, for local transportation, substitute plug-in electric vehicles, the battery costs for which are falling rapidly;

   iii. Build no new fossil-fuel power plants; and

   iv. Move as quickly as possible to meet all energy needs via solar, wind, and other clean energy sources.

b. To withdraw CO_2 from the atmosphere and ocean, quickly mount public research, development, and program support for carbon sequestration. Examples of technologies to be studied and, when proven safe and effective, applied are to:

   i. Add biochar (charcoal) to soils;

   ii. Add algae to oceans to consume CO_2, and then sequester it in ocean bottoms;

   iii. Remove CO_2 from the atmosphere such as by weathering (using the mineral olivine);

   iv. Reforest the Earth;

   v. Greatly expand land-based, low-technology carbon-sequestration practices – such as climate-friendly livestock management, composting, conserving natural habitats, no-till farming, producing local food, restoring wetlands and rangelands,

and other carbon-smart land-use practices – already being practiced by some gardeners, farmers, ranchers, and watershed activists.; and

vi. Provide payments for CO2 removed from the atmosphere and sequestered.

c. To cool our planet quickly, also mount research, development and application of proven technologies.[i] Candidates for application are, for example, to:

i. Disperse sulfates into the atmosphere; and

ii. Use "cloud brightening" to reflect incoming solar energy.

A high and rising fee on fossil fuels will create powerful economic incentives for both consumers and suppliers of energy. On the demand side, it will mean rapid shifts by homeowners, motor vehicle users, businesses, organizations, and agencies – anyone, that is, who currently consumes energy – to shift from fossil fuels to clean energy sources. On the supply side, it will support:

- Research, development, and deployment of emissions-free/renewable energy systems;
- Conversions to solar power at the home, community, and utility scale;
- Development of local and utility-scale energy storage; and
- Economies of scale that will allow further reductions in the costs of supplying clean energy.

A "fee" on fossil fuels is different from a "tax" in that the revenues gained would be returned back to private individuals. An equal per capita dividend of revenues from a fee on fossil fuels will also make the policy equitable in that for most poor people, who use relatively little carbon, the dividend would be greater than the cost of the fee.

Advocacy for various public actions advocated by environmental groups – actions such as:

1. Stopping the Keystone Pipeline, Cove Point, fracking, Arctic drilling, and mountain-top removal; and
2. Promoting fossil-fuel industry disinvestment and higher renewable-portfolio standards

are commendable, but they are not the **main focus** for advocacy by CSGA.

A sufficiently high fee on carbon would stop Keystone and the other regrettable actions listed above because they would become unprofitable, and a fee would promote clean energy alternatives to fossil-fuel production and use. Nevertheless, to partner with people who are

energized to take public action, and to educate ourselves and others about how issues relate to **climate change**, CSGA should engage in and support commendable actions.

Government action can and should be taken at several levels:

- **Municipalities and counties** should assist in solving the problem of **global warming**, for example, by eliminating their own carbon footprint, creating incentives for energy conservation in residential and commercial buildings, accelerating solar power growth, and providing plug-in options for electric cars;
- **States** should help, for example, by adopting renewable portfolio standards and promoting solar and wind power, such as California and Maryland have done, and – like British Columbia, Canada – by imposing a carbon fee-and-dividend program;[ii]
- The **United States** should take the lead, for example, by creating a carbon fee-and-dividend policy, such as the one proposed by the Citizens Climate Lobby, or, alternatively, a cap-and-dividend policy such the one introduced to the House of Representatives by Maryland Congressman Chris Van Holland; and
- At the **international level**, it is salutary to recognize that if America dropped its annual emissions to zero, global annual emissions would decline by only 17 percent, and atmospheric CO_2 would remain unaffected. Thus, the international community should create multi-country agreements and programs to employ safe, effective, and equitable programs to draw down atmospheric CO_2, cool the Earth, and reduce CO_2 emissions.

