Environmental Petitions

Contact information:

[redacted]

Name of the group (if applicable):

The Qualicum Institute

[redacted]

Title of petition:

The relationship of science to the Sustainable Development Strategy

Background Information:

Introduction

As an MP, Prime Minister Trudeau wisely stated, *"there are a lot of people out there, environmental thinkers like Herman Daly and others, who talk about the fact that maybe endless growth within a finite system is not either possible or even desirable. Maybe we have to talk about shifting our focus…"*.[1] This statement is wise because there is an honest and simple recognition that science must inform politics and policy in order to safeguard society's core values. Endless growth on a finite planet just isn't possible and, as science has shown, we're at the limits now. However, after reviewing Canada's Sustainable Development Strategy (SDS), we are concerned that the Prime Minister's wisdom has been lost and instead of science informing politics, politics is now trying to skew science under the "sustainability" banner in order to prop up ever more economic growth—business-as-usual. This is further reflected in the Prime Minister's statement that we don't need to choose between a healthy environment and a strong, growing economy.[2] In fact, we do need to choose if the economy is continually growing and currently, science is telling us we're making the wrong choice. Our petition questions why the tables have turned and seeks to demonstrate that the Prime Minister was right when he initially recognized that politics must flow from science.

What the science is telling us

Since the 1972 publication of *Limits to Growth (LtG)*, there have been a number of scientists' warnings about human impacts to the biosphere and the changes we must make if we are to become a sustainable civilization.

LtG, itself, warned that:

> If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.[3]

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1 Geddes, J. 2012. In conversation: Justin Trudeau. *Maclean's* 27 February 2012.

2 Liberal platform: Real change: a new plan for Canada's environment and economy. https://www.liberal.ca/realchange/real-change-a-new-plan-for-canadas-environment-and-economy/ [22 March 2017]

3 Meadows, D. H. et al. 1972. *The limits to growth*. Universe Books, New York. pp. 23–24.

Indeed, *LtG* even warned of the potential for climate change: "It is not known how much CO_2 or thermal pollution can be released without causing irreversible changes in the earth's climate."

One of the main factors *LtG* cited as exacerbating the situation was economic growth: "For the first time, it has become vital to inquire into the cost of unrestricted material growth and to consider alternatives to its continuation." Yet we did not heed their warning. Today, a number of independent studies show that we are significantly aligned with the *LtG* Standard Run which is the business-as-usual growth scenario that projects global collapse of our economic system and population around mid-century.[4,5,6,7]

In 1979, the first "World Climate Conference" expressed concern that "continued expansion of man's activities on Earth may cause significant extended regional and even global changes of climate. Later, in 1985, the United Nations Environment Program, World Meteorological Organization, and the International Council for Science, held a conference that concluded: "as a result of the increasing greenhouse gases it is now believed that in the first half of the [21st century] a rise of global mean temperature could occur which is greater than in any man's history."[8]

In 1988, the United Nations and World Health Organization established the Intergovernmental Panel on Climate Change (IPCC). The IPCC published its first report in 1990 and its fifth report in 2014. The fifth report concluded that "Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years."[9]

Despite these scientific warnings, we have yet to seriously address climate change,[10] all the while knowing the main contributor to greenhouse gas emissions is global economic growth,[6,9,11] facilitated by per-capita consumption and population growth. "Unless economic growth can be reconciled with unprecedented rates of decarbonization (in excess of 6% per year), it is difficult to envisage anything other than a planned economic recession being compatible with stabilization at or below 650 ppmv CO_2e [equal to a catastrophic 4°C increase]."[12] There is also little evidence that economic growth, operating concurrently with decarbonization efforts, has produced any effective reduction of greenhouse gas (GHG) emissions.[13,14]

In 1992, 1,700 of the world's leading scientists issued a warning to humanity:

> Human beings and the natural world are on a collision course. Human activities … put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the

4 Turner, 2014. Is global collapse imminent? MSSI Research Paper No. 4, Melbourne Sustainable Society Institute, The University of Melbourne; http://sustainable.unimelb.edu.au/ sites/default/files/docs/MSSI-ResearchPaper-4_Turner_2014.pdf

5 Hall, C.A.S. and J.W. Day Jr. 2009. Revisiting the Limits to Growth after peak oil. *American Scientist* 97:230–237.

6 Pasqualino, R., A. Jones, I. Monasterolo and A. Phillips. 2015. Understanding Global Systems Today—A Calibration of the World3-03 Model between 1995 and 2012. *Sustainability* 7:9864–9889.

