

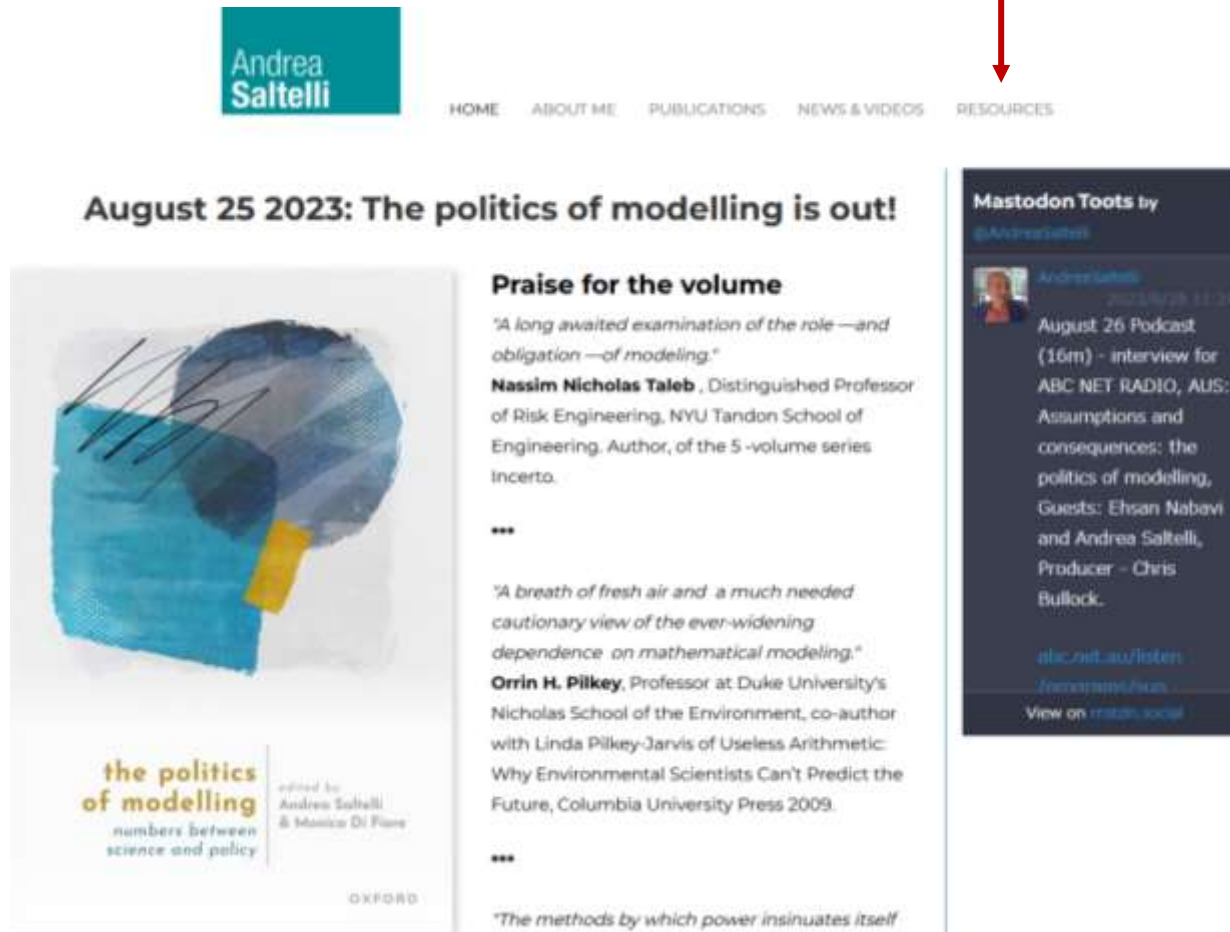
On biophysical economics

Andrea Saltelli

Course at JRC–Ispra, September 2023



Where to find this talk: www.andreasaltelli.eu



The screenshot shows the website www.andreasaltelli.eu. The navigation menu includes: HOME, ABOUT ME, PUBLICATIONS, NEWS & VIDEOS, and RESOURCES. A red arrow points to the RESOURCES link. The main content area features a post titled "August 25 2023: The politics of modelling is out!". On the left is the book cover for "the politics of modelling: numbers between science and policy" edited by Andrea Saltelli & Monica Di Florio, published by OXFORD. The cover art depicts a globe with blue and yellow abstract shapes. To the right of the book cover are three quotes:

