

***All the world's a stage . . .<sup>1</sup>***

William Shakespeare  
*As You Like It*, Act 2, Scene 7

Since the time that the Kyoto Protocol was produced in 1997, humankind has waited for sovereign nations to take action in preventing dangerous levels of climate change. Any hope was crushed by the inaction at the 2009 Copenhagen Climate Conference, but slightly raised by the Cancun Climate Change Conference of December 2010. However, the acrimonious divide between nations still appears to be blocking any substantive, global, remedial action to prevent dangerous levels of climate change.

*The analysis [of greenhouse gas emissions growth] suggests that despite high-level statements to the contrary, there is now little or no chance of maintaining the global mean surface temperature at or below 2°C. Moreover, the impacts associated with 2°C have been revised upwards, sufficiently so that 2°C now more appropriately represents the threshold between 'dangerous' and 'extremely dangerous' climate change (Anderson and Bows 2011).*

Stated bluntly, humankind is seemingly unconcerned about the future and is rapidly moving from a dangerous to an extremely dangerous situation in climate change.

Fortunately, the Tyndall Centre of Climate Change Research (2011) has provided a list of “. . . challenges involved in avoiding high levels of warming, as well as the challenges of adaptation should society fail to do so.” These challenges indicate what must be done to leave a habitable planet for the next generation (and those after) and the adaptations all will be forced to make if humankind continues business as usual and the planet is pushed to four degrees and beyond current global temperatures. This report of the Tyndall Centre was intended to bring the latest climate change research to the UN Summit in Mexico in December 2010. Since that UN Summit appears to have failed to meet the challenge, humankind must prepare to adapt.

The following issues reported by the Tyndall Centre deserve serious attention.

(1) *On emissions scenarios — With high emissions and strong climate-carbon cycle feedbacks, 4 degrees global warming could be reached in the early 2060s (Betts et al. 2011).*

(2) *Water — With a 4 degrees warming, climate change is more important than population growth for determining whether a river basin suffers from water stress. If warming is limited to 2 degrees, the reverse is true (Fung et al. 2011).*

(3) *Industrialising economies — . . . cumulative emissions, split into richer and poorer nations, [can be used] to understand the implications of rapid emission growth in nations such as China and India, for global reduction rate (Anderson and Bows 2011).*

(4) *People — A greater temperature change might not only affect the magnitude of the associated population movements, but also – and above all – the characteristics of these movements, and therefore the policy responses that can address them. . . . policy evolutions [show what] . . . climate-induced displacements in a 4°C+ world would require (Gemenne 2011).*

(5) *Ecosystem interactions — Agriculture, plants, and animals would need to move large distances to stay cool or wet. Humans might be increasingly concentrated in places remaining sufficiently wet for economic prosperity. In a 2°C world, impacts would be roughly halved, many ecosystems like forests preserved, with much less need for movement (Warren 2011).*

(6) *Adaptation — Adapting to global warming of 4°C cannot be seen as a mere extrapolation of adaptation to 2°C; it will be a more substantial, continuous and transformative process. Decision-makers are likely to be paralysed by the complexity of this problem, . . . (Stafford Smith et al. 2011).*

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<sup>1</sup>I am indebted to Richard Rusk for reminding me of this quote when I told him about the tentative contents of this chapter.

(7) *Climate projections* — The patterns of change in temperature and precipitation are similar for high-end and non high-end models but are amplified in the high-end models. The greatest warming occurs in the Arctic, where December, January and February temperatures increased by 12-16°C. Warming during June, July, August (6-8°C) occurred over many land areas, including the USA, Mediterranean Europe, much of Africa and northern Australia (Sanderson et al. 2011).

(8) *Emissions targets* — . . . if we met a cumulative emissions target, or a single budget between now and 2200, we would be more likely to limit global warming to two degrees than if we had used a 2020 or 2050 target (Bowerman et al. 2011).

(9) *Food* — In a four-plus degree world, food security will be more difficult to achieve because of commodity price increases and local production shortfalls (Thornton et al. 2011).

(10) *Forests* — Our results confirm some risk of forest retreat, (eastern Amazonia, Central America, parts of Africa), but also indicate a potential for expansion in other regions (Congo Basin). This potential increases if the positive impact of CO<sub>2</sub> is considered. Other, more uncertain, factors, notably higher temperature, may have a negative effect (Zelazowski et al. 2011).

(11) *Sea-level rise* — A pragmatic estimate of sea-level rise by 2100 for a temperature rise of 4°C or more over the same time frame is between 0.5m to 2m. Without adaptation, this may result in the forced displacement of up to 187 million people over the century (up to 2.4% of global population). Protection is costly with up to 0.02% of global domestic product needed (Nicholls et al. 2011).

Astonishingly, despite the massive increase in scientific evidence, polls indicate that fewer people in 2010 than in 1997 believe that humans are a factor in global climate change. Humans are not directing the ecological “play” on the world stage in the evolutionary theater. The play has been in progress for approximately 3.5 billion years and is dominated by the universal laws of physics, chemistry, and biology. Most of the “actors” who have been “on stage” are now extinct, but the process of evolution has supplied new actors (i.e., species), even after five great extinctions.

The metaphor of an evolutionary stage with species as the actors suggests some important questions.

(1) How long does *Homo sapiens* have “on stage”?

(2) Why do some “actors” (species) remain on stage much longer than others?

(3) Does acting contrary to the universal laws of physics, chemistry, and biology markedly reduce an actor’s “time on stage”?

(4) Is it ethical/moral to pass on both a huge financial and ecological debt to future generations?

(5) At present, 1.2 billion humans go to bed hungry each night and over 2 billion are malnourished — how can they be shown compassion while trying to keep Earth’s human population within its carrying capacity?

(6) What should humankind’s relationship with other life forms be? Are they fellow actors on the stage, each with a different role to play or are they commodities for the human economic system?

(7) *Homo sapiens* has been on Earth for an estimated 160,000 – 200,000 years. Species are the actors in the evolutionary stage – not the individual. Should this knowledge influence the relationship between generations?

(8) What can humankind do to increase its time on stage?

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