7 Jackson, T. and R. Webster. 2016. *LIMITS REVISITED A review of the limits to growth debate.* All-Party Parliamentary Group (APPG), London, England <http://limits2growth.org.uk/revisited> [19 April 2017].

8 World Meteorological Organization. 1986. *Report of the International Conference on the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts, Villach, Austria, 9-15 October 1985*. University of California.

9 IPCC. 2014. Climate Change 2014 Synthesis Report: Summary for Policymakers. https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf [22 March 2017]

10 *The Paris Agreement Is Now In Effect. In Canada You'd Never Know | DeSmog Canada*. 2016. <https://www.desmog.ca/2016/11/04/paris-agreement-now-effect-canada-you-d-never-know-it> [28 March 2017].

11 Canadell, J.G. et al. 2007. Contributions to accelerating atmospheric CO_2 growth from economic activity, carbon intensity, and efficiency of natural sinks. *Proceedings of the National Academy of Sciences.* 104:18866–18870. http://www.pnas.org/content/104/47/18866.full.pdf

12 Anderson and Bows. 2008. Reframing the climate change challenge in light of post-2000 emission trends. *Phil. Trans. R. Soc. A* 366:3863–3882.

13 Green, R. 2015. *Green capitalism: the god that failed*. World Economics Association.

14 Wiedman, T.O. 2012. The material footprint of nations. *Proceedings of the National Academy of Sciences* 112:6271–6276.

> living world that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about. [15]

The scientists emphasized that "Current economic practices which damage the environment, in both developed and underdeveloped nations, cannot be continued without the risk that vital global systems will be damaged beyond repair."

This is because current economic practices remove the structural elements of ecosystems, deplete non-renewable resources, physically displace healthy ecosystems and their services, and degrade remaining ecosystems with waste. It is clear, we must move to an economic system that is sustainable, one that is not ecologically illiterate,[16] a system that is in balance with the regenerative and assimilative capacity of the biosphere.[17,18,19,20,21]

In 1993, 58 of the world's scientific academies held a population summit that concluded:

> ... time is short and appropriate policy decisions are urgently needed. ... In our judgment, humanity's ability to deal successfully with its social, economic, and environmental problems will require the achievement of zero population growth within the lifetime of our children.[22]

In 2005, 1,360 scientists conducted the largest assessment of the planet's ecosystems to date—the Millennium Ecosystem Assessment (MEA). They found that 60% of the ecosystem services—the life-support services of the planet—were being degraded or used unsustainably.[23] The MEA concluded:

> At the heart of this assessment is a stark warning. Human activity is putting such strain on the natural functions of Earth that ***the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted*** [our emphasis].
>
> … We must learn to recognize the true value of nature ... the protection of these assets can no longer be seen as an optional extra, to be considered once more pressing concerns such as wealth creation or national security have been dealt with.[23]

Since these warnings were issued, there has been much additional scientific research documenting increasing impacts to the biosphere on a grand scale as a result of our pernicious demand for economic growth:

- climate change continues unabated with 2001–2016 among the hottest years ever recorded.[24,25] Economic growth is a driver of climate change and continuing under our current and unsustainable economic paradigm may be a fatal mistake: "In true Orwellian style, the political and economic dogma that has come to pervade all facets of society

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15 World Scientists' Warning to Humanity. 1992. Union of Concerned Scientists. http://www.ucsusa.org/about/1992-world-scientists.html#.V4-yReDr2Um

16 Jackson, T. 2011. *Prosperity without growth: economics for a finite planet*. Pbk. ed ed. Earthscan, London ; Washington, DC.

