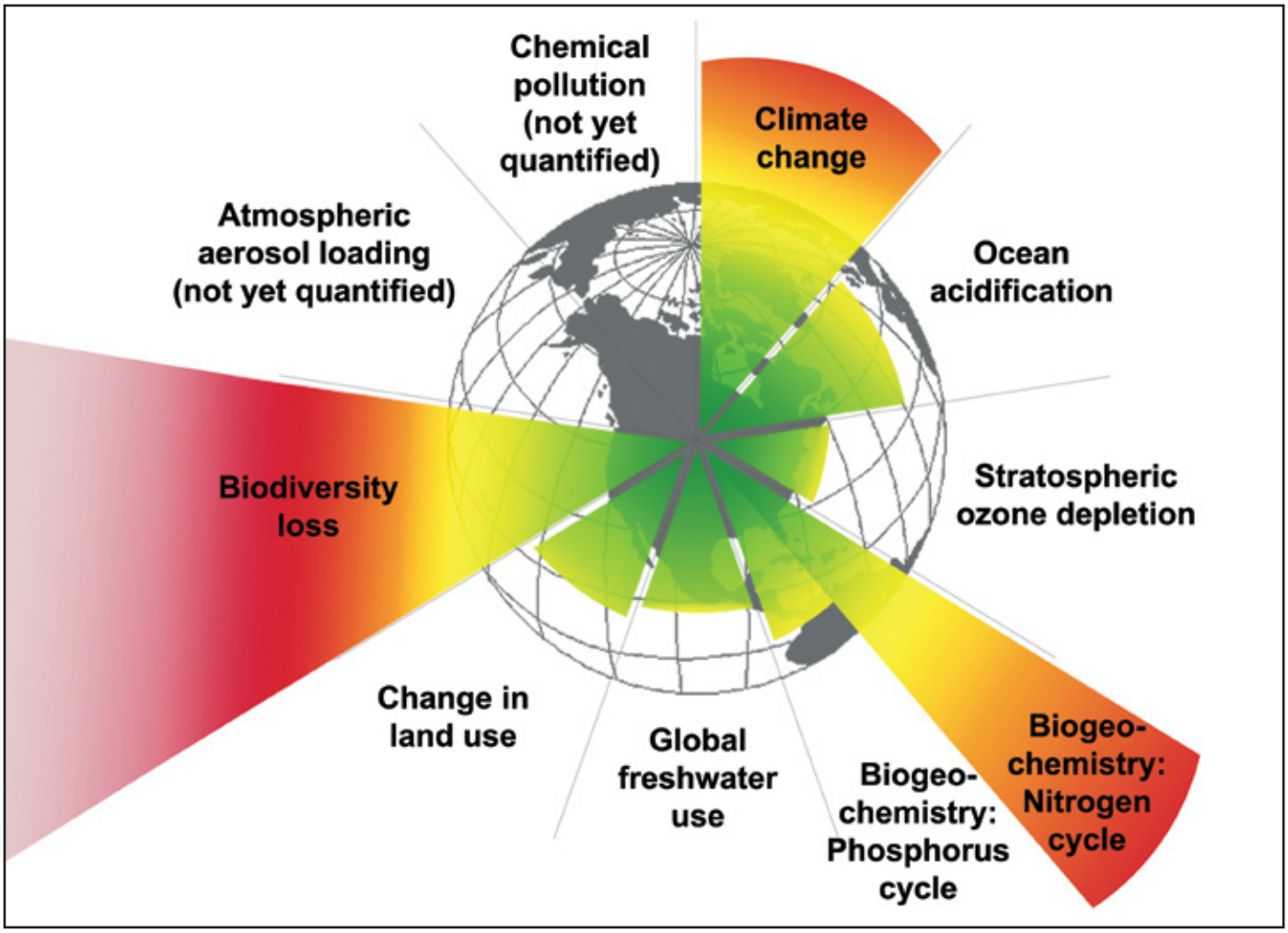

Figure 1: The globe represents the proposed safe operating space for planetary systems with the wedges representing an estimate of the current position for each. Source: Steffen et al., 2011. How Defining Planetary Boundaries Can Transform Our Approach to Growth. Solutions. http://www.thesolutionsjournal.com/node/935

Future Earth: A Sustainable Planet for Future Generations

Gordon McBean

Now in the Anthropocene, the Age of Man, sustainable development needs to be implemented to enable future generations to meet their needs for an ethical and equitable planet. The International Council for Science and global partners have initiated a new research program Future Earth: Research for Global Sustainability. To fully address societal concerns and link society, economy and environment, the Future Earth program will engage stakeholders across societies to "co-design", "co-produce" and "co-deliver" the program.

