

A NEW SYNTHESIS OF PUBLIC ADMINISTRATION

NS is an International Co-Operation Project Led by:
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A PGI Think Piece

WHY IS IT SO DIFFICULT TO MAKE PROGRESS ON CLIMATE CHANGE?

by Jocelyne Bourgon, January 2020



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Why Is It so Difficult to Make Progress on Climate Change?

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Summary

Climate change is one of the greatest threats facing humanity today. Despite scientific evidence, years of international negotiations and growing public concern, progress on climate change remains elusive. Utilizing insights from the New Synthesis of Public Administration (NS) Initiative, this paper examines why it is difficult to understand climate change and how to do something about it. The paper argues that in our modern world of interdependent problems, linear human thinking shaped by factors evolving on a human scale and unfolding along human timelines, combined with a poor understanding of complex systems, are blinding us to the accelerating pace of changes affecting the planet. Climate change cannot be solved along national silos, and, so far, it has proven impossible to make progress by asking countries to act in concert. In short, progress to date has been insufficient to change the path upon which we are walking. This begs the question: what is needed to accelerate the pace of change in government, business, and society to keep up with the increasing velocity of climate changes? The New Synthesis Initiative argues that “the way we think has a direct impact on the way we frame issues, the solutions that will be found and the results that will be achieved.” There is a need for a broader mental map that encompasses all aspects of life in society using a dynamic approach to collective problem solving. It would bring together, in an integrated whole, the roles of government, business, and citizens as public value creators. Conventional approaches are insufficient to produce viable solutions to the complex issues we are facing collectively. More than ever before, climate change brings to the fore our shared responsibility for the stewardship of the planet. Governments can adopt regulatory measures and prepare eco-economic strategies to ensure that their economies respect ecological principles. Companies can take proactive measures and develop business plans to reduce their dependency on fossil fuel and CO2 emissions. Citizens can choose not to be spectators and mobilize to set society on a sustainable human trajectory. This calls for distributed leadership, increased collective consciousness, and holistic thinking across systems and across multiple timelines. This is our time and our Copernicus moment.

Key Words: Climate Change. Governance. Re-think. Re-frame. Re-invent. New Synthesis. Eco-economy. Collective consciousness. Holistic and dynamic thinking. Collective problem solving. Distributed leadership.

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Introduction

Despite scientific evidence, years of international negotiations and growing public concern, progress on climate change remains elusive.

The *New Synthesis Initiative* has argued that “the way we think has a direct impact on the way we frame issues, the solutions that will be found and the results that will be achieved” (Bourgon 2018). Why is our mental map making it inherently difficult to understand climate change and to set society on a sustainable trajectory?

The New Synthesis has also argued that “a system is perfectly designed to generate the results we are witnessing. To change the results, we need to re-think the ideas that have given rise to the problem in the first instance, re-frame the issue from a broader perspective and re-invent solutions adapted to the context where they must take hold” (Bourgon, 2017). Can the *New Synthesis of Public Administration* (NS)¹ help to shed new light on what makes climate change such a uniquely difficult problem to understand and address?

Why is it so Difficult to Understand Climate Change?

Too Big to Grasp

From the Paleolithic age (old stone age) until now, human thinking has been shaped by events unfolding on a human scale and along human timelines. People are aware of changes that affect them most directly during their lifetime and they have some appreciation of changes that have taken place during the lifetime of their parents. The average human life spans about 80 years.

The timelines relevant to geological or planetary phenomena like climate change, acidification of the oceans, desertification, deforestation, ice cap melting, and ozone depletion evolve on a totally different scale of magnitude. The universe is 13.8 billion years old. Earth was formed 4.5 billion years ago; life began 3.7 billion years ago. Humans have existed for 300,000 years (Lovelock J. 2019). Phenomena unfolding on a planetary scale and along geological timelines are of critical importance for life on Earth, but their scale makes it difficult to grasp. Climate changes require thinking along multiple timelines ranging from short, mid, long, very long, geological, and planetary.

On a planetary scale, heat will eventually destroy planet Earth. It took 3.7 billion years for life on Earth to build a system that keeps Earth’s temperature under control. During that time, heat emissions from the sun increased by about 20 %. The issue is not whether heat emissions from the sun will continue to increase - they will - it is about preventing human activities from accelerating the heating process by destroying the conditions that have made human life possible. It is about *reducing* the self-inflicted consequences of human activities that affect life on Earth, the planet that sustains us.

1 See NS Fieldbook (Bourgon, 2017) and NS of Public administration (Bourgon, 2011)

The inclination to think along human timelines has several consequences. The first is to give more weight to short-term costs over longer-term impacts. The second is unwarranted optimism about the human capacity to turn things around when it is needed. Humans tend to assume that when a problem reaches critical proportions, there will be time to take corrective actions. This is a dangerous assumption in the case of complex systems in general, and climate changes in particular.

Too Complex for Reductionist Solutions

CO₂ emissions over the last 100 years have accumulated in the atmosphere. The increasing concentration of CO₂ particles in turn causes climate changes. By the time the damage becomes visible, the problem is already serious. The impact of remediation measures will only materialize over very long periods of time. The average lifetime of greenhouse gases in the atmosphere is in the hundreds of years. CO₂ half-life is 40 years while other emissions' half-life run up to 200 years (Wagner and Weitzman, 2015).

Complex systems evolve at different speeds. They have thresholds and tipping points beyond which the pace of change accelerates and the whole system moves to a new, and sometimes irreversible state. Complex systems have emergent properties that display a high degree of uncertainty.