6. <u>Effective Behaviors and Policies Are Not Being Adopted because of Six Barriers.</u>

Six ethical, political, and psychological barriers explain why people continue to pollute the atmosphere with carbon and why governmental policies to bring about the needed changes have not been employed:

a. The fossil-fuel industry and their "bought and paid for" allied think tanks, trade associations, advocacy organizations, and other "Merchants of Doubt" are the components of a well-organized Climate Change Counter Movement that discourages effective policy making solve the problem of **global warming**. Much of the funding for the movement is financed by "dark money," that is, unreported, large donations that likely emanate from the fossil-fuel industry. As disingenuous information is spread by this Counter Movement, multiple news channels (telling quite different stories) no longer require groups to face the same "facts".

b. People use ideologically-motivated cognition to screen out scientific understanding. Such behavior refers to the tendency of people to process information in a manner that suits

some end or goal that is extrinsic to the formation of accurate understandings. Thus, people tend to conform their view about the problem of **global warming** to values that define their cultural identities, including, by some individuals, for example, a strong identification with "free-market values" and "market efficiency" that discredits any need for government action.

c. People tend, egocentrically, to fully add up the costs of public action on **climate change** for themselves but to discount its benefits for others. The costs and benefits of undertaking public action include considerations of **when** to expect the pain and the gain, **who** will be affected and with **how much certainty** the results can be estimated. The **costs** of doing something significant about **global warming** are typically considered:

   i. Immediate;

   ii. Personal, i.e., falling on American consumers such as you and me; and

   iii. With a high degree of certainty.

   The **benefits**, in contrast, are commonly viewed as:

   i. Achievable only "down the road";

   ii. Flowing largely to others, meaning future generations and people in flood-vulnerable countries like Bangladesh and Pacific-island nations; and

   iii. Uncertain, seemingly, because of the confusion being sown by the Climate Change Counter Movement.

   It is as if we relied on weather forecasters, who simply looked out the window to "forecast" the weather.

d. Many people in leadership positions fail to understand and/or to accurately state that the problem of **global warming** is, at its core, one of the growing atmospheric CO_2 total accumulated stock and not just the flow of CO_2 emissions. Misunderstandings or misstatements of the problem occur when political leaders tout, as triumphs, agreements to reduce emissions only. Witness the trumpeting of the U.S.-China agreement in 2014 to reduce emissions but without mention that the accumulated stock of atmospheric CO_2 will continue to increase indefinitely. And witness, too, after the agreement, the absence of public statements by scientific and environmental leaders who know but did not say that to tout the reduction of emissions flow as a triumph ignores the core problem of increasing atmospheric CO_2 stock. Their silence raises the question as to whether they really understand the difference between stock and flow. Moreover, we seem to have politicians, who may acknowledge the severity of a problem in private, but seem loath to take a public position until this is demanded by their electorate.

e. Many environmental organizations are focused on diverse causes and priorities. Because of the looming crisis humans have created for ourselves, CSGA advocates making **global**

warming the most important environmental cause and humans' highest environmental priority. Moreover, CSGA believes that among those environmental organizations for whom **global warming** is a cause, some are dedicated to secondary issues such as, for example, stopping the Keystone Pipeline and increasing renewable portfolio standards. Such causes, while commendable, do not directly address the core problem of global warming. As argued in this statement, imposing a fee on carbon would discourage building the Keystone Pipeline and other regrettable activities because such activities would be unprofitable; moreover, a substantial carbon fee would rapidly make renewable portfolio standards unneeded. Only one group, the Citizens Climate Lobby (CCL), is advocating a carbon fee policy, but, given reasonable assumptions about the elasticity of demand for fossil-fuel products, CCL is advocating a fee that would be too low to create the rapid decline in demand needed to reduce CO_2 emissions.

f. Many charitable foundations and private donors who fund **climate change** organizations have not done enough homework to prioritize their giving so as to maximize its effects on solving the core problem of **global warming.** Since the members of CSGA believe **global warming** should be our most important environmental cause and highest priority, we see that unfocused actions to address comprehensive environmental issues dilute the resources that would be best applied to addressing **global warming**.