17 Daly, H.E. 2005. Economics in a full world; *Scientific American*, September 2005:100–107.

18 Victor, P.A. 2008. *Managing without growth: slower by design, not disaster*. (Advances in ecological economics). Edward Elgar, Cheltenham, UK ; Northampton, MA.

19 Douthwaite, R.J. 1999. *The growth illusion: how economic growth has enriched the few, impoverished the many, and endangered the planet*. Rev. and updated ed ed. New Society Publishers, Gabriola Island, B.C. Canada.

20 Fullbrook, E. Ed. 2004. *A guide to what's wrong with economics*. (Anthem studies in political economy and globalization). Anthem, London.

21 Czech, B. 2013. *Supply shock: economic growth at the crossroads and the steady state solution*. New Society Publishers, Gabriola, BC.

22 "Science Summit" on World Population: A Joint Statement by 58 of the World's Scientific Academies. *Population and Development Review.* 20:233–238.

23 Millennium Ecosystem Assessment, 2005. *Living beyond our means; Statement from the Board*. World Resources Institute, Washington, DC.

24 *Global Analysis - Annual 2015 | State of the Climate | National Centers for Environmental Information (NCEI)*. n.d. <https://www.ncdc.noaa.gov/sotc/global/201513> [16 February 2017].

25 *Global Analysis - December 2016 | State of the Climate | National Centers for Environmental Information (NCEI)*. n.d. <https://www.ncdc.noaa.gov/sotc/global/201612> [16 February 2017].

must not be questioned. For many years, green-growth oratory has quashed any voice with the audacity to suggest that the carbon budgets associated with 2°C cannot be reconciled with the mantra of economic growth."[26]

- biodiversity has fallen below safe levels globally,[27] threatening life itself for ***it is all these organisms simply living out their daily lives that facilitate ecosystem functioning and the provision of the planet's life-support services.***[28] This is impossible to correct under our current economic system because a *fundamental conflict* exists between biodiversity conservation and economic growth.[29] In addition, the fact that we're driving many species to extinction is a significant moral failing.[30]
- we have exceeded a number of planetary boundaries that define a safe operating space in which human societies can develop and thrive[31,32] "The exponential growth of human activities is raising concern that further pressure on the Earth System could destabilize critical biophysical systems and trigger abrupt or irreversible environmental changes that would be deleterious or even catastrophic for human well-being. ***This is a profound dilemma because the predominant paradigm of social and economic development remains largely oblivious to the risk of human-induced environmental disasters at continental to planetary scales*** [our emphasis]. ... The thresholds in key Earth System processes exist irrespective of peoples' preferences, values, or compromises based on political and socioeconomic feasibility, such as expectations of technological breakthroughs and fluctuations in economic growth."[33]
- we are approaching a state-shift in the biosphere as a result of human influence.[34] To postpone or possibly avert such a shift "will require reducing world population growth and per-capita resource use [the two drivers of economic growth]; ... and enhancing efforts to manage as reservoirs of biodiversity and ecosystem services, both in the terrestrial and marine realms, the parts of Earth's surface that are not already dominated by humans."

Background summary

Canada's Sustainable Development Strategy is presented as a science-based approach to economic development (i.e. growth) while respecting the principles of sustainability guided by the "Precautionary Principle." However, the abundance of scientific inquiry that we have referenced is not reflected in the SDS and this precludes the application of the Precautionary Principle. When policy does not consider the weight of scientific evidence, the result is magical thinking. We believe that people and the environment that supports them are worth more than that; we deserve the chance to move towards a sustainable civilization and we need to pay attention to the results of scientific inquiry to do that. We believe that politics can be informed by science and therefore we seek clarification combined with evidence as to how these principles are in fact being respected.