The difficulty of thinking along multiple timelines and the lack of appreciation of the long timelines of remediation measures lead to delayed or ineffective actions. The lack of understanding of complex systems leads to underestimating the urgency of the climate crisis. These blind spots inhibit progress on climate change (Capra and Luisi, 2014).

The skill most needed to address complex issues like climate change is the capacity to think dynamically across systems and across multiple timelines. This means that short term actions must build the capacity to make progress in the mid-term in a way that improves the likelihood of success over the time horizon most relevant to the issue. In the case of climate change, the question is; what can be done today to improve the likelihood of setting the planet on a sustainable human trajectory in the mid-term and thus reduce the risks of cataclysmic climate changes? Each generation is left with the responsibility to act within its timeframe with a view of improving the outcomes *beyond its lifetime*.

Too Dynamic for Linear Thinking

People often find it difficult to understand the difference between stocks and flow (stock is the accumulated amount, the flow is the rate of growth). International negotiations on climate change have focused on reducing the rate of growth of CO₂ emissions (flow). What matters is the stock of CO₂ in the atmosphere. For instance, The Kyoto Protocol adopted in 1997 aimed to cut CO₂ emissions around 5 % by 2012 relative to 1990 levels. The Paris Agreement, adopted in 2015, aimed to keep the increase in global average temperature below 2 °C above pre-industrial levels; and to pursue efforts to limit the increase to 1.5 °C. These Agreements are important. However, reducing the rate of growth (flow) means that the stock of CO₂ in the atmosphere continues to increase and that the situation will continue to deteriorate. If the rate of emission exceeds the rate at which CO₂ is re-captured, climate changes will continue to accelerate. The Montreal Protocol adopted in 1987 is often touted as the most successful multilateral environmental agreement. It is worth

noting that it did not focus on reducing the rate of growth but on the complete phasing out of ozone-destroying substances (ODS); this is why it was successful.

Currently, it is estimated that the flow of CO₂ emissions is at twice the rate of nature's capacity to capture and sink CO₂ emissions. Measures aimed at curbing the growth rate of CO₂ emissions give the impression of making progress, while, in fact, these measures are insufficient to address the problem.

In June 2019, wildfires in Alaska and Siberia released 50 megatons of CO₂. The level of emissions of other gases, including methane, during these events remains unknown. Alaskan and Siberian wildfires burnt peat and peat moss, which have been instrumental in the planet's storage of CO₂ emissions over thousands of years. One small scale bushfire in the Arctic can release enough CO₂ and methane in the atmosphere (flow) to wipe out a country's effort to curb its domestic growth rate of CO₂ emission and significantly increase the overall number of particles in the atmosphere (stock). Forest fires, floods, and ocean and global warming *cannot be understood or solved in isolation* from each other. Our thinking about environmental challenges including climate changes must catch up with the holistic nature of the ecological systems of which we are part; we must rediscover the "oneness" of life and nature.

Too Fast for Incremental Actions

The most powerful force in the universe is exponential growth (Einstein). The human population, energy consumption, synthetic chemicals production, trash, and the size of deserts on earth are growing exponentially.

The world's population is also growing exponentially. It is projected to grow from 7.7 billion in 2019 to 8.5 billion in 2030, 9.5 billion in 2050, and to 10.9 billion in 2100 (UN Population, 2015). Many of the fastest growing populations are in the poorest countries, thus putting additional pressure on an already fragile environment.

The world economy is growing exponentially. An annual growth rate of 3.5 % will double the size of the industrial world in 20 years. The climate crisis we are experiencing is the result of exponential economic and population growth on a planet with finite resources. It is the result of a misalignment of economic, social and ecological systems (Brown, 2001).

Ten billion tons of ice melted on Wednesday July 31st, 2019, according to the Danish Meteorological Institute, creating a net mass of ice loss of 197 billion tons from Greenland in July alone. The release of 100 billion tons of water raises the sea level by 0.28 milliliters. The USA and Greenland have estimated that the melting of ice in Greenland alone, everything else being constant, will add 33 centimeters to rising sea levels by 2100 and that the melting of all of Greenland's ice would rise sea levels by 7.2 meters. But of course, nothing is constant. Record-breaking fires are raging in the Amazon - one of the most biodiverse ecosystems for the entire planet. Human activities, including deforestation, slash-and-burn agricultural practices, and the drive to extract mineral resources and logging have all contributed as catalysts to these fires. The National Institute for Space Research (INPE) in Brazil noted that there have been 80,000 fires so far this year (2019) in Brazil. This is an 84 % jump compared to the number of fires the country experienced over the same time period in 2018 (Taylor, 2019). More than half of those fires are taking place in the Amazon,

which is regarded as the world's largest CO₂ sink. Scientists have indicated that the Amazon rainforest is at risk of gradually turning into a dry savanna.

Complex problems cannot be understood in isolation from each other or addressed through disaggregated interventions. They are interdependent. Exponential population growth, economic growth, ice melting, and forest fires are interconnected issues. These factors and others are interacting in ways that are *accelerating global warming and climatic changes*. Human thinking shaped by factors evolving on a human scale and unfolding along human timelines, combined with a poor understanding of complex systems, are blinding us to the accelerating pace of changes affecting the planet. Simultaneously, governments ponder whether something out of the ordinary needs to be done.

Why is it so Difficult to Do Something about Climate Change?

After you...

No other issue is as directly dependent on global collaboration as is climate change. International cooperation in various areas has contributed to human progress. In many cases, international agreements made it possible for countries to progress at a pace that reconciled their individual interests with the benefits derived from participating in a broader group's effort. Historically, this has been the case for multilateral trade agreements, agreements constraining nuclear arms proliferation, and agreements expanding human rights.