In 1987, the UN's World Commission on Environment and Development presented its report *Our Common Future, From One Earth to One World* which defined sustainable development as: "humanity has the ability to make development sustainable—to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainable development explicitly requires looking ahead, well beyond the next election, and not compromis-

ing the needs of future generations and is very much about one world.

Canada has been a leader on these issues as reflected by the 1988 Toronto Conference on The Changing Atmosphere: Implications for Global Security, which was opened by Prime Ministers Brian Mulroney of Canada and Gro Brundtland of Norway, who had been the chair of the World Commission on Environment and Development. The Conference's summary opened with: "Humanity is conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war". At the 1992 UN Conference on Environment and Development in Rio de Janeiro, chaired by Maurice Strong of Canada, Mulroney and his Environment minister, Jean Charest, played leading roles. The Conference agreed to the Framework Convention on Climate Change, Convention on Biological Diversity and Commission on Sustainable Development, which provide a framework for action to address the issues of global environmental change and sustainable development.

More recently, Prime Minister Stephen Harper signed the 2009 Copenhagen Accord which states that "climate change is one of the greatest challenges of our time. … deep cuts in global emissions are required… Adaptation to the adverse effects of climate change … urgently required."

The scientific judgment now is that the Earth's evolution is defined by human's massive impact and we have entered the Anthropocene—*the Age of Man*—according to Professor Paul Crutzen, Nobel Prize winner for his analysis of ozone layer chemistry. Maintaining our global environment for human development and well-being requires that humanity respect planetary boundaries that delineate a "safe operating space" for humanity (Figure 1). Our Planet is already beyond the boundaries for biodiversity loss, nitrogen cycle and climate change and actions are needed. Stratospheric ozone depletion is one area of progress with the Montreal Protocol on ozone depleting substances having a strong scientific basis.

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In the previous issue of *Policy* Magazine on Sustainable Energy, David McLaughlin noted that Canada will get only about halfway to the common US-Canada target on greenhouse gas emissions while the US will achieve it. The Fall 2014 Report of the Commissioner of the Environment and Sustainable Development concluded that: "Current federal measures will have little effect on emissions by 2020". Although Environment Canada had recently committed to the principle of transparency, "the Department's approach to some of the planned regulations for greenhouse gas emissions has not been consistent with federal requirements and the principles of world-class regulation, in terms of the extent and nature of consultation."

The Future Earth approach, discussed below, is emphasizing consultation across all sectors of all societies. It's definitely a big idea on the environment.

In the past few years, Canadians have been impacted by the increasing numbers of extreme weather-climate events of which the Calgary and Toronto floods are only two examples. In January, 2014, the Parliamentary Budget noted that the 280 per cent increased spending in the first six months of 2013-14 of Public Safety Canada's Emergency Preparedness program activity and the $4.1 billion federal liability associated with major flooding and rainstorm events in 2011 through 2013. The Insurance Bureau of Canada President Don Forgeron stated "Water is our biggest problem, and adaptation is our solution." As Dan Gagnier, former head of the Energy Policy Institute of Canada, observed in *Policy* Magazine's sustainable energy issue, "Quite frankly we are beyond mitigation and need to focus hard on adaptation". The conclusion is that Canadians and people around the globe need to adapt: "making adjustments in our decisions, activities and thinking because of observed or expected changes in climate, in order to moderate harm or take advantage of new opportunities." We need to recognize that we also need mitigation now to protect our grandchildren from the impacts beyond 2050.

The World Health Organization recently reported on Global Mortalities and Climate Change with projections for 2030 and 2050. Compared with a future without climate change, they project that there will be by 2030, the following additional deaths per year: 38,000 due to heat exposure in elderly people; 48,000 from diarrhoea; 60,000 from malaria; and 95,000 due to childhood under nutrition. By 2050, the number of additional deaths due to heat exposure will be over 100,000 per year with approximately 250,000 additional deaths due to climate change per year between 2030 and 2050.