7. <u>CSGA Should Adopt Strategic Actions to Overcome the Six Barriers</u>

The following actions provide means to overcome the six barriers to effective behaviors and public policies.

a. To respond to the **climate change** counter movement:

   i. Develop an understanding of the science of **global warming** and the communication skills to share informed perspectives with others;

   ii. Change our own behaviors to conserve energy and switch to clean-energy and carbon-smart consumption because those behaviors are the right thing to do and signal that we are "walking the talk";

   iii. Educate others – including acquaintances, groups, and organizations – about the feasibility of doing the right thing;

   iv. Realize that although the counter movement attempts to frame its debate with scientists as being "scientific," it is actually <u>political</u> and <u>economic</u>; and

   v. Engage in the political process by writing letters to public decision makers and editors of newspapers, visiting with elected officials, and participating in and organizing public rallies.

b. To respond to ideologically-motivated cognition:

i. Focus attention on people of all ages and organizations that are open to learning about **climate change** – for example, watershed groups, religious organizations, property owners threatened by flooding, and science-oriented entrepreneurs – to co-sponsor educational events and form political alliances;

ii. Relate to people by bonding and connecting on the basis of shared values – for example, shared concerns for our families, for our health, for highly vulnerable people and coastal communities, and for the Creator's work;

iii. Reframe communications about **climate change** to include supportive figures of speech such as "insurance, protection, health, and opportunity";

iv. Use the power, also, of appealing stories and narratives, such as the joy that comes from renewing ecosystems threatened by **climate change**, from establishing innovative climate stewardship, from riverkeeping and from bravely doing the right thing for human civilization and all of nature; and

v. Offer exciting and aspirational solutions that appeal across the political spectrum, including solutions – for example, market-based policies and technological advancements – that appeal to political conservatives and provide a clean energy future that appeals to most people.

c. To help people reflect on the costs and benefits of undertaking individual and collective action about **global warming**:

i. Raise ethical and moral issues, such as, "How much am I willing to sacrifice for others to reduce my carbon footprint?" "How willing am I to accept a carbon fee to help other people who currently are more at risk than I?" And, "How willing am I to accept such a fee to help my children and grandchildren, and those of others?"

ii. Relate to faith-based groups for whom **climate change** is a spiritual issue that fits within the framework of their religious beliefs about loving their neighbor and the Creator of the universe; and

iii. Educate people about the economic advantages of switching from dirty to clean energy sources. Inform people, for example, of the personal advantages of using home-based solar power and of driving electric vehicles. And inform people, too, about the powerful incentives for decreasing the demand for fossil fuels and increasing the supply of clean power that a carbon fee would induce.

d. To counter the failure of public leaders to know and accurately state the problem, and who fail to take real leadership roles, challenge them to increase their understanding of **global warming** and to have the courage to communicate it. Also, identify legislative proposals worthy of support, and advocate their adoption. Currently, there are three serious legislative proposals for consideration by the U.S. Congress to reduce the use of fossil fuels. In historical order, the proposals are:

i. "Fee and Dividend" legislation, as proposed by the Citizens Climate Lobby;

ii. "Cap and Dividend" legislation, as introduced by Maryland Representative Chris Van Hollen; and

iii. "Carbon Fee" legislation, as introduced by U.S. Senators Sheldon Whitehouse (RI) and Brian Schatz (HI).

See the Appendix for details of the three proposals.

e. To help environmental organizations focus their efforts, educate and remind them about the core problem of **global warming**, and support those whose mission it is to solve it.

f. To improve the record of foundations giving to climate-change organizations, communicate with them to say that we are watching what they do and are concerned that the environmental community is often missing the core problem. Research and document where foundation money goes and its effectiveness for addressing **global warming**.