In the case of climate change, however, the heterogeneity of situations among countries makes it easy to disagree and difficult to agree on the way forward. What is in the best interest of a country at any given point in time may be the worst path for the planet. Developing countries can reasonably argue that the most advanced economies have generated most of the stock of CO₂ emissions and that the level of development they have achieved depends on their access to cheap fossil energy. Developed countries can reasonably argue that progress is impossible unless the most populous countries like China and India curtail their CO₂ emissions and reduce their use of coal. The USA can reasonably argue that they will take actions only if China is prepared to do its part. Canada can reasonably argue that a level playing field with the USA is needed for them to act. Every country has a good reason to hold back; meanwhile “the house is on fire”(Thunberg, 2019).²

The issue cannot be solved in national silos, and, so far, it has proven impossible to make progress by asking countries to act in a likewise fashion. Is it possible to unite countries behind a common public purpose broad enough to allow for diversity of actions? Framing the issue in terms of CO₂ emissions has not rallied the world behind a call to action, and as useful as they might be, carbon taxes are easy targets for climate change deniers.

² Greta Thunberg, the Swedish teenage environmental activist, used this phrase during the 2019 World Economic Forum (WEF) to urge leaders to act on climate change.

The overarching challenge is to preserve the life sustaining power of the only planet we know to be able to support human life. A unifying purpose would help to recognize the diversity of circumstances faced by various countries and to recognize that varied contributions are valued and urgently needed. For instance, actions encouraging family planning, curtailing the environmental footprint of the digital economy, protecting the Amazon and biodiversity in general, and revamping agricultural policies are complementary measures needed to reduce the world dependency on fossil fuels. A broader umbrella would make it easier for countries, partners, and citizens to initiate actions within their control and avoid using the need for collective action as a justification for their inaction.

Human beings have caused climate changes over decades and will be dealing with the aftermath of this issue for centuries. There is enough scope for all to initiate specific mitigating actions to prevent some of the most detrimental effects and to bring about a better future than the one that will otherwise exist.

Pay Now and Pay Later: The “Chosen Ones”

Climate changes have started to affect peoples’ daily lives. It is impacting the bottom line of companies in various domains. Central banks are starting to research the economic implications of climate changes and how they may affect monetary policies. Governments are being hit with the increasing costs of intensifying temperature, floods, and storms.

This generation will experience a double set of costs. They will pay the price for the climatic disturbances resulting from the actions of prior generations and they will have to fund the mitigation measures that will benefit future generations: they are ‘the chosen ones’. The costs resulting from past actions include responses to flooding, forest fires, heat waves, as well as increasing health costs, loss of life, and destruction of nature. Remediation measures will include higher costs for fossil fuel, taxes, alternative energy, etc. Policies to cut greenhouse emissions will not have a discernible impact on global warming for decades and even for centuries.

These costs will affect respective sectors and countries differently, making domestic and international collaboration difficult, setting the stage for conflicts. A greater focus on sharing costs as well as distribution of benefits will be needed to overcome some of these disconnects. The development of new industries, technologies, and forms of energy security are among the potential benefits. A careful attention to the global distribution of the incentives could help address some of the imbalances arising from efforts to curtail climate changes. This might also overcome time and cost disconnects (Wagner and Weitzman, 2015).

In the early 20th century, countries undergoing a double process of change involving industrialization and democratization invented the “social state.” A mix of policies and programs were put in place to steer society through a rapid period of change. One of the questions that these countries faced at the time was “what should be done to help citizens in times of need and in a period of unprecedented changes?” The answer varied, but it generally included measures such as public education, support for the most vulnerable, pensions for the elderly, active measures for the unemployed, and some form of access to public health, etc. These measures encouraged social cohesion, built solidarity, and immensely contributed to economic prosperity.

In contemporary terms, the question may be, “what we are prepared to do to help fellow human beings through these unprecedented disruptions due to climate changes that result from the actions of prior generations?” A related question may be: “what would a ‘Marshall Plan’ to set the world on a more sustainable trajectory look like?”

Preparing for the Worst or Changing Course?

Preventing an acceleration of climate changes and ensuring that the planet is on a sustainable *human trajectory* are the greatest challenges human beings are facing in this early part of the 21st century. This is our most important rendez-vous with history. It will require a different way of thinking from the one prevailing during the 20th century when short-term solutions held more value than future considerations and when self-interest was more pressing than collective interests.

Human beings are linear thinkers. We have difficulty grasping the dynamic interrelationships among and across multiple systems. The short human lifespan has conditioned us to pay attention to the here and now. Planetary phenomena unfolding along geological timelines or at an exponential rate are difficult to grasp.

For years, climate change has been on the agenda of governments. The progress to date has been insufficient to change the path we are on. This lack of progress reveals the difficulty to grasp the scale, scope, and speed of the unfolding events and the difficulty of building support behind the actions needed.

So, what is one to do? Should we get ready for desperate measures if all else fails and prepare for the conflicts to come? What would it take to pull governments out of the paralysis that is holding back progress?

In Technology We Trust?

One of the greatest risks going forward may lie in a combination of resignation, ignorance, arrogance, and unquestionable faith in technological capabilities. Resignation makes us believe that *nothing can be done*. Ignorance leads us to believe that *nothing needs to be done*. Arrogance is to believe that *we know more than we do*.

