The existential risk to the planetary life support systems: Where does responsibility lie?

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DISCLOSURE STATEMENT

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The future of the Earth's living environment has become a non-issue in the current Australian election.

"*We're simply talking about the very life support system of this planet*" (Hans Joachim Schellnhuber, director Potsdam Institute of Climate Impacts and chief climate advisor to the German Government http://www.reuters.com/article/2009/09/28/us-climate-science-idUSTRE58R3UI20090928)

In a keynote paper titled "*A safe operating space for humanity*" a group of 26 prominent scientists, including Nobel laureate Paul Crutzen, former Goddard Institute for Space Studies climate scientist James Hansen and the German Chancellor's chief climate adviser Hans Joachim Schellnhuber (Rockstrom et al. 2009) (http://www.nature.com/nature/journal/v461/n7263/full/461472a.html) has indicated three of nine interlinked planetary boundaries have already been overstepped. These include (Figure 1):

1. Climate change
2. Biodiversity loss
3. The biogeochemical cycles

According to James Hansen, NASA's former chief climate scientist (http://www.theguardian.com/environment/earth-insight/2013/jul/10/james-hansen-fossil-fuels-runaway-global-warming , http://www.ted.com/talks/james_hansen_why_i_must_speak_out_about_climate_change.html , www.pnas.org/cgi/doi/10.1073/pnas.1205276109) "*Burning all fossil fuels would create a different planet than the one that humanity knows. The palaeoclimate record and ongoing climate change make it clear that the climate system would be pushed beyond tipping points, setting in motion irreversible changes, including ice sheet disintegration with a continually adjusting shoreline, extermination of a substantial fraction of species on the planet, and increasingly devastating regional climate extremes*".

Although it is unlikely the world's fossil fuel reserves, estimated as more than ~13,000 billion tons of carbon (Figure 2) would be combusted, since deteriorating global climate, extreme weather events and their

consequences for agriculture and industry would inevitably reduce the use of fossil fuels, rendering carbon emissions self-limiting.

Kevin Trenberth, chief scientist of the National Center for Atmospheric Research in Boulder, Colorado, states: "*Some of the human-induced changes are occurring 100 times faster than they occur in nature … And this is one of the things that worries me more than climate change itself. It's actually the rate of change that's most worrying… Ecosystems are not prepared for this jolt … And neither are many human endeavours, built around assumptions about how hot it's going to be, how much it's going to rain on our croplands, and how high the seas will rise.*" (http://www.npr.org/2013/08/23/214198814/the-consensus-view-kevin-trenberths-take-on-climate-change)

This observation is dramatically demonstrated by the current rise of atmospheric greenhouse gases at an unprecedented rate of 2 to 3 ppm/year (see Figure 3), which renders our era – the Anthropocene (http://rsta.royalsocietypublishing.org/content/369/1938/842.full) – as a major oxidation event.

As defined the Anthropocene is a new geological era triggered by a species which has uniquely mastered ignition and is excavating and releasing hundreds of billions of tons of carbon from geological formations into atmosphere.

In terms of the growth rate of atmospheric greenhouse gases no such event is known in geological history, except for the excavation of billions of tons of carbon from carbonate and shale formation impacted by asteroids, such as the K-T impact 65 million years ago (http://www.sciencemag.org/content/208/4448/1095.abstract). The consequences for the biosphere, referred to as the sixth mass extinction of species http://www.nature.com/nature/journal/v471/n7336/full/nature09678.html, threatens to become a tragedy for human ideals and for nature.

What or who are responsible for the unfolding calamity?

On the level of the species “Homo sapiens”, once a species masters sources of energy – fire, electricity and nuclear fission – larger by orders of magnitude than its own physiological process, the species can hardly be expected to have the wisdom and degree of responsibility to control the effects of its inventions from getting out of hand.

Unique among all species humans adopted fire and combustion as their source of energy and power over nature. Over the last two million years, camped around camp fires, watching the flames, human imagination has grown to inquire, perceive future possibilities, develop fears, and craving for immortality, and the concept of gods – imparting a mythological quality to the human mind.