Petition questions and/or requests:

1. The Government of Canada has stated that we don't need to choose between a healthy environment and a strong, growing economy.[35] However, recent science tells us this is probably not true. For example, global economic growth accounts for a

26 Anderson, K. 2015. Talks in the city of light generate more heat. *Nature* 528:437.
27 Newbold, T. 2016. Has land use pushed terrestrial biodiversity beyond the planetary boundary? A global assessment, *Science* 353:288–291.
28 Hooper, D.U., et al. 2005. Effects of biodiversity on ecosystem functioning: A consensus of current knowledge. *Ecological Monographs* 75:3–35
29 Czech, B. 2000. Economic growth as the limiting factor for wildlife conservation. *Wildlife Society Bulletin* 28:4–14.
30 Cafaro, P., and R. Primack. 2014. Species extinction is a great moral wrong. *Biological Conservation* 170:1–2.
31 Rockström, J., et al. 2009. A safe operating space for humanity. *Nature* 461:472–475.
32 Steffen, W., et al. 2015. Planetary boundaries: Guiding human development on a changing planet. *Science* 347:1259855–1259855.
33 Rockström, J., et al. 2009. Planetary boundaries: exploring the safe operating space for humanity. *Ecology and Society* 14:32. [online] URL: http://www.ecologyandsociety.org/ vol14/iss2/art32/
34 Barnosky, A.D., et al. 2012. Approaching a state shift in Earth's biosphere. *Nature* 486:52–58.
35 Liberal platform: Real change: a new plan for Canada's environment and economy. https://www.liberal.ca/realchange/real-change-a-new-plan-for-canadas-environment-and-economy/ [22 March 2017]

majority of the increase in CO_2 emissions and is a roadblock to reducing those emissions.[36,37,38,39] In addition, biodiversity loss continues to increase in step with the growth of our ecological footprint[40,41] **What peer reviewed science—not neoclassical economics—is the government relying on to make the claim that we don't need to choose between a healthy environment and a strong, *growing* economy? Given that many scientific studies tend to refute this claim, how is the government applying the precautionary principle by encouraging economic growth on a finite planet with limited resources when there are well-documented threats of irreversible damage if we continue with business-as-usual?** Federal departments responsible for reply: **Environment and Climate Change Canada; Natural Resources Canada; Department of Finance Canada**

2. Global land and water temperature anomalies are close to 1 °C [42] with CO_2 levels around 406 ppm [43] thus there appears to be little hope, assuming we continue our current actions, in keeping the global mean surface temperature anomaly below 2 °C,[44] the threshold between dangerous and extremely dangerous climate change. **What evidence does the SDS rely on that justifies disregarding the correlation between economic growth and increasing GHG emissions? How does Canada plan on achieving its Paris Agreement target of a 30% reduction below 2007 levels while continuing to grow the economy?** Federal departments responsible for reply: **Environment and Climate Change Canada**

3. Approval of the Kinder Morgan and Line 3 pipelines has sparked criticism that Canada will not achieve its emission reduction goal.[45,46] **What is the government's answer to the criticism of their approving two more pipelines, which will result in the global growth of emissions when reducing global emissions is the target? How does Canada justify the support of increasing fossil fuel extraction and exportation when the goal is to reduce global GHG emissions on an absolute basis?** Federal departments responsible for reply: **Environment and Climate Change Canada; Natural Resources Canada.**

4. Between 1976 and 2008, Canada's GDP grew at an average rate of 2%[47], increasing 5-fold over that period. Despite the latter GDP growth over those 33 years, the poverty rate grew at an average rate of 0.04% while the unemployment rate fell at -0.37%; in other words, both essentially flat-lined.[48] In addition, between 1999 and 2012, Canada's GDP grew at the same

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36 Canadell, J.G. et al. 2007. Contributions to accelerating atmospheric CO_2 growth from economic activity, carbon intensity, and efficiency of natural sinks. *Proceedings of the National Academy of Sciences.* 104:18866–18870. http://www.pnas.org/content/104/47/18866.full.pdf

37 Anderson, K. and A. Bows. 2008. Reframing the climate change challenge in light of post-2000 emission trends. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 366:3863–3882.