We live in a period when the future of the planet will be the result of human actions, decisions, and ways of life. This is the Anthropocene era, the age in which humans acquired the power to transform the physical world on a *massive scale* (Lovelock, 2014). This does not mean that our understanding of world scale phenomena and our wisdom are commensurate to our technological capabilities. Having the technological capacity to affect the climate of the planet and making wise use of technological capabilities are two very different things. Public fear in the face of extreme climate changes, combined with ignorance, a touch of arrogance, and technological might is a potent mix that could set the world on an unpredictable path with irreversible consequences.

This is not as farfetched as it may sound; this scenario is in the making today. Geo-engineering research is currently exploring how large-scale manipulations of the earth’s systems may

reverse the damages caused by humans' activities. Geo-engineering interventions will become increasingly appealing as climatic changes begin to displace large numbers of people. Cambridge University has a Center for Climate Repair as part of its Carbon Neutral Futures Initiative. They are conducting an initiative on deploying 'space sails' to deflect heat. On August 1st, 2019, Harvard University announced that a "Stratospheric Controlled Perturbation Experiment" will be conducted in the coming months. A few kilograms of particles will be dropped in the stratosphere to conduct simulation on how this may affect climatic changes. Eventually, artificial intelligence (AI) could be used to decide where, when, and how many particles need to be dropped to cool down the planet. The capabilities for drones and AI computer-controlled cockpits already exist. The petroleum industry and the military have a keen interest in such research. In May 2019, Saudi Arabia and the United States of America, the two most prominent producers of oil and gas, opposed the idea of regulating geo-engineering at a UN assembly meeting. These experiments entail scientific, social, and political risks.

In the past, the balance between technological might and the use that society makes of it has been the result of social norms and public values. We have the capacity to run farms to collect organs - but we do not do so because it is unethical. We have the capacity to genetically generate superhumans but, we have not. We have the capacity to start a nuclear war that would inflict irreparable global harm, but years of effort have been dedicated to avoiding such an outcome. The scientific community has displayed much self-restraint. Social norms, public values and self-restraint have been the safeguards of human technological progress. What normative frame will guide actions and decisions about engineering the climate of the planet? Low cost geo-engineering options and the diversity of circumstances may make it irresistible for some countries to attempt to influence climate changes in their favor. Interventions by some countries would inevitably lead to counter-reactions by others. The President of the United States of America recently mused about the possibility of using atomic bombs to deter hurricane formation. The potential for climate warfare in the coming years is a very real possibility.

Technological innovations are needed and will be part of the solution. The point is to avoid a "spirit of technicity" (Schmitt, 1993); a belief that there are technological solutions to what are basically problems of society, such as climate change. A techno-managerial focus bears its own set of risks. It limits the discussion about change within existing parameters so that nothing really needs to change. It provides a false sense of reassurance that it is possible to continue generating CO2 emissions without restraints because there will be "technological solutions." It avoids addressing the root causes of climate changes and circumvents fundamental questions about the way society is organized (Brown, 2001:129). The ecological crises we are experiencing is anchored in the way society is organized: The system is perfectly designed to generate the results we are witnessing (Bourgon, 2017).

In Government We Trust?

The world's top five warmest years on record since instrument records started in 1880 have occurred since 2014 and it is almost certain that 2019 will be added to the list. Greenhouse gas concentration is at its highest level in 3 million years and the odds favor more record-breaking years ahead. The Arctic is melting, floods are running havoc in Asia, and the Americas and the Amazon are burning. There is a growing public feeling that something existential is happening and that the efforts deployed by governments to date have been

ineffective.

So far, public support has not translated into support for government actions to reduce CO2 emissions, even when these measures affect people most directly. Government measures to reduce CO2 emissions played a role in the “gilets jaunes” movement in France and in court challenges launched by provincial governments opposing a carbon tax in Canada. The rise of the green movement in the European election in May 2019, the youth movement that started in Sweden, led by Greta Thunberg - a 16-year-old Swedish climate activist - that is expanding in Europe and the Americas may signal that things are changing, but there is still a long way to go to get climate changes at the top of government and business agendas.

Governments are the most powerful instruments for collective action. They are the intermediaries with the responsibility to steer society through an ongoing process of change. However, the present circumstances make it unlikely that governments will provide the necessary leadership. In fact, the situation is likely to get even worse before it gets better. The trade war between the USA and China is reaching a tipping point. The USA administration denies that climate change even exists; other governments are going down the same path. Europe is distracted by internal problems; the UK is consumed by Brexit; Italy is facing a fiscal crisis; populist movements are on the rise. The G7 countries are unable to display a united front on most questions. There are growing tensions in the Gulf region. Russia is playing mischief through cyberwarfare. China is flexing its muscle. Borrowing the expression of Richard Haass, this is “A world in Disarray.”

Can public mobilization pull governments out of their paralysis? Human progress has often been the result of people’s agency. People’s aspirations for a better life have been the driving force behind societal changes like the end of apartheid in South Africa, the civil right movement in the USA, the fall of the Berlin Wall, etc. This requires people to mobilize as citizens rather than consumers.

Powerful lobbies are deploying much effort to frame climate changes in terms of individual choices. People are encouraged to change their behaviors as consumers - changing the way they eat, bicycling to work, buying electric cars, recycling water, avoiding using plastic bags, and using paper straws. These efforts are important because they build public awareness about the importance of the issue, but they will *not* prevent global warming.

Focusing on individual responsibilities is an attempt to avoid addressing the root causes of the problem; the difficulty of reconciling a market economic model based on growth with a sustainable human trajectory. It is a way to privatize the issue and to transfer the responsibility for change to individuals. Powerful lobbies have successfully embraced this approach in other areas: “Guns don’t kill people, people do;” “Packages don’t litter, people do,” etc. The motivation behind framing public policy challenges in terms of irresponsible individual behaviors is to prevent regulatory or structural changes that would serve the collective interest but would affect single interests.