Praise for the volume

"A long awaited examination of the role—and obligation—of modeling."
Nassim Nicholas Taleb, Distinguished Professor of Risk Engineering, NYU Tandon School of Engineering. Author, of the 5-volume series *Incerto*.

"A breath of fresh air and a much needed cautionary view of the ever-widening dependence on mathematical modeling."
Orrin H. Pilkey, Professor at Duke University's Nicholas School of the Environment, co-author with Linda Pilkey-Jarvis of *Useless Arithmetic: Why Environmental Scientists Can't Predict the Future*, Columbia University Press 2009.

"The methods by which power insinuates itself

On the right, a Mastodon post by @AndreasSaltelli from August 26, 2023, at 11:24 AM. The post text reads: "August 26 Podcast (16m) - interview for ABC NET RADIO, AUS: Assumptions and consequences: the politics of modelling, Guests: Ehsan Nabavi and Andrea Saltelli, Producer - Chris Bullock." Below the text are links for abc.net.au/listen, www.abc.net.au/news, and [View on instagram social](https://www.instagram.com/andreasaltelli).

Flow-Fund Theory of Nicholas Georgescu-Roegen

**Southern
Economic
Journal**

January Volume 41
1975 Number 3

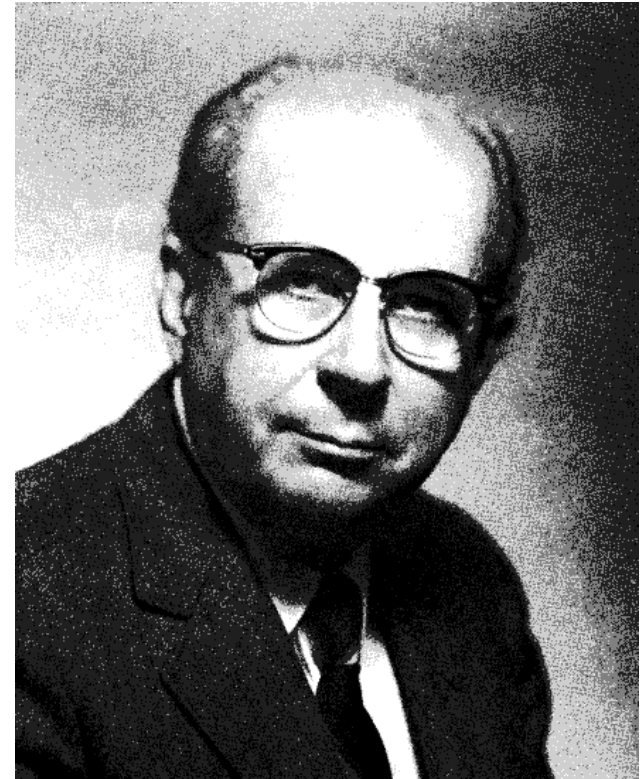
ENERGY AND ECONOMIC MYTHS*

NICHOLAS GEORGESCU-ROEGEN

Vanderbilt University

So you can now all go home and sleep peacefully in your beds tonight secure in the knowledge that in the sober and considered opinion of the latest occupant of the second oldest Chair in Political Economy in this country, although life on this Earth is very far from perfect there is no reason to think that continued economic growth will make it any worse.