Once stable Holocene climates since about ~10,000 years ago allowed cultivation and production of surplus food, the craving for omnipotence and omniscience was expressed by the building of monuments to immortality, the pyramids, as well as endless wars acquiring loot for this purpose.

Spiritual pantheism by pre-historic clans such as the Australian aboriginals has been transformed into admiration of sky gods and monotheism, then into the space cult and crass materialism.

When the theory of “economic rationalism” emerged, pricing every item including cultural and spiritual values, a question arose as to “*The price of the earth*”. As a sign of the times, recently this has been estimated as 3000 trillion pounds (or about $5000 trillion) (http://www.dailymail.co.uk/sciencetech/article-1361145/Earth-worth-3-000-trillion-according-scientists-new-planet-valuing-formula.html).

Since the greenhouse effect and its underlying laws of physics and chemistry were decoded in the 19th century (http://www.aip.org/history/climate/co2.htm), the question has arisen: to what extent will societies and their leaders accept the implications of the science for human industry and human future? Will the scientific method itself and the enlightenment form the basis of future decisions?

In 21st century Australia, the answer has been a resounding “no”. Government and corporate decisions on climate change are being influenced by misconceptions and misrepresentations of the evidence. What began some 20 years ago as presentation of solid empirical evidence has deteriorated to media-controlled debate replete with misunderstandings of the basic laws of physics, paleo-climate science and climate science (http://arxiv.org/abs/1105.0968 http://www.zeroemissionnetwork.org/files/MILESTONES_19-6-07.pdf)

Does responsibility lie with vested interests and fossil fuel lobbies promoting carbon saturation of the atmosphere, or with media barons and their mouthpieces hijacking the information systems of democracies, or with cowardly political “leaders” - presiding over extensive demise of future generations? (http://www.columbia.edu/~jeh1/mailings/2012/20120127_CowardsPart1.pdf , http://www.columbia.edu/~jeh1/mailings/2012/20120130_CowardsPart2.pdf)

A multitude of media outlets and hundreds of websites proliferate notions ignorant of peer-reviewed science. The lesson of numerous attempted debates with those who deny the reality of global warming, or attempt to attribute it to natural non-human factors, is that those entertaining these notions cannot be dissuaded by any amount of scientific evidence.

Misleading pseudoscience continues to promote combustion of fossil fuels. Meanwhile, the unthinkable consequences of 4 degrees Celsius and higher temperature rise on the terrestrial atmosphere-ocean system have already begun (http://www.fourdegrees2011.com.au/presentations/). We are seeing a series of extreme weather events, reflecting the rise in energy/temperature of the atmosphere-ocean system – the “new normal” (http://blog.ucsusa.org/bigger-hotter-and-longer-wildfires-are-the-new-normal-as-the-climate-changes-in-the-west-183).

To cite just a few examples of climate change misconceptions:

1. The claim, as if temperature rise has preceded CO2 rise during the glacial terminations and therefore the current rise of temperature is not the result of CO2 rise (http://www.skepticalscience.com/co2-lags-temperature.htm), is irrelevant. The effects of CO2 and temperature variations are intertwined. During the last ~400,000 years glacial eras were terminated by solar maxima, affecting decreased CO2 solubility in warming water and thereby a rise in CO2 levels of the atmosphere. By contrast climate developments since the 18th century, when negligible or no rise in insolation occurred, were triggered by the anthropogenic greenhouse effect of the release of >560 billion ton carbon, consistent with the basic laws of physics (https://en.wikipedia.org/wiki/Black-body_radiation).

2. The claim as if Global warming represents recovery from the *'Little Ice Age'* (LIA) cannot be sustained: The LIA was caused by a near-cessation of sunspot activity during ~1650-1700, depressing global temperatures by ~0.2-0.3^{o}C relative to preceding periods. By contrast, global warming from about 1975 has tracked toward more than 1.5^{o}C over the continents relative to pre-industrial temperatures (http://berkeleyearth.org/).