The changes needed exceed what can be accomplished through individual actions. Collective problem solving requires collective actions. People may have difficulty grasping the scale of a phenomenon like climate change, but more and more people are being personally exposed to climate changes that can only be explained by the impact of human actions on the planet. Humans display a powerful survival instinct and unparalleled ingenuity. Climate

change is about to go viral and political, driven by a human instinct for survival.

The Future to be Co-Created

The *New Synthesis Initiative* was launched as an international collaborative effort in 2009. It brings together new ideas from various academic disciplines as well as insights from practice in the field. It is aimed at assisting practitioners who accept the heavy burden of serving and governing in the 21st century (Bourgon 2017). Some insights generated by the New Synthesis Initiative are relevant to the discussion on climate change.

- First: *“the way we think has a direct impact on the way we frame issues, the solutions that will be found and the results that will be achieved.”*
- Second: NS brings complexity theory, system and adaptive system thinking to public administration and public decision-making. It argues that *“a system is perfectly designed to generate the results we are witnessing. If we are not satisfied with the results, we need to re-think the ideas that have given rise to the problem in the first instance, re-frame the issue from a broader perspective and re-invent solutions adapted to the context where they must take hold”*(Bourgon, 2017).
- Third: one of the key findings of the NS Initiative is that *“there are always enough resources and capabilities around to make progress if there is a will”* (Bourgon, 2017).
- Fourth: by the actions they take and decisions they make *“people are the most important producers of public value”* (Bourgon, 2011).

Can some of the findings of the New Synthesis Initiative shed new light and help us to make progress on complex issues like climate change by providing a dynamic and systemic approach to collective problem solving? Can it help public sector leaders think through the multiple dimensions of the issue and map out a trajectory toward a more sustainable future?

A Copernicus Moment

There was a time when people believed that the Earth was at the center of the universe, with the sun and stars circling around it. In the 16th century, Copernicus published a short paper that proposed a set of ideas that changed our understanding of the world and people’s place in it. This is what some call a ‘paradigm shift’ (Kuhn, 1970), but since the expression is often used to describe modest changes, I will therefore describe radical re-thinking as a ‘Copernicus moment’. His view of the world was contested by powerful people in science, government, and the clergy. The preponderance of evidence over time proved him right and the rest is history.³

There comes a time when evidence, insights, and discoveries shed a new perspective about the world around us. We have reached a Copernicus moment that makes it necessary to re-think the ideas that have given rise to climate changes. Many have already argued that the view of the world as an “economic growth centric system based on throw away

³ Copernicus, Nicolaus. 1543. “On the Revolutions of the Celestial Spheres.” <https://www.wdl.org/en/item/3164/>.

consumerism and cheap fossil fuel energy consumption with an automobile centered way of life is unsustainable” (Brown, 2001: 83). This view of the world will not work over the long-term for the most affluent countries and even less for the entire world.

Recognizing that the Earth was not the center of the solar system set the stage for a multitude of scientific discoveries. Similarly, recognizing that the economy is not the center of the world would bring about a new balance and a recalibration between the ecological, economic, and social spheres of life. Considering ecology as the main system and economics as a sub-system would be a Copernicus moment; a reordering of concepts and ideas that have supported decision-making through the industrial age but are inadequate to invent solutions to address the challenges of the 21st century. When reality does not fit the theory, re-thinking the theory from a different and broader perspective that embraces the best available evidence is the only way forward.

Multiple ‘big shifts’, as coined by management experts, John Hagel III, John Seely Brown, and Lang Davidson in a *Harvard Business Review* article, are needed to curb the dependency on fossil fuels, prevent further acceleration of climate changes, and put the world on a more promising trajectory. Each one may unfold differently, start from a different place and be led by different people. These shifts will require clarity of purpose to ensure coherence, collective problem solving, and distributed leadership on an unprecedented scale. Addressing the fundamentals behind climate changes requires nothing less than to re-conceptualize the interrelationships between the economic, social, environmental, and political spheres of life in society.

It's the Ecology Stupid! A Big Shift from Economy to Eco-Economy

The expression “It’s the economy stupid!” became known as Bill Clinton’s de facto election message in his successful 1992 presidential campaign against President George H. W. Bush. Tapping into the challenges of the then-prevailing recession in the U.S., the Clinton campaign framed the election around the economy. It is time to re-think this proposition and to review the underlying assumptions.

An economy that is sustainable does not self-destruct. An eco-economy is one that respects the principles of ecology. Conventional economics does not reflect the true costs of goods and services and as a result provides misleading information to decision-makers. Markets notoriously do not pay attention to imbalances between carbon emissions and nature’s capacity to fix and recycle carbon. The social and environmental impacts of economic decisions are considered ‘externalities’. This means that the State, people, and communities are left with the responsibility of dealing with the social and environmental consequences of economic decisions. From a conventional economic perspective, environmental impact is merely the cost of doing business. A more comprehensive and holistic way of thinking is needed to improve government and business decision-making.

For instance, cost-benefit analyses are frequently used to support decision-making. They do not recognize the value of the services provided by an ecosystem. Ecology is telling us that the Amazon forest is worth more for the wellbeing of the planet than the value of the

timber or the food that could be harvested if it was burnt down. The Amazon forest has a primordial impact on the climate cycle of the planet. Once it is gone, there is no turning back. Economics is telling us to cut it down. Ecology is telling us to stop pumping water when the level of an aquifer is declining. Economics is telling us to dig deeper (Brown, 2001). Evaluating the cost of the services provided by ecosystems is not an easy task but any reasonable estimates would be an improvement over assigning a zero value to natural capital as it is done currently. Ecological and economic analysis must be reconciled to improve decision-making.

