The interplay between Science, Technology & Society

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In urgent need of complex anticipatory systems

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Science and Technology are the drivers of societal evolution

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S&T will solve the societal challenges we face

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Disruptive or not enough?

Or not in the right direction?

Anticipation

Ref. Christophe Bonneuil,
Jean-Baptiste Fressoz
"L´Évènement Anthropocène", 2013

T. Robert Malthus > "An Essay on the Principle of Population" (1798)
Charles Fourier > "Détérioration matérielle de la planète" (1821)
Pierre Leroux > Circular economy (1843)
John Stuart Mill > "The Principles of Political Economy" (1848)
Eugène Huzar > "La Fin du monde par la science" (1855)
George Perkins Marsh > "Man and Nature" (1872)
Augustin Mouchot > Solar collector (1866), Solar steam machine (1869)
Justus von Liebig > "The natural laws of Agriculture" (1862)
Stanley Jevons > "The Coal Question" (1866)
Ernst Haeckel > Ecology (1867)
Alfred Marshall > "The Future of the Working Classes" (1873)
Thorstein Veblen > "The Theory of the Leisure Class" (1899)
Tramways in US cities (1900-1935)
Ernst Friedrich > Plunder economy (1904)
Ludwig Klages > "Man and Earth" (1913)
Frederick Soddy > "Cartesian Economics" (1921)

Anticipation

Ref. Christophe Bonneuil,
Jean-Baptiste Fressoz
"L´Évènement Anthropocène", 2013

Stuart Chase > "The Tragedy of Waste" (1925)
Vladimir Vernadski > "The biosphere" (1926)
Lewis Mumford > "Technics and Civilization" (1934)
Fairfield Osborn > "The Plundered Planet" (1948)
Maria Telkes > Solar house with 75% self-sufficiency (1948)
Roger Revelle, Hans E. Suess > CO2 increase in the atmosphere (1957)
Hannah Arendt > "The Human Condition" (1958)
Rachel Carson > "Silent Spring" (1962)
Radovan Richta > "The civilization at the crossroad" (1966)
Nicolae Georgescu-Roegen > "Entropy Law & the Economic Process" (1971)
Crawford S. Holling > Ecological resilience (1973)
James Lovelock > Gaia Hypothesis (1974)
Jimmy Carter > Anti-consumerist speech at TV (1979)
Howard & Elizabeth Odum > "Energy Basis for the Man and Nature" (1981)
Elinor Ostrom > "Governing the Commons" (1990)

Sustainable Development

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

It contains two key concepts:

- *The concept of 'needs', in particular, the essential needs of the world's poor, to which overriding priority should be given;*

And

- *The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."*

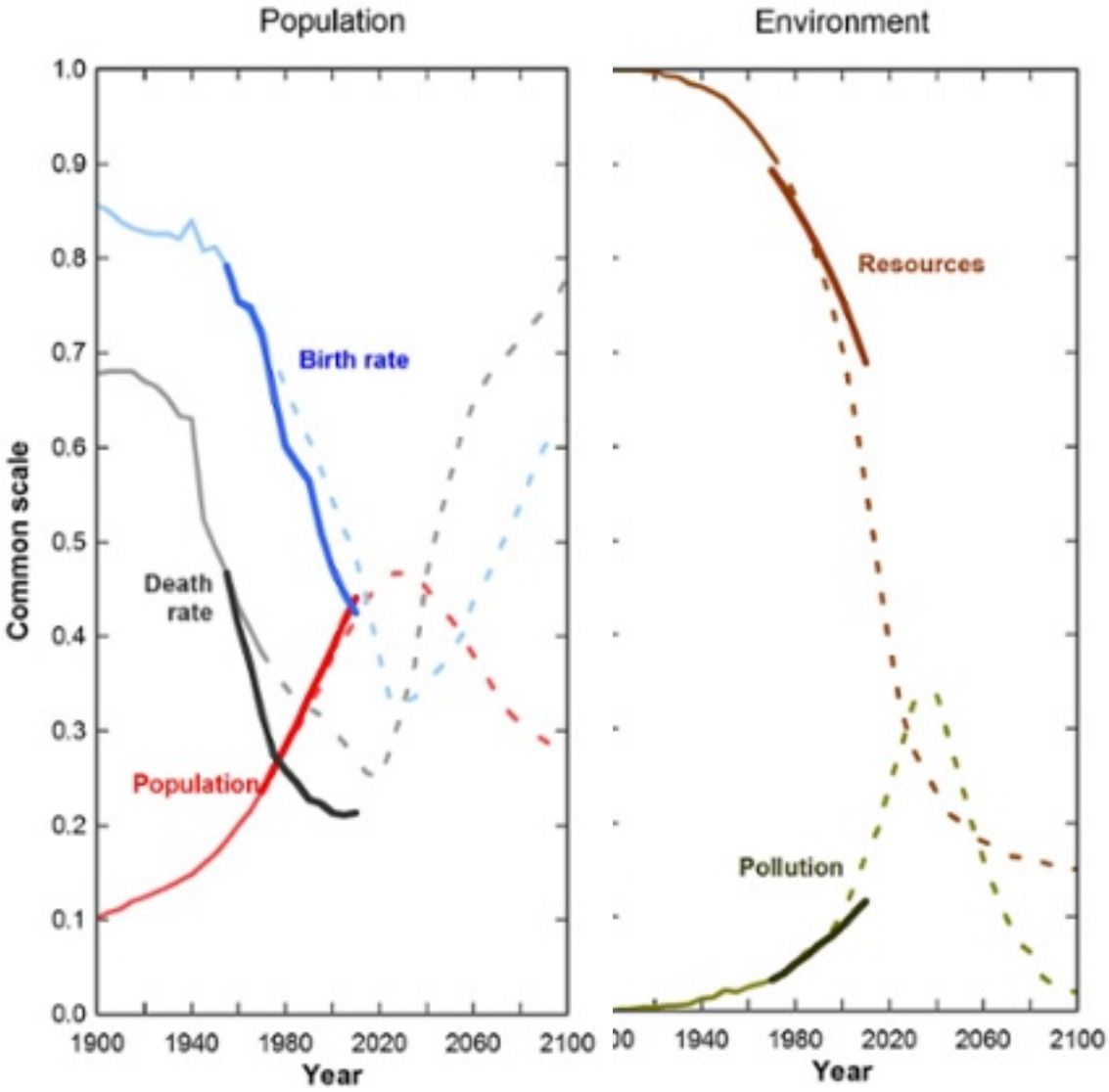
Brundtland Report, World Commission on Environment and Development, United Nations Organization, 1987