3. Claims related to the cosmic rays flux (CRF) effects: A dominant solar effect on the climate since 1970 is ruled out by measurements of solar radiation (http://www.mps.mpg.de/homes/natalie/PAPERS/warming.pdf). The incidence of cosmic rays, which oscillate reciprocally with the 11 years sunspot cycle, has been shown to have minor effects on cloud nucleation and has not varied significantly since the mid-20th century (http://www.pik-potsdam.de/~stefan/Publications/Journals/rahmstorf_etal_eos_2004.html , http://www.sciencedirect.com/science/article/pii/S1364682603000415)

4. The claim as if Carbon dioxide is emitted mainly from volcanoes: According to the United States Geological Survey (2012) sub-

aerial and sub-marine volcanism emits approximately 150 – 260 million tons CO2 per-year whereas anthropogenic emissions total about 35 billion tons CO2/per-year (http://volcanoes.usgs.gov/hazards/gas/climate.php).

5. Mars warming (http://www.skepticalscience.com/global-warming-on-mars.htm): The argument invokes unknown solar system-wide phenomena, despite measurements of solar radiation and the cosmic ray flux which show little change since the mid-20th century. Some temperature fluctuations in Mars are known to be related to dust storms.

   Deceived by such misconceptions Homo “sapiens” continues to march toward a cliff, taking much of nature with it.

   Good planets are hard to come by

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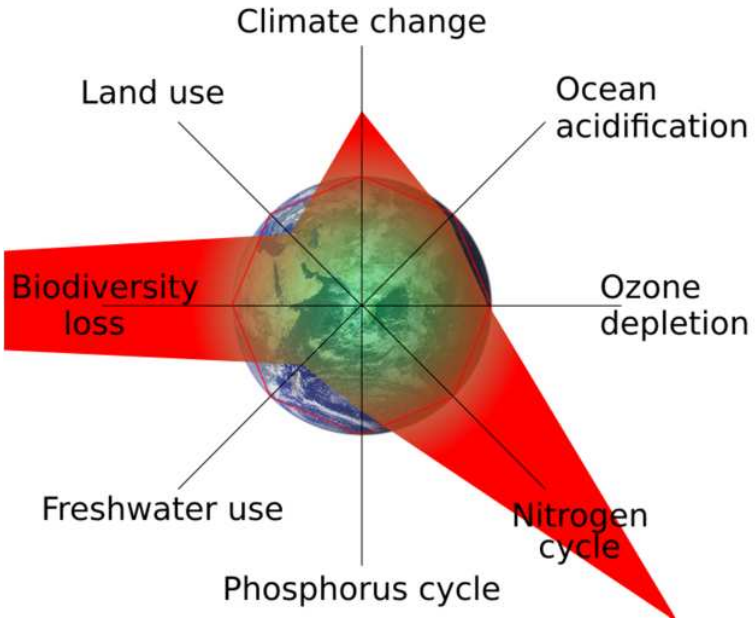

Figure 1. Planetary boundaries according Rockström et al. http://en.wikipedia.org/wiki/Planetary_boundaries .] The coloured star-like area represents the estimated current state and the corners of the red octagon circumscribed by the Earth are the estimated boundaries. Systems whose safe operating space could not yet be determined were left out.