Conventional economics does not consider the costs of cataclysmic environmental events with unknown probability. Global warming is a *risk management problem*. It is an existential risk on a planetary scale. It is unlike any other environmental issue and unlike any other public policy challenge: “It is uniquely global, uniquely long-term, uniquely irreversible and uniquely uncertain” (Wagner and Weitzman, 2015:7). For instance, the work of the Intergovernmental Panel on Climate Change (IPCC) and of the International Energy Agency (IEA) suggests that there is up to a 10 % probability for eventual temperature increases exceeding 6 °C. People take insurance to protect themselves against risks with much less than a 1 % probability such as the risks of car accidents or of their house burning. It is irresponsible to brush aside risks on a planetary scale. The most basic ‘precautionary principle’ tells us that it is irresponsible not to consider a credible risk when a cataclysmic event could cause irreparable harm (Wagner and Weitzman, 2016:79). Conventional economics counts what can easily be quantified and leaves aside what is of greatest value for society. This is inadequate to support decision-making in the 21st century on issues like climate change.

None of this is new and all of this is well-known to the economic community. The consequences of conventional economics are visible in collapsing fisheries, expanding desertification, declining water tables, deforestation, rising CO2 levels, rising temperatures, melting glaciers, rising sea levels, dying coral reefs, declining ecological diversity, etc. We know the consequences and we know how to do better: this big shift is long overdue.

The pioneering work of Dr Weitzman (Dismal Theorem), Robert Stains, Paul Romer and others on environmental economics has demonstrated the weaknesses of conventional approaches. The work of Paul Romer and William Nordhaus, 2018 Nobel prize winners, show the way to more ecologically robust approaches: “In a world where the demands of the economy are pressing against the limits of natural systems, relying on distorted market signals to guide [...] decisions is a recipe for disaster” (Brown, 2001:80). A shift is needed from conventional economics to what Lester R. Brown has called an *Eco-economy* to build an economy that respects fundamental principles of ecology. This implies a reordering of concepts that sees ecology as the broader system and economy as a sub-system that must contribute to the well-being of the broader system. This would bring greater clarity to the true costs and consequences of the decisions we make as a society and the avenues open for building a more sustainable human trajectory.

The knowledge needed is available and some countries are even showing the way. For instance, Denmark has a stable population. It has banned coal fire plants. In 2014, wind power alone produced 42.7 % of Denmark’s electricity. It has restructured its urban transportation network. Costa Rica has a plan to shift to renewable energy by 2025. Finland is working toward a hydrogen-powered economy. These efforts are insufficient to achieve a sustainable eco-economy, but they are moving in the right direction. *Every country needs*

an eco-economy strategy.

Business Heal Thyself... or Else: A Big Shift from Shareholders Profit Maximization to Societal Results Optimization

Most economic models assume perpetual growth on a planet with finite resources. Liberal economies have relied on growth to solve economic and political conflicts by promising everyone a larger slice of the pie. This was possible for a time; it cannot work forever. This has only been possible because existing business models do not internalize the natural capital costs. Internalizing the natural capital costs would reveal that many of the biggest companies and sectors are unprofitable. They report significant profits because they are heavily subsidized and monetize the use of the natural capital of the planet (Brown, 2001:139). Today, “what is needed is not just better accounting but a new global industrial system” (Roberts, 2013).

There is almost unanimity among scientists today that the natural capital of the planet will not be sufficient to ensure a middle-class way of life for all, even though people in other countries, including China, India, Indonesia and developing countries, have every right to aspire to a level of life comparable to their counterparts in the most developed countries.

The prevailing business model works by applying to all production factors a ‘commodity form’ enforced through a legal system. The concepts relevant to commodities are money, financial capital, and prices. The preponderant view is that *financial* capital is the most important asset. It must therefore be invested to generate returns that can be reinvested to keep the system going. The case could be made that *natural* capital is now the scarce resource and most valuable resource to future human progress.

The economic policies and business practices that have yielded extraordinary growth in the 20th century are the same ones that are consuming the world’s endowment of natural capital. A preponderant focus on growth and existing business practices are the underlying causes of the ecological crises we are facing.

The concept of a ‘Green Economy’ emerged around 2008 in response to increasing public pressures and mounting evidence of environmental damages. It was defined variously and may reflect a more or less ambitious approach. The United Nations defined a Green Economy as “an economy that results in improved human well-being and reduced inequalities over the long term, while not exposing future generations to significant environmental risks and ecological scarcities.” (UNEP 2010:5). The OECD definition is more ambitious. It defines Green Economy as “a way to pursue economic growth and development while preventing environmental degradation, biodiversity loss and unsustainable natural resource use” (OECD 2010:9). Both definitions propose a more holistic view although they reveal some serious limitations. Essentially, they propose to do less harm within the current parameters of existing business models without challenging the assumption of perpetual growth. Kenneth Boulding, a distinguished economist, famously wrote in 1996 that: “Anyone who believes that exponential growth can go on forever in a finite world is either a madman or an

economist.”⁴

Business and business leaders have an unprecedented opportunity and a responsibility to re-design global industrial eco-systems compatible with circular and green economy concepts. They have benefited by monetizing the natural capital of the planet. They must now shape a business model that is better aligned to the realities of the 21st century. Some business leaders are more proactive than others. They see that it is in their business interest to play a proactive role in reshaping the industrial eco-systems and business models rather than to take a reactive stance. This is the case with Amazon’s “Climate Pledge” with the goal of becoming carbon-neutral by 2040 (Calma, 2019). It is worth noting that these commitments came as a result of pressure exercised by Amazon tech employees who pledged to fight for a livable planet. British Petroleum (BP) also provides an example of the changes afoot in the private sector. BP’s CEO, Bob Dudley is transforming an oil and gas company into an energy company that produces and uses energy in cleaner ways. It incentivized 36,000 employees by linking their performance bonuses to emissions reduction targets (BP, 2018). Changes are coming one way or another. People will increasingly demand change that will affect the prevailing business model; reluctantly or otherwise, business and government will respond to these pressures.