Anticipation

"The Guardian"
2 September 2014

"Limits to Growth" was right. New research shows we're nearing collapse.

"Four decades after the book was published, Limit to Growth's forecasts have been vindicated by new Australian research. Expect the early stages of global collapse to start appearing soon."



1972 Club of Rome – “Limits to Growth”

1981 IBM PC

1982 Commodore PC

1984 Macintosh

1987 Brundtland Commission – Sustainable Development

“The ICT revolution can have a tremendous positive impact as an instrument of sustainable development.”

World Summit on the Information Society (2003-2005)

Digital Tech is clean, efficient, sustainable

Based on critical resources > The Coltan Wars

Production processes

Fossil fuels:	1.600 gr
Chemical inputs:	72 gr
Water:	32.000 gr
Gases:	700 gr
DRAM chip:	2 gr

Waste

Growing 2-3x faster than any other source of waste
Recycling 10-15%, down to 1% for critical elements

Energy consumption

Huge and growing

GHG emissions

Growing +6%/year. Fastest growth of all sectors

But Digital Tech is good for the sustainability of other sectors, right?

"While the overall impact of ICT on most environmental indicators seems to be weak, the impact of specific areas or types of ICT applications can be very relevant in either direction. On an aggregated level, positive and negative impacts tend to cancel each other out."

Lorenz M. Hilty et al, July 2006
"The relevance of ICTs for environmental sustainability"

How many new mobile phones per year?

How many new mobile phones per year?

1,5 billion

Changing the world, in what direction?

