### The Anthropocene Paradox Surviving the Age of Humans?

#### Will Steffen ANU and Stockholm Resilience Centre



Photos: Tas van Ommen, Australian Antarctic Division

#### Earth as a System



Adapted from Steffen et al. 2004; ice core data from Petit et al. 1999

## Human Development and Earth System Dynamics



Evolution of fully modern Hunter-gatherer societies only humans in Africa

Adapted from Steffen et al. 2004; ice core data from Petit et al. 1999

#### Human Development and Earth System Dynamics



Source: J. Rockström and N. Nakicenovic Data from Petit et al. 1999 and Oppenheimer 2004

#### Socio-economic trends

### The Human Enterprise

- Population
- Economic Growth
- Freshwater use
- Energy use
- Urbanization
- Globalization
- Transport
- Communication



Steffen et al. 2015

## **Global Impact**

- Greenhouse gases
- Ozone depletion
- Climate
- Marine ecosystems
- Coastal zone
- Nitrogen cycle
- Tropical forests
- Land systems
- Biosphere integrity

Earth system trends



Steffen et al. 2015

#### **IGBP Newsletter 41: May 2000**

The "Anthropocene" by Paul J. Crutzen and Eugene F. Stoermer

Thename Holocene ("Recent Whole") for the post-glacial geological epoch of the past ten to tryclye thousand years seems to have been proposed for the first time. by Sir Charles Lyell in 1803, and adopted by the International Geological Congress 1000 Mt. Daulan day

panied e.g. by a growth in cattle population to 1400 million (6) (about one cowper average size family). Urbanisation has even increased tenfold in the past century. In a few generations mankind is echausting the lossil fuels that were



#### P.J. Crutzen, "The Geology of Mankind", Nature 2002

#### Explicitly proposed the Anthropocene as a new geological epoch.

Suggested that the start date be set at the beginning of the Industrial Revolution, late 1700s, or beginning of the Great Acceleration, ca. 1950

#### The geology of mankind? A critique of the Anthropocene narrative

Andreas Maim and Alf Hornborg

#### Abstract

The Anthropocene narrative portrays humanity as a species ascending to power over the rest of the Earth System. In the crucial field of climate change, this entails the attribution of fossil fuel combustion to properties acquired during human evolution, notably the ability to manipulate fire. But the fossil economy was not created nor is it uphold by humankind in general. This

It is not correct to consider "mankind" or "humankind" in general

The fossil fuel-driven, consumption oriented, globalised economy was not created by humankind *in general*.

"Intra-species inequalities are part ....of the current ecological crisis and cannot be ignored in attempts to understand it.



The Anthropoces Review 201X, Vol XX(X) 1-8 6 The Author 61 2014 Replies and perintestors separate and perintestors DOI: 10.1177/2053019012516291 and separate SAGE





#### **Equity Issues**

- Population
- Economic growth
- Fertilizer use
- Urbanization
- Globalization
- Transport
- Communication



#### Steffen et al. 2015

### Equity and the Great Acceleration



18% of the global population (the OECD countries) are responsible for 74% of the world's consumption – and therefore impact on the Earth System.

## The dilemma of the Anthropocene





#### Health and Social Problems are Worse in More Unequal Countries





# Capitalism drives inequality in wealth

#### NAOMI KLEAN THIS CHANGES EVERYTHING





Extreme wealth corrupts political systems FORGET EVERYTHING YOU KNOW. NATURE IS NO LONGER NATURE. WE HAVE ENTERED A NEW EPOCH.



"The astonishing force of consumer culture has swamped traditional customs, values, and aspirations, replacing them with a devotion to money, materialism and branded identities that has left tradition a smoking rubble."



Fritjof Capra and Pier Luigi Luisi The Systems View of Life



...Our world today is dominated by a global economic system with disastrous social and environmental impacts – "predatory capitalism".... We are the only species on Earth who destroys its own habitat, threatening countless other species with extinction in the

process.





### **System Incompatibilties?**









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#### The 21<sup>st</sup> Century: A bright future of continued growth? Or...



#### ...sailing towards a global collapse?

#### The Earth: Patterns of a Complex System



Image: NASA

# The Earth as a Complex System

Glacial state

Interglacial (warm) state



Sources: Petit et al. 1999; Scheffer 2009



Sources: Petit et al. 1999; Scheffer 2009

### Temperature rise: Beyond the envelope of natural variability?



Summerhayes 2015

# **IPCC** temperature projections



**IPCC 2013** 



Summerhayes 2015

## Implications of the Anthropocene



# Tipping Elements in the Earth System





Huber, Lenton, and Schellnhuber, in Richardson et al. 2011

### Rates of Change

Rate of increase in ocean acidification is unparalleled for at least the last 300 million years.