Wilfred Beckerman



Nicholas
Georgescu-Roegen
(1906–1994)

Nicholas Georgescu-Roegen

- Father of ecological economics
- Ante-litteram advocate of degrowth?
Inspired the Club of Rome works
- The first to note that the laws of thermodynamics, particularly the second law, which emphasizes the irreversibility of natural processes, are ignored in economics

- Defines "flows" (current resources) and "funds" (accumulated resources) to be used in economics → sustainability
- Reintroduces Entropy in economics

“... the viewing of the economic process as a mechanical analogue consisting – as all mechanical analogues do – of a principle of conservation (transformation) and a maximization rule.

...

The economic science itself is thus reduced to a timeless kinematics”

**Southern
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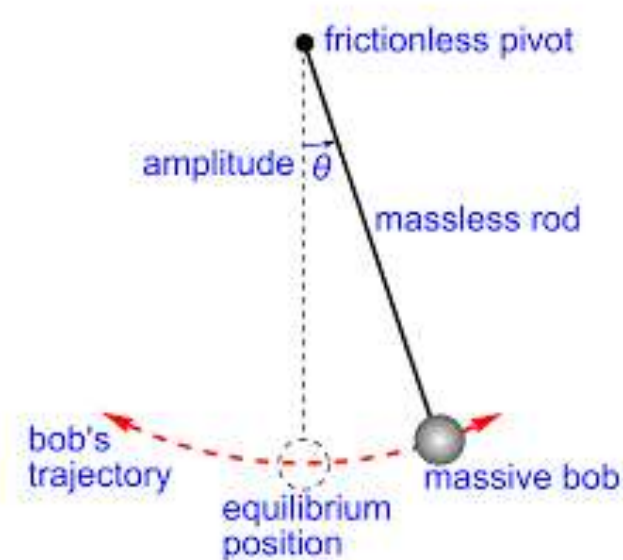
January Volume 41
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Vanderbilt University

“Everything now turns out to be just a pendulum movement. One business "cycle" follows another. The pillar of equilibrium theory is that, if events alter the demand and supply propensities, the economic world always returns to its previous conditions as soon as these events fade out”



Source: Wikipedia Commons

**Southern
Economic
Journal**

January 1975 Volume 41
Number 3

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Vanderbilt University

“An inflation, a catastrophic drought, or a stock-exchange crash leaves absolutely no mark on the economy. Complete reversibility is the general rule, just as in mechanics”