A ‘greening’ strategy for every industrial sector is possible and needed. Some industries, (and not least the oil and gas industry and the car manufacturing industries), are actively exploring ways of increasing their energy efficiency and reducing their greenhouse gas emissions. The need to address climate changes offers an unprecedented opportunity to redesign the functioning of key industrial sectors and to align the necessary investments in support. The message to the market is *heal thyself, or else*. Regulation will be needed to provide the market with the incentives for change and to ensure that governments fulfill their precautionary responsibilities. The regulatory regime needed may be more or less constraining depending on the proclivity of the private sectors’ approach to change.

The Special Case of the Digital Economy:

Most of the attention to reduce CO₂ emissions has focused on conventional sectors such as mining, coal, oil and gas, transportation, the automotive industries, etc. Meanwhile, the environmental footprint of the digital economy has attracted little attention and yet its environmental impact is significant, with the energy need of this sector growing exponentially.

The digital economy has been described differently at different times. It includes the information economy (1970), knowledge economy (1980), the new economy (1990) and the internet economy (2000). The digital economy is made possible by modern technologies supporting the transmission and processing of data and information. The environmental footprint of the digital economy is significant, from the extraction and mining of rare earth, to the manufacturing of hardware (PC, tablets, phones, chips, etc.) and digital applications through the internet, data processing centers, cloud architecture, AI learning, blockchains, etc.

The world information-communication technologies ecosystem consumes annually as much

⁴ Cited in Ehrlich and Ehrlich (2016:3). Also, see Coscieme et. al. 2019. Overcoming the Myths of Main-stream Economics to Enable a New Wellbeing Economy. Sustainability 11, 4374

energy as the electricity generation capacity of Japan and Germany combined (Mills, 2013). For instance, a single bitcoin transaction requires 215 kilowatt-hours of electricity. This is equivalent to what an average American household consumes in one week, and it is enough to fill two Tesla batteries, run a fridge-freezer for a year, or boil 1872 liters of water (Malmo, 2017). There are about 300,000 bitcoin transactions per day. Bitcoin miners worldwide are using enough electricity at any given time to power 2.26 million American homes (Malmo, 2017). Stiglitz argued that “Bitcoin is thousands of times less efficient than a credit card network.”

Coal is the world’s largest single source of energy and will remain the case in the foreseeable future. This means that the growing energy needs of the digital economy will increasingly depend on coal. This led Mills (2013:3) to argue that “the cloud begins with coal.” The implications are that on the current trajectory, the growth of the digital economy and its supporting ecosystem will accelerate climate change and the warming of the planet. This should not be allowed to happen.

The challenge for the industry and the dominant players such as Microsoft, Apple, Facebook, Amazon, Google, and Huawei is to set the industry on a path that reconciles the digital economy business imperatives, human progress, and vital ecological interests. This is unlikely to happen without concerted government and business efforts and much vigilance by citizens. The rapid growth of the digital world requires *special and urgent attention* to ensure that the digital economy that is taking shape will be compatible with a green and ‘circular economy’ (circular economies take a regenerative approach to minimize waste by creating a close-loop system that employs reusing, recycling, sharing, repairing, refurbishing and remanufacturing). It would be disastrous if the efforts to curtail the world dependency on fossil fuel in conventional sectors was all for nothing because the digital techno-ecosystem will generate even more CO2 emissions. There is an urgent need to ensure that the digital economy will be part of the solution: this is not a forgone conclusion.

In summary, the leadership that is needed from business leaders goes well beyond the concept of ‘social responsibilities’ whereby companies are expected to invest in their communities, or of philanthropy where well paid executives fund social causes. The issue is not about compensation and how corporate leaders spend their money but about how wealth is generated, and money is made in the first instance.

The business leadership needed is one that builds synergies between the economic, societal, and environmental spheres of life. Major firms need to come clean about the scale of their environmental impact and to develop a meaningful strategy for the greening of their operations. Corporate boards need to oversee a shift from shareholder maximization to societal results optimization. Shareholders should ensure that every industrial sector benefits from a comprehensive greening strategy. There is a need for distributed leadership on an unprecedented scale across sectors, at multiple levels, in business and in government.

The Return of Citizens: A Big Shift: From Consumers to Stewards of a Sustainable Future

People’s behavior as consumers matters -reducing the use of plastic, eating less meat, rethinking urban transportation to encourage bicycling, public transportation or the use

of electric cars, etc. help to curtail the growth of CO2 emissions. The most important contribution of these measures is that they build a collective awareness of the importance, scale, and scope of the issue; but changing consumer behaviors will not solve the problem. Fortunately, people are much more than consumers. They are citizens, and as citizens, they can influence the trajectory of their countries.

People may find it difficult to understand complex issues unfolding on a planetary scale, but they have powerful survival instincts. Global warming is an existential threat and people are getting increasingly vocal in demanding change.