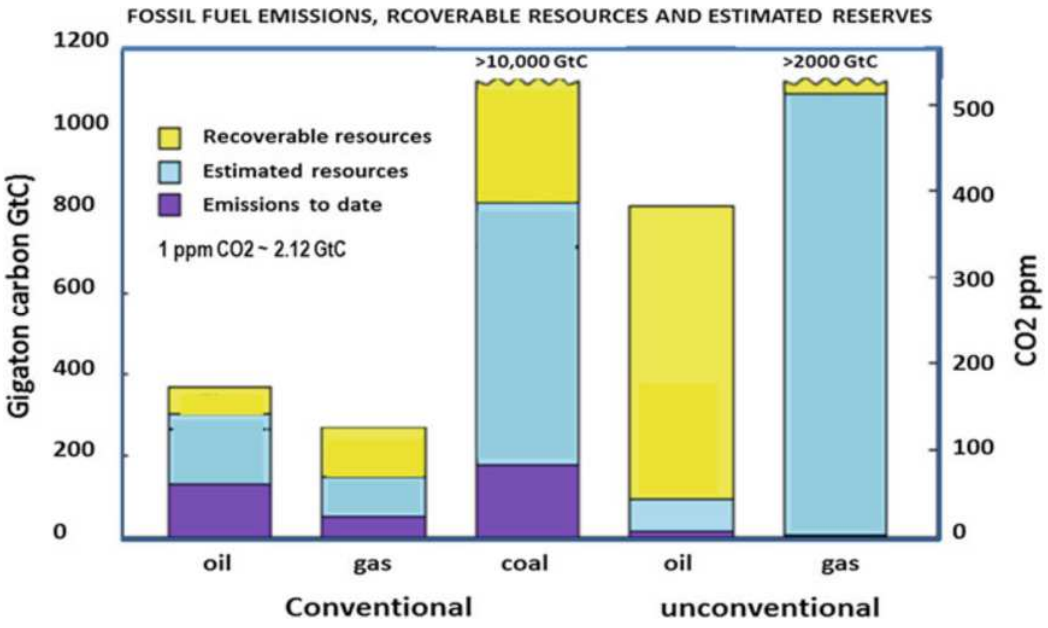

Figure 2. Estimates of fossil fuel resources and equivalent atmospheric CO2 levels, including (1) emissions to date; (2) estimated reserves, and (3) recoverable resources (1 ppm CO2 * 2.12 GtC). (Hansen 2012a; Hansen et al. 2012b, Fig. 1; http://www.columbia.edu/~jeh1/mailings/2012/20120127_CowardsPart1.pdf

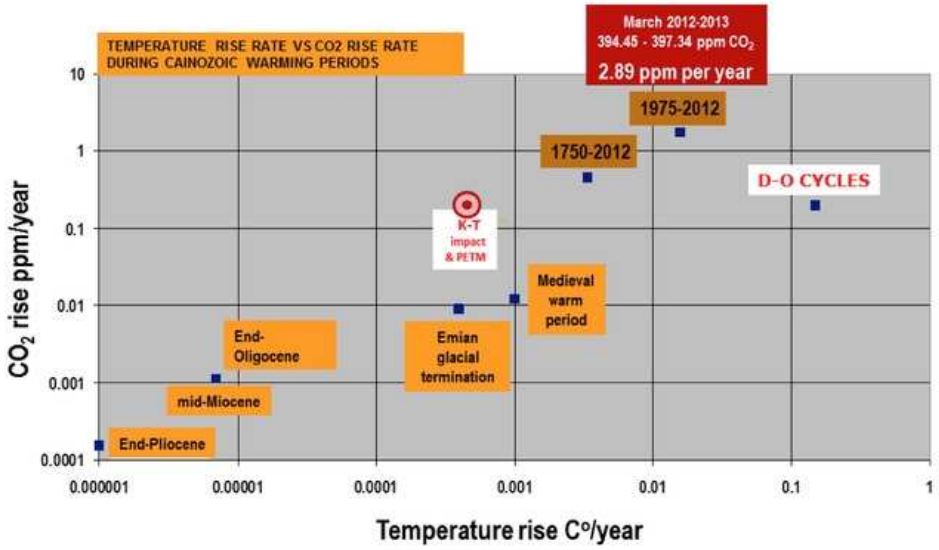

Figure 3. Relations between CO2 rise rates and mean global temperature rise rates during warming periods, including the Paleocene-Eocene Thermal Maximum, Oligocene, Miocene, late Pliocene, Eemian (glacial termination), Dansgaard-Oeschger cycles, Medieval Warming Period, 1750-2012 and 1975-2012 periods.