38 Tapia Granados, J.A., E.L. Ionides and Ó. Carpintero. 2012. Climate change and the world economy: short-run determinants of atmospheric CO2. *Environmental Science & Policy* 21:50–62.

39 Rosales, J. 2008. Economic Growth, Climate Change, Biodiversity Loss: Distributive Justice for the Global North and South. *Conservation Biology* 22:1409–1417.

40 WWF. 2014. *Living Planet Report 2014: species and spaces, people and places.* [McLellan, R., Iyengar, L., Jeffries, B. and N. Oerlemans (Eds)]. WWF, Gland, Switzerland.

41 Clausen, R. and R. York. 2008. Global biodiversity decline of marine and freshwater fish: A cross-national analysis of economic, demographic, and ecological influences. *Social Science Research* 37:1310–1320.

42 NOAA. Climate at a glance. https://www.ncdc.noaa.gov/cag/time-series/global/globe/land_ocean/ytd/12 /2000-2017. [22 March 2017]

43 CO2.earth. Keeling curve monthly. https://www.co2.earth/ [22 March 2017]

44 Anderson, K. and A. Bows. 2011. Beyond 'dangerous' climate change: emission scenarios for a new world. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 369:20–44.

45 Hughes, J.D. 2016. *Can Canada Expand Oil and Gas Production, Build Pipelines and Keep Its Climate Change Commitments?* Canadian Centre for Policy Alternatives <https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office%2C%20BC%20Office/2016/06/Can_Canada_Expand_Oil_and_Gas_Production.pdf> [12 May 2017].

46 McDowell, L., T. Stafford and F. Lawong. 2016. *The Global Significance of a New Kinder Morgan Pipeline* Conversations for Responsible Economic Development, Vancouver, BC <http://credbc.ca/wp-content/uploads/2016/11/Global-Significance-of-Kinder-Morgan_WEB.pdf> [12 May 2017].

47 OECD. Gross Domestic Product (GDP). Canada 1976–2008. https://data.oecd.org/gdp/gross-domestic-product-gdp.htm [22 March 2017]

2%[49] and over that period the vast majority of the increase (66%) in wealth went to the wealthiest 20%.[50] Studies have shown that health and social problems such as physical health, mental health, drug abuse, education, imprisonment, obesity, social mobility, trust and community life, violence, teenage pregnancies, and child well-being, outcomes are significantly worse in more unequal rich countries.[51] **In light of the evidence we give in our background of the impacts that economic growth has on Canada's ecosystems and their life support services and despite Canada's GDP growth over 33 years that failed to have a positive impact on poverty and unemployment, or a decrease in wealth inequality, what new action will the government take to reduce poverty and unemployment and attain improved wealth equality without further damaging the environment by growing the economy?** Federal departments responsible for reply: **Environment and Climate Change Canada; Employment and Social Development; Health Canada**

5. As an MP, the Prime Minister has stated: *"there are a lot of people out there, environmental thinkers like Herman Daly and others, who talk about the fact that maybe endless growth within a finite system is not either possible or even desirable. Maybe we have to talk about shifting our focus so that instead of just growing, we're actually developing and improving."* [52] **Since endless growth within a finite world is incompatible with a sustainable civilization, according to current scientific evidence, what is the government's position on eventually shifting from an economy of continuous growth to a steady state economy, a sustainable economy that lies within the regenerative and assimilative capacity of the biosphere?** [53] **If the government has not considered such a shift, why not, and if it has, what factors are preventing the mention of this type of economy in the SDS?** Federal departments responsible for reply: **Environment and Climate Change Canada; Department of Finance Canada; Innovation, Science and Economic Development Canada**