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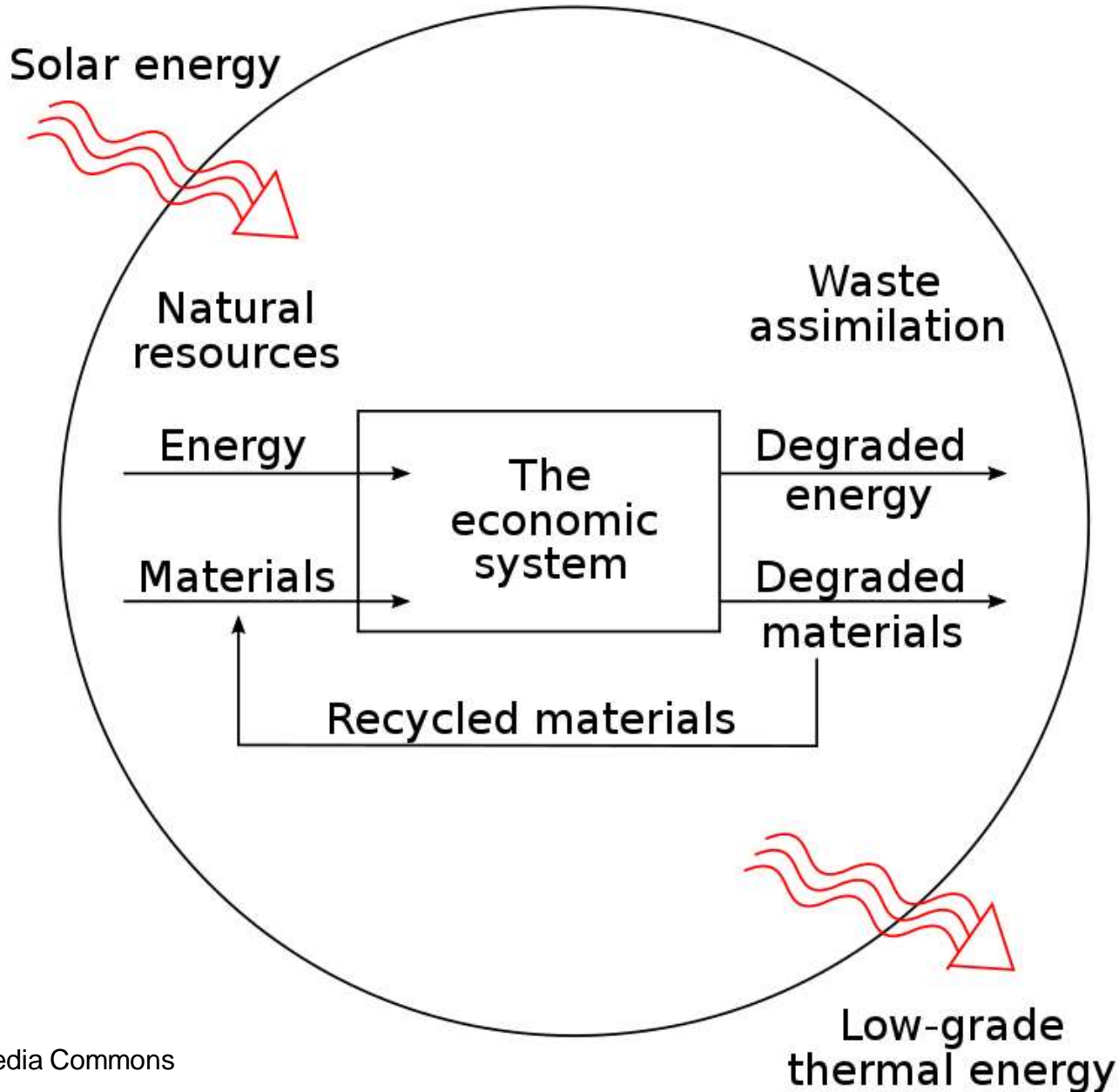
NICHOLAS GEORGESCU-ROEGEN

Vanderbilt University



Plastic waste dumping site at Thilafushi, an example of no mark.
Source: <https://www.dreamstime.com>

The Earth's biosphere



MECHANICS VERSUS THERMODYNAMICS

To equate the economic process with a mechanical analogue implies, therefore, the myth that the economic process is a circular merry-go-round which cannot possibly affect the environment of matter and energy in any way

Entropy = “entropy as an index of the amount of unavailable energy in a given thermodynamic system at a given moment of its evolution”

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“... to act in accord with a myth is the distinctive characteristic of man among all living beings”