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To achieve sustainable development requires an integrated approach across social, environmental and economic issues, including climate change and disaster risk reduction, and to understand the abilities and needs of present and future generations. The International Council for Science, working with the

International Social Sciences Council, UNESCO, UNEP, United Nations University, World Meteorological Organization and a global consortium of national funding agencies, has initiated a new global program, Future Earth: Research for Global Sustainability. The goal is to provide the knowledge required for societies in the world to face risks posed by global environmental change and to seize opportunities in a transition to global sustainability. The program will be structured in three interacting themes: dynamic planet; global development; and transformations towards sustainability. A cross-cutting theme is research on both natural and social-economic components and the interactions between them. There will be research to examine the fundamental and innovative long-term transformations that are needed to move towards a sustainable future. Significant shifts in political, economic and cultural values and changes in institutional structures and individual behaviours, with technological innovations, will be needed to address global environmental change and its consequences.

To strengthen international science for the benefit of society, all societies, and its vision of a world where science is used for the benefit of all, excellence in science is valued and scientific knowledge is effectively linked to policy making.

The approach to implementing Future Earth recognizes the need to fully engage stakeholders from governments, business sector, non-governmental organizations and others around the world in consultation with a transparent approach. The implementation of Future Earth will be undertaken by having Scientific and Engagement Committees working together from the beginning to co-design the program leading to co-production and co-delivery of knowledge to societies.

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This fits well with the mission of the International Council for Science to strengthen international science for the benefit of society, all societies, and its vision of a world where science is used for the benefit of all, excellence in science is valued and scientific knowledge is effectively linked to policy making. Future Earth will be managed by a global network of program offices, located in Tokyo, Colorado, Paris, Stockholm and Montreal with regional offices in Africa, south Asia and Latin America. The program will bring together the existing programs on global change, biodiversity, human dimensions and climate change that have been underway for two to three decades and have provided the present basis for knowledge.

While preparing this article, I attended the Science and Technology in Society Forum 11th Annual Meeting in Kyoto, Japan. Japan's Prime Minister Shinzo Abe spoke at the opening ceremonies and about 1,000 global leaders in science and technology, policy, business and media from approximately 100 countries, regions and international organizations met to discuss how to strengthen the "*lights*" (the benefits) and control the "*shadows*" (such as health and environmental impacts) of science and technology. The Forum's statement included the words: "Global environmental problems are reaching a critical stage. The need for a consensus on specific measures to reduce CO2 emissions is urgent". This Forum was followed by the inaugural meeting of the Innovation for Cool Earth Forum (ICEF) in Tokyo. As Prime Minister Abe stated there, the ICEF is to be a meeting of world's leading policy makers, business persons and researchers to address climate change through innovation. These sessions give one some hope that the issue of greenhouse gas emissions may be addressed and the "lights" will shine while the "shadows" are diminished for an ethical and equitable planet now and for many future generations.

As David McLaughlin wrote: "It is time to rethink this approach". He was speaking of emissions' targets but it is clear that we need to rethink our overall approaches to human-economy-environment so that a sustainably developed future becomes a reality. There are many intersections across our society, economy and the environment and within the environment. For example, actions to reduce smog in cities can be effectively linked to GHG emissions, noting also that the occurrence of smog with its health implications will increase as the climate warms, unless smog-creating emissions are reduced. Climate warming is also projected to cause a metre or more in sea level rise, affecting our economy as well as societies. Following the example of Future Earth with its engagement of stakeholders across societies, there is need for open, transparent consultation with the stakeholders in Canada, including the broad scientific community and all societal sectors, to co-design, co-produce and co-deliver a sustainable development policy and actions for Canada. For the benefit of all grandchildren, it is essential that future policies address these issues for the decades to come. P

Gordon McBean is President of the International Council for Science, Professor at the University of Western Ontario and Co-Director, Centre for Environment and Sustainability and Director, Policy Studies, Institute of Catastrophic Loss Reduction.
gmcbean@uwo.ca