6. Global biodiversity has declined by 58% since 1970 and this rate of loss does not appear to be slowing.[54,55] The direct drivers of biodiversity loss, such as habitat loss, degradation and fragmentation; over-exploitation of biological resources; unsustainable forms of production in agriculture, aquaculture and forestry; pollution such as greenhouse gas emissions and nutrient build-up; introduction of invasive alien species; and the many pressures on ecosystems[56] have all been linked directly to current economic sectors,[57] thus economic growth appears far from being a solution to biodiversity loss.[58] **What science-based evidence is the government using that indicates increasing economic growth will not further reduce biodiversity and continue to threaten people's and other organisms' well-being?**[59] Federal departments responsible for reply: **Environment and Climate Change Canada; Natural Resources Canada; Innovation, Science and Economic Development Canada**

7. Apparently almost no industry is profitable if environmental costs—neoclassical economic externalities—are included in their balance sheets. A recent UN-supported report has shown that high impact region-sectors do not generate sufficient

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48 Statistics Canada. Figure 2.1. Low-income rates and unemployment rate, Canada, 1976 to 2009. http://www.statcan.gc.ca/pub/75f0002m/2012001/fig/fig2.1-eng.htm. [22 March 2017]

49 OECD (2017), Gross domestic product (GDP) (indicator). Canada 1999–2012. doi: 10.1787/dc2f7aec-en [27 March 2017]

50 Macdonald, D. 2014. *Outrageous fortune: documenting Canada's wealth gap*. Canadian Centre for Policy Alternatives.

51 Wilkinson, R.G. and K. Pickett. 2010. *The spirit level: why greater equality makes societies stronger*. Bloomsbury Press, New York.

52 Geddes, J. 2012. In conversation: Justin Trudeau. *Maclean's* 27 February 2012.

53 Daly, H.E. 1996. *Beyond Growth: The economics of sustainable development.* Beacon Press, Boston.

54 Butchart, S.H.M., et al. 2010. Global Biodiversity: Indicators of Recent Declines. *Science* 328:1164–1168.

55 World Wide Fund for Nature. 2016. *Living planet report 2016: risk and resilience in a new era.* <http://awsassets.panda.org/downloads/lpr_living_planet_report_2016.pdf> [23 March 2017].

56 Secretariat of the Convention on Biological Diversity and United Nations Environment Programme Eds. 2014. *Global biodiversity outlook 4: a mid-term assessment of progress towards the implementation of the strategic plan for biodiversity 2011-2020*. Secretariat for the Convention on Biological Diversity, Montreal, Quebec, Canada.

57 Czech, B., P. R. Krausman, and P. K. Devers. 2000. Economic associations among causes of species endangerment in the United States. *Bioscience* 50(7):593-601.

58 Iritie, B.G.J.J. 2015. Economic Growth and Biodiversity: An Overview Conservation Policies in Africa. *Journal of Sustainable Development* 8 <http://www.ccsenet.org/journal/index.php/jsd/article/view/45534> [22 March 2017].

59 Díaz, S., J. Fargione, F.S. Chapin and D. Tilman. 2006. Biodiversity Loss Threatens Human Well-Being. *PLoS Biology* 4:e277.

profit to cover their environmental impacts.[60] **What policies has the government implemented that internalize these costs with efficacy to avoid further depletion of ecosystem goods and services and biodiversity losses? If no policies have been implemented, are they planned and what are they and if not, why not?** Federal departments responsible for reply: **Environment and Climate Change Canada; Department of Finance Canada; Innovation, Science and Economic Development Canada**

8. In the SDS, the government proposes conserving 17% of lands and inland waters and 10% of coastal and marine areas by 2020. We understand these figures come from the Convention on Biological Diversity and the Strategic Plan for Biodiversity 2011–2020.[61] However, the SDS also emphasizes that the government wants to ensure that Canada plays a leading role, including becoming a leader on the international stage.[62] Such land conservation targets should be based on scientifically sound goals and protocols[63] and current ecological studies show that at least 50% of the ecosystems in a region are required to be left in their natural state in order to provide an adequate supply of ecosystem services for humanity.[64,65,66] **In view of the current ecological studies that call for at least 50% of the ecosystems in a region to be left in their natural state, how does following the 10% and 17% conservation goals play a leadership role internationally and how does the government plan on ensuring life-support services for all Canadians with an adequate supply of healthy ecosystems? How is the precautionary principle being applied in the SDS to address the need to protect 50% of natural ecosystems?** Federal departments responsible for reply: **Environment and Climate Change Canada; Fisheries and Oceans Canada; Parks Canada Agency**