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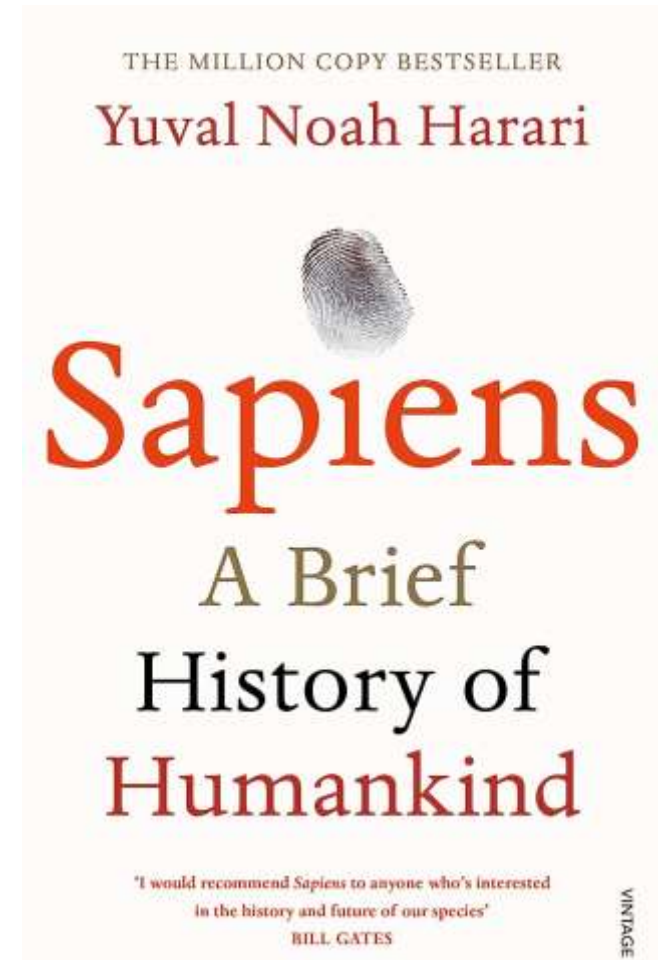
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Vanderbilt University

Harari's recipe for humans' success: believing shared stories in large collectives



“Thermodynamics a, peculiar branch of physics, so peculiar that purists prefer not to consider it a part of physics because of its anthropomorphic texture”

“Energy thus came to be divided into available or free energy, which can be transformed into work, and unavailable or bound energy, which cannot be so transformed. Clearly, the division of energy according to this criterion is an anthropomorphic distinction like no other in science”

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Vanderbilt University

“The myth of perpetual motion of the second kind, which is that we may use the same energy over and over again, still lingers on in various veiled forms”

“Another economic myth is that man will forever succeed in finding new sources of energy and new ways of harnessing them to his benefit”

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Vanderbilt University

Bootlegging entropy

The danger of linear thinking

The myth that the price mechanism can offset any shortages, whether of land, energy or materials

The fallacy of endless substitution

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Substitution within a finite stock of accessible low entropy cannot possibly go on forever



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NGR on waste:

Robert A Solo [an economist] also asserts that because of growth and technology, the present society could eliminate all pollution ... at a bearable cost. It is only because of some perversity of our values that we are not doing it. That we could devote more effort to pollution disposal is beyond doubt. **But to believe that with nonperverse values we could defeat the natural laws reflects an indeed perverse view of reality**

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“There always was a tension on this subject, as proved by the now famous exchange in the 70’s involving [Daly \(1997a\)](#) ([1997b](#)), [Stiglitz \(1997\)](#) and [Solow \(1997\)](#)”

Environmental Science and Policy 142 (2023) 99–111



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Environmental Science and Policy

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Impact assessment culture in the European Union. Time for something new?

Andrea Saltelli ^{a,b,*}, Marta Kuc-Czarnecka ^c, Samuele Lo Piano ^d, Máté János Lőrincz ^d,
Magdalena Olczyk ^c, Arnald Puy ^e, Erik Reinert ^{f,g}, Stefán Thor Smith ^d,
Jeroen P. van der Sluijs ^{b,h}



“The debate - started in 1975–1979 by Georgescu-Roegen in opposition to Solow and Stiglitz - was about to what extent one can substitute capital for natural resources in a growth equation, and what role technology could play to make this substitution more effective.