War and Peace

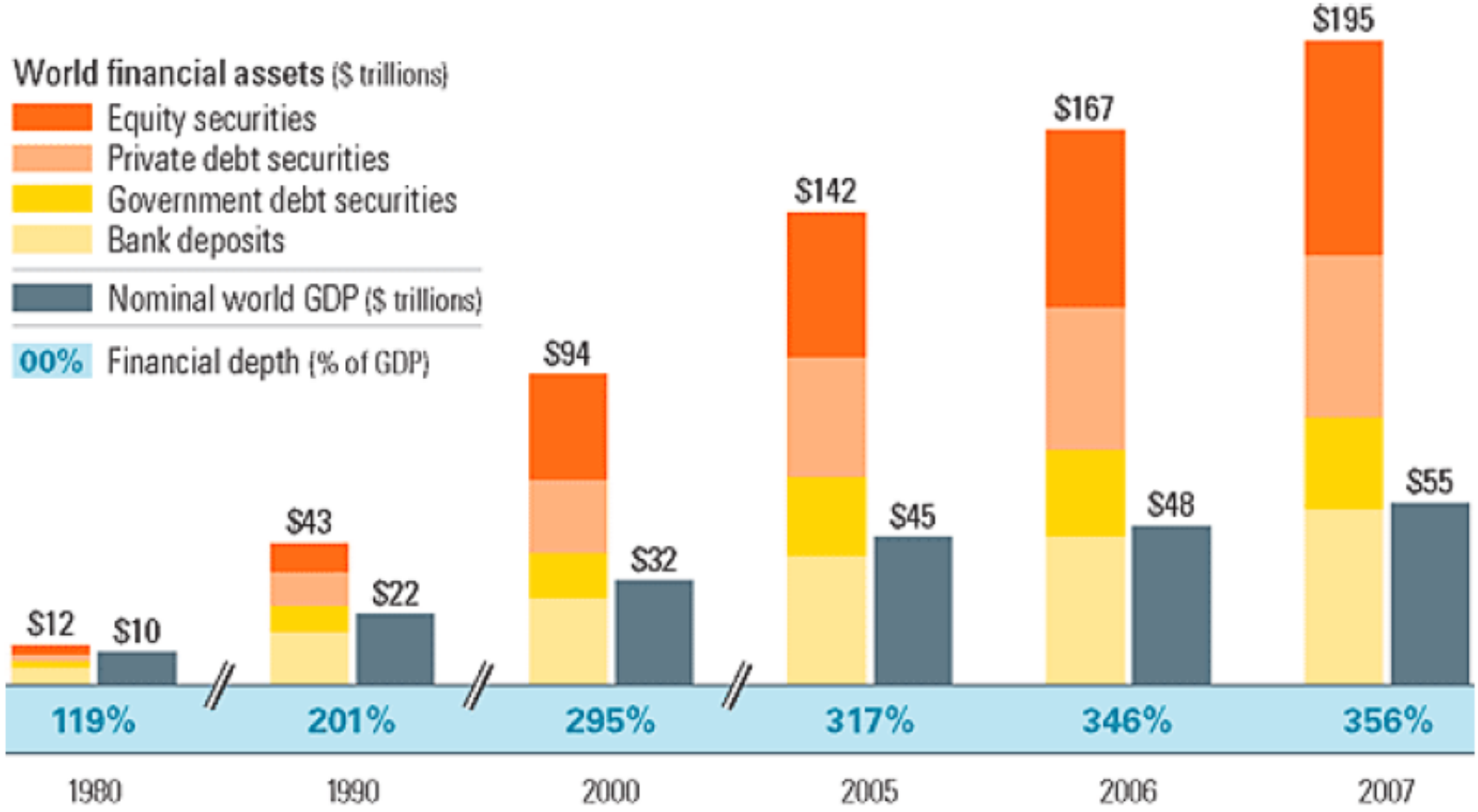
Changing the world, in what direction?

War and Peace

Globalization, financialization

World financial assets

More than three times higher than GDP



Note: Asset and GDP figures have been rounded for simplicity. Financial depth percentages were calculated using nonrounded figures. Source: McKinsey Global Institute

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Changing the world, in what direction?

War and Peace
Globalization, financialization
Development

Changing the world, in what direction?

War and Peace

Globalization, financialization

Development

Productivity, growth, entrepreneurship

	Prod growth, USA
1930s-1970s	1,5-3% per year
Since 1980s	< 1% per year

Robert Gordon, 2016, “The Rise and Fall of American Growth”

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Density of start-ups has fallen to half since the 1970s

Changing the world, in what direction?

War and Peace
Globalization, financialization
Development
Productivity, growth, entrepreneurship
Changing patterns of work

Changing the world, in what direction?

More than 1 million employees:

- Armies of USA, China, India
- Wal-Mart
- McDonalds
- Main energy companies in China
- Indian railways

Microsoft	120.000 employees
Apple	110.000
Google	60.000
Facebook	12.000

Changing the world, in what direction?

War and Peace
Globalization, financialization
Development
Productivity, growth, entrepreneurship
Changing patterns of work
Do It Yourself

Changing the world, in what direction?

War and Peace
Globalization, financialization
Development
Productivity, growth, entrepreneurship
Changing patterns of work
Do It Yourself
Bypass regulations

Changing the world, in what direction?

War and Peace
Globalization, financialization
Development
Productivity, growth, entrepreneurship
Changing patterns of work
Do It Yourself
Bypass regulations
Concentration of power and wealth

the story-telling of S&T

the story-telling of S&T

Deus ex-machina

neutrality & objectivity

omnipotence

core of the solution

driven by markets

faster and faster

good for citizens

good for the environment

good for peace

dematerialization

another version

rhetoric waves

driven by human decisions

physical limits

core of the problem

driven by the State

speculative bubbles

private monopolies

critical resources

relegitimation of war

disposability of humans

The future…

techno-utopian or technolitarian?

The framing of S&T

The framing of S&T

Too much complexity or not enough?

The paradox of Digital Disruption

True innovation <> Short-term financial gains

InnoDemos = Innovation Democracies (after Andy Stirling)

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