CONCLUSION

We live in a time of great challenge and increasing peril; yet, too, we live in a time of immense opportunity. Unless we act boldly and soon to change our behaviors and create effective public policies that have everyone doing the same, we are increasingly at risk of creating a climate calamity. We have the opportunity, on the other hand, to reform our scientific, technological, and ethical relationships with our fellow humans and with life on Earth. We can, even at this perilous point in time, change how we do business, expand carbon-smart practices, form communities, undertake collective actions, protect individual dignity and freedom, and accept our human and spiritual responsibilities. The Climate Stewards of Greater Annapolis base our mission on the science of global warming. We strategically focus and prioritize our advocacy efforts to achieve those changes in behavior and new public policies and programs that are needed to stop burning fossil fuels, reduce atmospheric carbon dioxide, and cool the Earth. We welcome others to join with us in taking advantage of opportunities to make our planet a fairer, safer, and happier place on which to live.

Climate Stewards of Greater Annapolis.

Bibliography

American Council on Renewable Energy. *Renewable Energy in California.* September 2014. See at http://www.acore.org/files/pdfs/states/California.pdf

British Columbia Ministry of Finance. *Carbon Tax: Overview of the Revenue-Neutral Carbon Tax*. See at http://www.fin.gov.bc.ca/tbs/tp/climate/carbon_tax.htm

Brulle, Robert J., Jason Carmichael, and J. Craig Jenkins. "Shifting Public Opinion on Climate Change," *Climate Change*, Published Online, 03 February 2012. See at http://www.pages.drexel.edu/~brullerj/02-12ClimateChangeOpinion.Fulltext.pdf

Bruninga, Bob. "AFM Climate Initiatives" on *Annapolis Friends Meeting Website*, 2015. See at http://aprs.org/AFM-environment.html

Caldeira, Ken, Kerry Emanuel, James Hansen, and Tom Wigley. *Open Letter to Those Influencing Environmental Policy but Opposed to Nuclear Power*, 2013. See at http://dotearth.blogs.nytimes.com/2013/11/03/to-those-influencing-environmental-policy-but-opposed-to-nuclear-power/?_r=0

Calvin, William H. *Global Fever: How to Treat Climate Change*. Chicago, IL: The University of Chicago Press, 2008.

Calvin, William H. *The Great CO_2 Cleanup: Backing Out of the Danger Zone*. Seattle, WA: ClimateBooks, 2012.

Candler, Wilfred. *Global Warming: The Answer (The Energy Dividend)*. Bloomington, IN: AuthorHouse, 2007.

Diffenbaugh, Noah. "Atmospheric Conditions Associated with the 2013-14 California Drought are 'Very Likely' Linked to Human-caused Climate Change" in *Stanford Woods Institute for the Environment: Research Brief,* Fall 2014. See at https://woods.stanford.edu/sites/default/files/files/2014-CADrought-Climate-BAMS-ResearchBrief-FINAL.pdf

Government of Scotland. *Exploring Climate Change: Evidence from Ice Cores*. See at http://www.educationscotland.gov.uk/exploringclimatechange/evidence/icecores.asp

Hansen, James. *Storms of My Grandchildren: The Truth About the Coming Climate Catastrophe and Our Last Chance to Save Humanity*. New York: Bloomsbury, 2009.

Hayhoe, Katharine. *DENIAL101x*. See at http://www.youtube.com/watch?v=BjhrwA9f4G8

Kahan, Dan. M. *Climate-Science Communication and the Measurement Problem: A Working Paper*. See at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2459057

Klein, Naomi. *This Changes Everything: Capitalism vs. The Climate*. New York: Simon & Schuster, 2014.

Marshall, George. *Don't Even Think About It: Why Our Brains Are Wired to Ignore Climate Change*. New York: Bloomsbury Press, 2014.

National Aeronautics and Space Administration. *Global Climate Change: Vital Signs of the Planet.* "The 10 warmest years in the 134-year record all have occurred since 2000." See at http://climate.nasa.gov/vital-signs/global-temperature/

Olson, Mancur. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge, MA: Harvard University Press, 1965.

Oreskes, Naomi and Erik Conway. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. New York: Bloomsbury Press, 2010.