Herman E. Daly... restarted the debate in 1997 in open opposition to neoclassic economists, iterating Georgescu-Roegen’s unanswered critique that one cannot "assume that agents of transformation (funds) can substitute for the resources undergoing transformation (flows)" (Daly, 1997a)”



Herman E. Daly
(1938–2022)

Peter Victor
Fri 11 Nov 2022 19.20 CET



Obituary

Herman Daly obituary

Pioneering ecological economist who foresaw the catastrophic effects of unlimited economic growth

Environmental Science and Policy 142 (2023) 99–111

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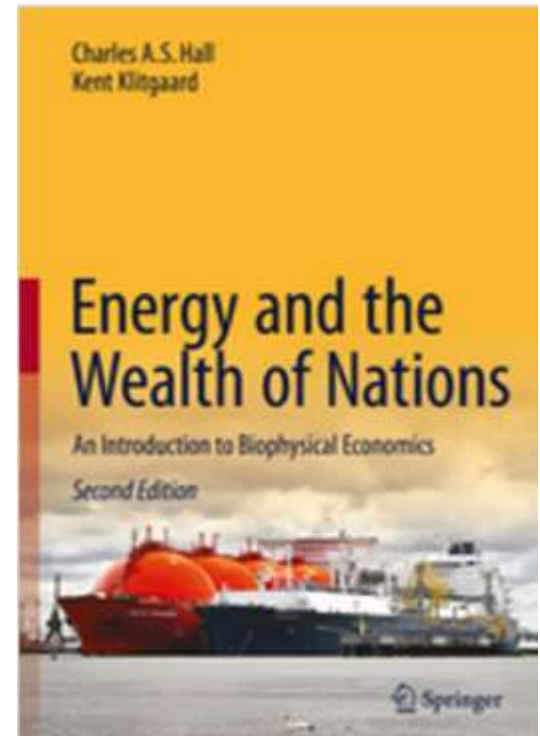
Andrea Saltelli^{a,b,*}, Marta Kuc-Czarnecka^c, Samuele Lo Piano^d, Máté János Lőrincz^d, Magdalena Olczyk^c, Arnald Puy^e, Erik Reinert^{f,g}, Stefán Thor Smith^d, Jeroen P. van der Sluijs^{b,h}



Some slides courtesy of Professor Charles A. S. Hall



chall@esf.edu



More resources from Charles A. S. Hall



YouTube playlist with all videos: <https://www.youtube.com/playlist?list=PLpPcX-rwKS6JucZpentitMCH-2FYvCfgy>

Medium versions with transcript: <https://medium.com/@alysion42/list/biophysical-economics-df1b957adb88>

