The Anthropocene: Policy Meets Complex Systems Science

Will Steffen
Evolution of fully modern humans in Africa

Hunter-gatherer societies only

Adapted from Steffen et al. 2004; ice core data from Petit et al. 1999
Human Development and Earth System Dynamics

First migration of fully modern humans out of Africa
Aborigines arrive in Australia
Migrations from South Asia to Europe
Beginning of agriculture
Great Asian, European, African, American civilisations

Source: GRIP ice core data (Greenland) and S. Oppenheimer, ”Out of Eden”, 2004
The Anthropocene

The changing human enterprise, from 1750 to 2000

From Steffen et al. 2004
The Great Acceleration

\[ I = P \times A \times T \]

In the Great Acceleration technology and especially consumption have overtaken population as a driver of change.
The Anthropocene

1. We’re in a no analogue state. The past is not a good guide to the future on the global environment, from 1750 to 2000

From: Steffen et al. 2004
Global Change and the Anthropocene

2. Policy integration

“Environmental goals must be mainstreamed into global trade, investment and finance regimes...” Biermann et al., Nature, 2012
3. Ongoing assimilation of new scientific knowledge

Source: Schellnhuber, after Lenton et al, PNAS, 2008

Tipping Elements in the Earth System
Climate Change: Moving beyond the Holocene state?

Northern hemisphere surface temperature

Post-industrial temperature rise

Mann et al. 2003 (EOS)
Earth System moves to a new State? Severe challenge to contemporary civilisation. Possible collapse?

4. The cost of failure is very, very large
A Safe Operating Space for Humanity