9. In the SDS, the Minister uses the term "clean growth" and "low-carbon economy" implying a green economy that can decouple resource use and environmental impacts from economic growth. There is considerable science that calls into serious question the concept of 'green growth' as well as the idea of *absolute* decoupling of resource use from a growing economy.[67,68,69,70] In fact, Decoupling has been called a 'fantasy' that obfuscates fundamental, inherent contradictions among the goals of poverty alleviation, environmental sustainability, and profitable enterprise, while sustaining faith in the possibility of maintaining continuous economic growth.[71] **What peer-reviewed science is the government using that indicates this 'clean growth' or green growth approach is actually possible and efficacious and will not further degrade the biosphere? How is the government applying the Precautionary Principle when there are so many**

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60 Trucost PLC. 2013. *Natural capital at risk: the top 100 externalities of business.* https://www.trucost.com/publication/natural-capital-risk-top-100-externalities-business/ [22 March 2017]

61 Secretariat of the Convention on Biological Diversity and United Nations Environment Programme Eds. 2014. *Global biodiversity outlook 4: a mid-term assessment of progress towards the implementation of the strategic plan for biodiversity 2011-2020*. Secretariat for the Convention on Biological Diversity, Montreal, Quebec, Canada.

62 Environment and Climate Change Canada. 2016. Achieving a sustainable future: a federal sustainable development strategy for Canada 2016 – 2019.

63 Soulé, M.E., and M.A. Sanjayan. 1998. Conservation targets: do they help? *Science* 279: 2060–2061.

64 Noss, R.F., A.P. Dobson, R. Baldwin, P. Beier, C.R. Davis, D.A. Dellasala, J. Francis, H. Locke, K. Nowak, R. Lopez, C. Reining, S.C. Trombulak and G. Tabor. 2012. Bolder Thinking for Conservation: *Editorial*. *Conservation Biology* 26:1–4.

65 Pojar, J. 2010. A New Climate for Conservation: Nature, Carbon and Climate Change in British Columbia, p. 71— http://cpaws.org/uploads/NewClimate_report_CPAWS.pdf

66 Terborgh, J. W. 2006. Reserves: How much is enough and how do we get there from here? Companion to Principles of Conservation Biology. 3rd Edition. Ed. M. J. Groom, G. K. Meffe, and C. R. Carroll. Sinauer Press. http://natureneedshalf.org/wp-content/uploads/2011/04/At-Least-Half-Terborgh-2006.pdf

67 Brand, U. 2012. Green Economy – the Next Oxymoron? No Lessons Learned from Failures of Implementing Sustainable Development. *GAIA* 21: 28 – 3

68 Ward, J.D., P.C. Sutton, A.D. Werner, R. Costanza, S.H. Mohr and C.T. Simmons. 2016. Is Decoupling GDP Growth from Environmental Impact Possible? *PLOS ONE* 11:e0164733.

69 Alexander, S., J. Rutherford, and J. Floyd . 2017. A critique of the decoupling strategy: A 'limits to growth' perspective. Simplicity Institute Report 17b. http://simplicityinstitute.org/wp-content/uploads/2011/04/Critique-of-Decoupling-Strategy-SimplicityInstitute.pdf [3 March 2017]

70 Næss, P. and K.G. Høyer. 2009. The Emperor's Green Clothes: Growth, Decoupling, and Capitalism. *Capitalism Nature Socialism* 20:74–95.

71 Fletcher, R. and C. Rammelt. 2016. Decoupling: A Key Fantasy of the Post-2015 Sustainable Development Agenda. *Globalizations* (December, 14):1–18.

current studies that posit a contrary view to a green, clean growth economy? Federal departments responsible for reply: **Environment and Climate Change Canada; Innovation, Science and Economic Development Canada**