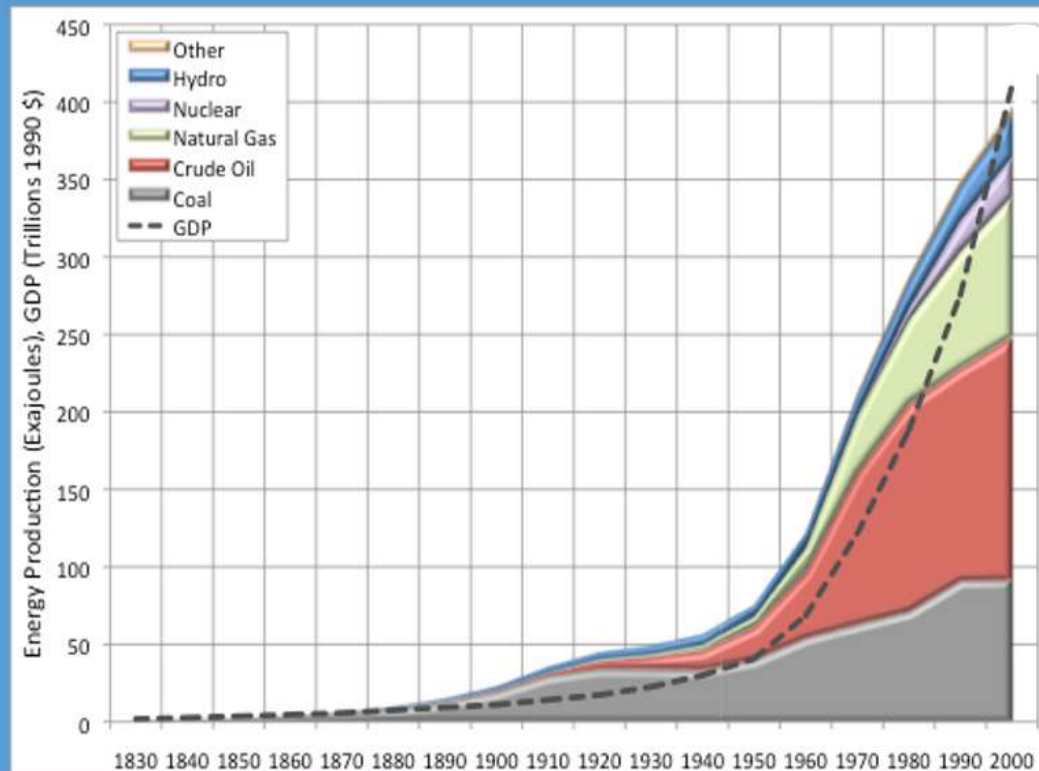


"Tell me the fairy tale about the economy."

Conventional economics is based on "sets of plausible but entirely arbitrary assumptions" leading to "precisely stated but irrelevant theoretical conclusions".
(W. Leontief, Nobel Laureate in Economics)

chall@esf.edu

The dirty secret to wealth production: Use more energy



Global GDP and
global energy use

Replacing our present reliance on fossil fuels with renewables, if possible, will be extremely fossil fuel intensive

chall@esf.edu

il existe une solution simple et fausse.



Together with ecologist Howard T. Odum, Charles A.S. Hall has developed the concept of Energy Return on Investment

EROI assesses the efficiency and sustainability of energy sources



Howard T. Odum
(1924–2002)

EROI =
amount of energy produced (or extracted) by an energy source
the energy input required to obtain, process, and distribute that energy

- $EROI > 1$: An energy source produces more energy than it consumes in its life cycle, making it a net energy gain.
- $EROI = 1$: Energy input equals energy output
- $EROI < 1$: An energy consumes more energy than it produces, resulting in a net energy loss.

Example: a mean EROI of 20:1 for wind power means that you get ~20 units of electricity in return for every unit of energy invested in manufacturing, installing, maintaining and decommissioning a wind energy system (Hall et al., 2014)

Melgar, Rigo, and Charles Hall. 2023. 'Energy Return on Investment: A Unifying Principle for Socio-Ecological Sustainability'. in *Elgar Encyclopedia of Ecological Economics*. Rochester, NY.

C A Hall , J G Lambert , S B Balogh, EROI of different fuels and the implications for society, *Energy policy* , volume 64 , p. 141 – 152, 2014.

“... There certainly are oil shales from which we could extract one ton of oil only by using more than one ton of oil”

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Ecological Economics 22 (1997) 261–266

ECOLOGICAL
ECONOMICS



Ecological Economics 22 (1997) 267–268

ECOLOGICAL
ECONOMICS

FORUM

Georgescu-Roegen versus Solow/Stiglitz

Herman E. Daly

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Received 23 September 1996; accepted 25 February 1997

REPLY

Georgescu-Roegen versus Solow/Stiglitz

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Stern School of Business, New York University, New York, NY 10012-1118, USA