Roberts, David. "What we can learn from British Columbia's Carbon Tax." In Grist.org, February 2015. See at http://grist.org/climate-energy/what-we-can-learn-from-british-columbias-carbon-tax/

Romm, Joe. "Electric Car Batteries Just Hit a Key Price Point." *ThinkProgress.org.* See at http://thinkprogress.org/climate/2015/04/13/3646004/electric-car-batteries-price/ April 13, 2015.

Schmid, A. Allan. *Property, Power, and Public Choice*. Santa Barbara, CA: Praeger Publishers, Inc. 1978.

Schuiling, Olaf. *Let the Earth Help Us to Save the Earth: The Role of Olivine*. Utrecht University. See at ftp://ftp.geog.uu.nl/pub/posters/2008/Let_the_earth_help_us_to_save_the_earth-Schuiling_June2008.pdf

Stern, Nicholas. *Why Are We Waiting? The Logical Urgency and Promise of Tackling Climate Change*. Cambridge, Massachusetts: The MIT Press, 2015.

Tucker, William. *Terrestrial Energy: How Nuclear Power Will Lead the Green Revolution and End America's Energy Odyssey*. Washington, D.C.: Bartleby Press, 2012.

White, Courtney. Grass, Soil, Hope: A Journey through Carbon Country. White River Junction, Vermont: Chelsea Green Publishing, 2014.

White, James W.C., et al. *Abrupt Impacts of Climate Change: Anticipating Surprises*. Washington, D.C.: National Academy Press, 2013.

END NOTES

[i] We recognize that there is dispute among experts as to what the "safe" level of atmospheric CO_2 is. The UNFCC (United Nations Framework on Climate negotiated International Panel on Climate Change has nominated a 2°C temperature rise as the limit beyond which it would be dangerous to go. The IPCC models suggest a 2°C rise will occur with about 440 ppm of atmospheric CO_2. James Hansen has suggested 350 ppm (or lower) is safe (hence the establishment of 350.org), and Apollo-Gaia.org estimates that with current increases in CO_2, when the atmosphere reaches an equilibrium (maybe decades or even centuries in the future), we will have blown well past a temperature rise of 2°C, which Apollo-Gaia.org estimates, on the basis of ice-core data, occurred at about 330 ppm. It thus seems highly probable that present day fossil-fuel emissions will need to be removed from the atmosphere. With current technology, this is likely to cost at least $250 per ton of carbon. It would seem reasonable that this cost of removal be added to the price of fossil carbon, resulting in a tax of $250 per ton of carbon, with no rebate since this revenue will be needed to defray the cost of removing CO_2 from the atmosphere.

[ii] The State of California is highly supportive of the clean energy sector and has enacted ambitious policies, such as its 33 percent renewable portfolio standard. California leads the nation in generation capacity from geothermal, biomass, solar photovoltaic, and solar thermal electric projects. The state's support for the renewable energy industry has been successful in attracting and incubating leading renewable energy companies which, in turn, have created many high-quality jobs. (See the American Council on Renewable Energy in the Bibliography.)
The Province of British Columbia enacted a revenue-neutral carbon tax, what in CSGA we call a carbon "fee," in 2008 and increased it annually until 2012 when the rate reached $30 per ton of CO_2. The goal of the tax was to reduce the province's CO_2 emission by 33 percent by the year 2020. Expectations in 2008 were that other North American jurisdictions would enact similar policies, but they have not, and for this reason the annual increase in the rate was ended in 2012. Analysis shows only very small reductions in economic growth as a result of the tax, although impacts differ among sectors. (See British Columbia Ministry of Finance and Roberts, David in the Bibliography.)

APPENDIX

All three of the following legislative proposals avoid the major errors – e.g., free distribution of most permits, "offsets", and "derivative trading" – of the "Cap and Trade" legislation that passed the U.S. House of Representatives in 2009 but failed to pass the Senate. Instead, they have the potential of creating the right incentives to reduce the burning of fossil fuels and increase the supply of clean, renewable energy sources.