Rate of atmospheric  $CO_2$  increase over the past two decades is about 100 times the maximum rate during the last deglaciation.

Since 1970 the global average temperature has risen at a rate about 170 times the background rate over the past 7,000 years of the Holocene, and in the opposite direction.

De Vos et al. 2014; Wolff 2011; Marcott et al. 2013; NOAA 2016; Canfield et al. 2010

## **Governed Earth**



M. Scheffer 2016, unpublished

## **Towards Global Solutions**



#### Frameworks and Roadmaps



#### Guidance Systems



#### **Planetary Boundaries**

#### Rockström et al. 2009

Photograph by Annie Griffing Belt, National Geographic Image Collection

Visions of Earth National Geographic February 2008 © 2006 National Geographic Society. All rights reserved.



Adapted from Steffen et al. 2015

# The 'Doughnut': a safe and just space for humanity





#### The UN Sustainable Development Goals

This is the biggest opportunity for humanity - It is also the biggest puzzle... How do we achieve it?



# The World in 2050



Transformation

2030

2050 +



#### CLIMATE POLICY

# A roadmap for rapid decarbonization

Emissions inevitably approach zero with a "carbon law"

### **Roadmap for Rapid Decarbonization**



### Rates of Change

Global carbon law guiding decadal pathways





#### **Towards New Guidance Systems**

- Slow or reverse human population growth
- Change consumption behaviour; build a circular economy
- Build Earth System governance systems to manage the system in an equitable way
- Establish stewardship of the Earth System as a core societal value
- Shift management and governance from incremental change and predictability to complexity and uncertainty

Steffen et al. 2017, in preparation

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Steffen et al. 2017, in preparation

![](_page_46_Picture_0.jpeg)

#### **Evolution and the Anthropocene**

Darwin's insights about the origin of humans - that we are apes, a part of nature (not above it) - challenged deeply held beliefs about the humanenvironment relationship.

Will the Anthropocene evoke a similar level of deep emotion in the public? Can humanity really affect the functioning of its own life support system at the planetary scale? What are the implications of this for our definition of "progress", our way of life and our future? Research article

#### Was the Anthropocene anticipated?

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(ROPOCENE

Clive Hamilton<sup>1</sup> and Jacques Grinevald<sup>2</sup>

# hropocene

#### Abstract

Yamous authors have identified "precentors" of the new boncept of the Anthroposene, with mestifrequent reference made to Antonio Stoppent. Viacimir Vernedsky and iherre Tellhand de Chandin. The effect, Intended or otherwise, of finding forerunners is to deflate the significance of the proposed new geological epoch. We argue there were no precursors to the notion of the Anthroposene, and that there could not have been because the concept (out forward in the year 2000) is an outgrowth of the recent intendisciplinary understanding of the Earth

There are no precursors to the concept of the Anthropcene (e.g., "th age of man"; "the face of the Earth". The Anthropcene cannot be equated to impact on the (global) environment.

"The Anthropocene represents a radical rupture with all evolutionary ideas in human and Earth history."

Dispels the notion of a progressive and linear evolutionary advance of human societies to a higher stage

#### Triple Bottom Line — Hierarchy of Goals

![](_page_48_Figure_1.jpeg)

#### Prof Dipash Chakrabarty University of Chicago

![](_page_49_Picture_1.jpeg)

# Homo-centric v. Zoe-centric (human-centric v. life-centric)

Contemporary society is based on a homo-centric approach, but the Anthropocene demands a zoe-centric approach.

"epochal consciousness" v. "departmental thinking"

Tanner Lectures in Human Values, Yale University, 2015

Prof Carl Folke Stockholm Resilience Centre and Beijer Institute of Ecological Economics

![](_page_50_Picture_1.jpeg)

# On humanity's challenge in the 21<sup>st</sup> century: "Reconnect to the biosphere"

![](_page_50_Picture_3.jpeg)

![](_page_51_Picture_0.jpeg)

We're only here for a short amount of time to do what we've been put here to do, which is to look after the country. We're only a tool in the cycle of things. ...(we) go out into the world and help keep the balance of nature. It's a big cycle of living with the land, and then eventually going back to it....

> Vilma Webb, Noongar People, Australian Aborigines, from: 'Elders: Wisdom from Australia's Indigenous Leaders'