Ecological Economics 22 (1997) 269–270

ECOLOGICAL
ECONOMICS



Ecological Economics 22 (1997) 271–273

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REPLY

Georgescu-Roegen versus Solow/Stiglitz

Joseph E. Stiglitz

The World Bank, Washington, DC 20433, USA

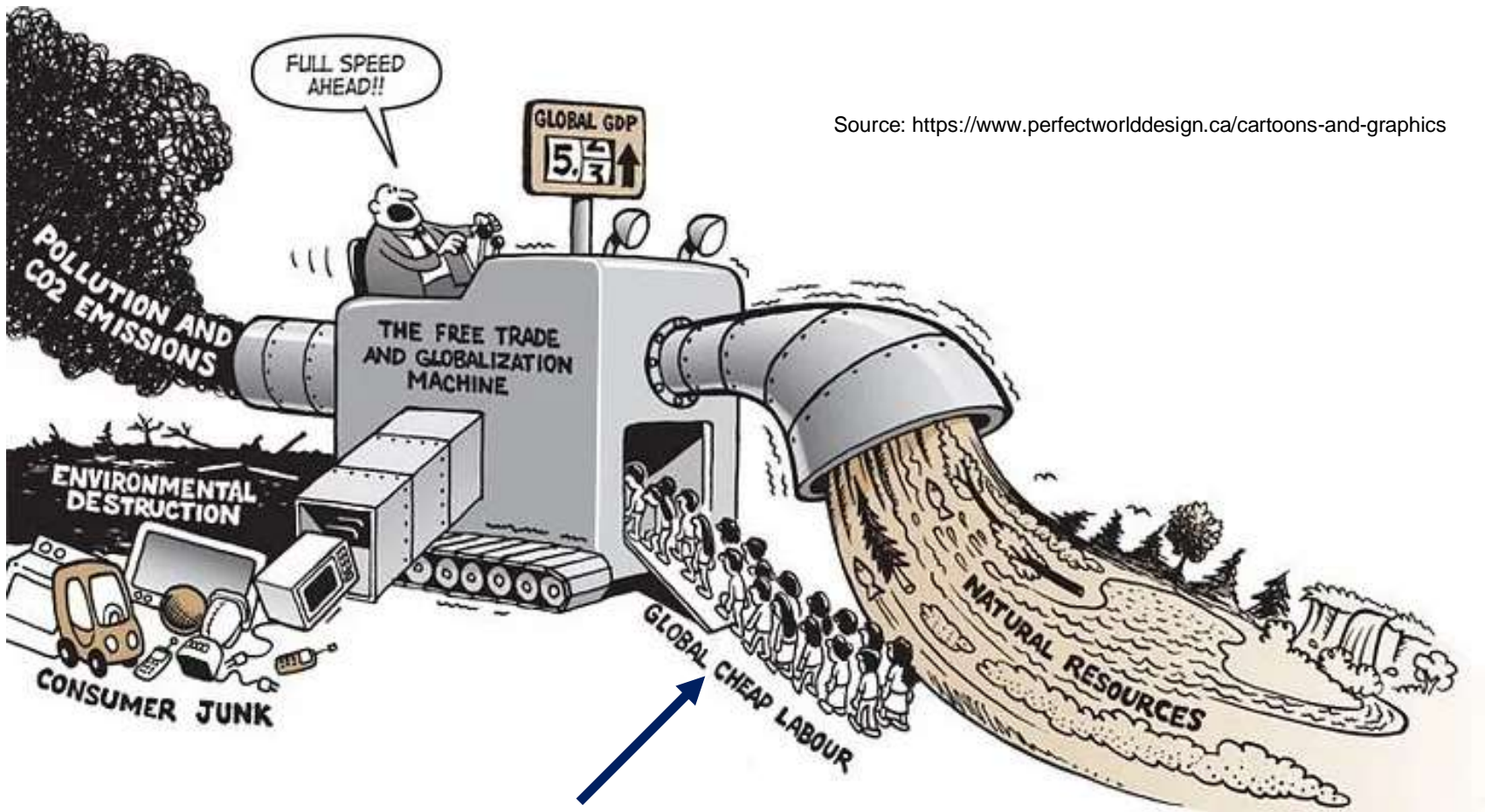
FORUM

Reply to Solow/Stiglitz

Herman E. Daly

School of Public Affairs, University of Maryland, College Park, MD 20742-1821, USA

Old (1997) or new debate?



Source: <https://www.perfectworlddesign.ca/cartoons-and-graphics>

Part of the equation

Gunnar Skirbekk

Epistemic Challenges in a Modern World

From “fake news” and “post truth”
to underlying epistemic challenges
in science-based risk-societies

Das Zentrum für Wissenschaftstheorie an der Universität
hat einen Druckkostenzuschuss bereitgestellt.

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