1. The Citizen Climate Lobby's (CCL's) "**Fee and Dividend**" legislative proposal, has the clear objective of returning atmospheric CO_2 levels to 350 ppm (from the current 400+ ppm level); it involves a fee of $15 per ton of CO_2 equivalent collected "up-stream" at the mine, well-head or port of entry. The fee would increase by $10 per ton of CO_2 equivalent, per year, and is to be collected on all other greenhouse gasses (GHGs), including methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons (HFCs) on the basis of equivalent heating impact. Revenue would be paid into a Carbon Fee Trust Fund, with 100% of the Fund to finance equal per-person monthly energy dividend payments. Equal monthly per-person payments would be made to all American households (1/2 per child under 18 years old, with a limit of 2 children per family) each month. The total value of all monthly rebate payments would represent 100% of the total carbon fees collected per month. Imports from countries without similar legislation would be subject to a tariff, and exports subject to a subsidy, to maintain competitiveness. Fossil-fuel subsidies would be phased out over five years, and a moratorium placed on new coal-fired plants. (Legislation introduced in the 111th Congress by Rep. Larson (D-CT), H.R. 1337 America's Energy Security Trust Fund Act, and by Rep. Inglis (R-SC), H.R. 2380 Raise Wages Cut Carbon Act, reflects an approach very similar to this.)
   http://citizensclimatelobby.org/files/images/FeeAndDividendLegProposal081811.pdf

2. Representative Chris Van Hollen's **"Healthy Climate and Family Security Act of 2014**" is a "Cap and Dividend" bill designed to cut fossil fuel use by 80% (of the 2005 level) by 2050. Production permits would be auctioned and all revenue returned to holders of Social Security numbers, equally per capita. The rebate would be tax free. Border adjustments would protect against countries without similar policies, and compensate for extra cost of exporters. Other GHGs would be controlled by the Environmental Protection Agency using the Clean Air Act, with methane produced by agriculture exempt. Annual permits would be reduced by 10% every five years. Restrictions would prevent speculative purchase or sale of permits. Fossil fuels destined to "non-emitting use" would be exempt. Anyone successfully capturing and sequestering CO_2 from power plants would be granted permits equal to the tons captured *and sequestered*. If the auction price is double the average for the preceding two years, additional permits would be sold to reduce the price.

(The bill is only 22 pages, versus about 1,400 for the defunct "Cap and Trade" Bill). See https://vanhollen.house.gov/sites/vanhollen.house.gov/files/VANHOL_042_xml_final.pdf

3. Senators Sheldon Whitehouse and Brian Schatz' "**American Opportunity Carbon Fee Act of 2015"** is a tax and rebate bill designed to reduce CO_2 emissions by at least 40% (of the2005 level) by 2025. All revenue would be used for: (a) an annual inflation-adjusted $500 refundable tax credit ($1,000 for couples filing jointly) and to reduced top corporate income tax from 33% to 29%; (b) a $500 annual benefit for Social Security beneficiaries, veterans, and retirees; and (c) modest State discretionary funds. The fee would start in 2016 at $45 per ton of CO_2 and increase by 2% above the rate of inflation each year. For fossil fuels, the tax would be collected at the mine, well-head, or port-of-entry; for other GHGs, it would be collected from major polluters. The bill provides for border adjustments. See http://www.whitehouse.senate.gov/download/?id=0fd52394-9832-4bba-8f49-491a71d558fa&download=1

These are three different but, in a sense, similar proposals. The CCL initiative is the most ambitious in that its intent is to reduce atmospheric CO_2 to 350 ppm, while the other two only aim to *slow down* the rate of emissions, resulting, thus, in atmospheric CO_2 well above 400 ppm. Contrariwise, the Whitehouse-Schatz proposal of $45 per ton tax is three times as aggressive as the CCL proposal for $15 a ton, although after about four years the CCL proposal would overtake the Senators' proposal. Notably, none of the proposals give short run estimates of supply or demand elasticity. The Van Hollen and CCL proposals agree on returning all funds to consumers on an equal per capita basis, while the Whitehouse-Schatz proposal features business tax reductions and social security benefits. The Whitehouse-Schatz bill also seems to be designed to garner some Republican support in that it reduces company taxes. All rely on the market.