Governments can overcome the paralysis that is holding them back if there is enough public demand for change. Public institutions are the most powerful instruments available to bring about change on the scale needed to put the world on a more sustainable trajectory. It would be a mistake to lose faith in the public institutions that at prior times were used to outlaw slavery and child labor, battle the great recession and depression, or give citizens dignity in old age. If anything, public institutions must be re-focused on matters of the highest public interest.

The active engagement of citizens is needed to ensure that global warming is at the top of government agendas in their respective countries. Global warming is imminently a complex, global and interdependent issue. There is a growing collective awareness that global warming is an existential threat that concerns everyone, affects every region and requires urgent actions at multiple levels. Collective awareness leading to pressing demands for change has been one of the missing elements for global progress. People, as citizens, may ultimately be called upon to be the guardian of the life sustaining power of the planet they share. It should be noted that public mobilization ('hitting the streets') is not the ideal situation, as it speaks to a failure of leaders to listen to the public before the public feels compelled to take action. A public that feels compelled to take action, however, is one that will often force the state's to pay attention.

Conclusion: Our Copernicus Moment

Climate change and global warming are a risk management issue. It is an existential threat on a planetary scale. It is unlike any other environmental issue and unlike any other public policy challenge. "It is uniquely global, uniquely long-term, uniquely irreversible and uniquely uncertain" (Wagner and Weitzman, 2015:7). The most basic understanding of the precautionary principle should leave everyone convinced of the need to take action; each acting at the pace of its increasing awareness and all taking actions commensurate with their capacity and sphere of influence.

We know enough to take action. We know what to do to prevent global warming and we know how to do it. Everything mentioned in the previous section is already happening in some countries, companies, or sectors, albeit at an insufficient scale and at an insufficient speed.

Governments can prepare eco-economic strategies to ensure that their economies respect ecological principles. They know how and have the capabilities to work with industries to prepare greening strategies for sectors of critical importance and deploy the resources necessary to assist the regions and employees most affected. This is particularly important

for the energy sector, transportation and automotive industries, etc. It is also essential to ensure that the expansion of the digital economy is compatible with a green economy agenda. Some countries are already taking steps along these lines.

Governments know that they will need to use their regulatory power for carbon pricing, one way or the other. This is needed to provide the right incentives for energy producers and consumers alike. It makes energy efficiency more attractive and low carbon solutions such as renewable, carbon capture or storage more competitive.

Companies know how and have the capabilities to assess the environmental footprints of their ecosystems. Some companies are redesigning their operations to make better use of renewable energies. A natural next step would see publicly traded companies monitor their progress toward reducing CO₂ emission by submitting an annual report for approval by their board of Directors and shareholders. This would encourage transparency and accountability. It would help to identify leaders and encourage laggards to improve their performance.

We know how to improve cost-benefit analysis by integrating environmental costs and impacts. This is a necessary step to improve public and private sector decision-making by revealing the true cost of the choices we are making as a society. It is also needed to send a clearer signal to markets about the true cost of CO₂ emissions.

Citizens know the importance of their contribution to a green and circular economy. A culture advocating the need for reducing, reusing, and recycling is progressively taking hold. We must find ways to build and sustain momentum.

There is no shortage of knowledge, know-how, capabilities, and human ingenuity. Despite this; progress to date has been insufficient to change the course of events. This paper asked, “what is needed to accelerate the pace of change in government, business, and society to keep pace with the increasing velocity of climate changes?” A key ingredient for accelerating the pace of change is to reach a *critical level of public awareness and collective consciousness*. This is needed to deploy a countervailing force to overcome single interests and to generate conditions that provide government with the legitimacy to take actions.

Public awareness and collective consciousness are needed to lift the veil of ‘willful blindness’ (Hefferman, 2011) that affects society. People in positions of authority in business and in government *know* what is *known*. Some have chosen to deliberately blind themselves to direct proof and to deny critical facts and evidence. Public awareness and collective consciousness make such a position untenable. There are some risks that no one has the right to take; neither government, business nor any other agent in society. Global warming is among them. Those who deliberately blind themselves to the obvious and gamble with the future of the planet must be held to account at least in the court of public opinion, if not in the court of justice.

Preventing global warming and setting the world on a more sustainable human trajectory involves a collective responsibility. It tests humanity’s capacity for collective problem solving on an unprecedented scale. It requires distributed leadership in every sphere of life and at every level. To be sure, public and business leaders bear a special responsibility, but so do individuals, families and communities.

The situation calls for true leadership because it requires acting *now* within one's sphere of influence in a way commensurate with one's capacity to bring about change without knowing if others will reciprocate. Such leadership is required while being cognizant that future generations will be the beneficiaries of today's action. This, in turn, requires a civic spirit, that is not always on display, to ensure that the collective interest trumps single interests (No pun intended). Climate changes bring to the fore, more than ever before, our collective responsibility for the stewardship of the planet and the importance of our role as citizens.

Most would agree that progress to date has been insufficient. The missing ingredient for gaining momentum and accelerating the pace of change may be an insufficient level of collective consciousness. That is to say, protecting and preserving the life-sustaining power of the planet is the ultimate responsibility of every human being.

We know what needs to be done and know how to get it done, but “knowing is not enough; we must apply. Willing is not enough; we must do.”⁵

An important chapter in human history is in the making.

5 This quote is often attributed to Johann Wolfgang von Goethe, a German writer, philosopher and statesman—Von Goethe, Johann Wolfgang. “On Knowing and Willing by Johann Wolfgang von Goethe (Gurteen Knowledge).” Accessed October 31, 2019. <http://www.gurteen.com/gurteen/gurteen.nsf/id/L004447/>

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