ECONOMIC & HUMAN DIMENSIONS RESEARCH ASSOCIATES

GREATER PROSPERITY THROUGH RESOURCE PRODUCTIVITY



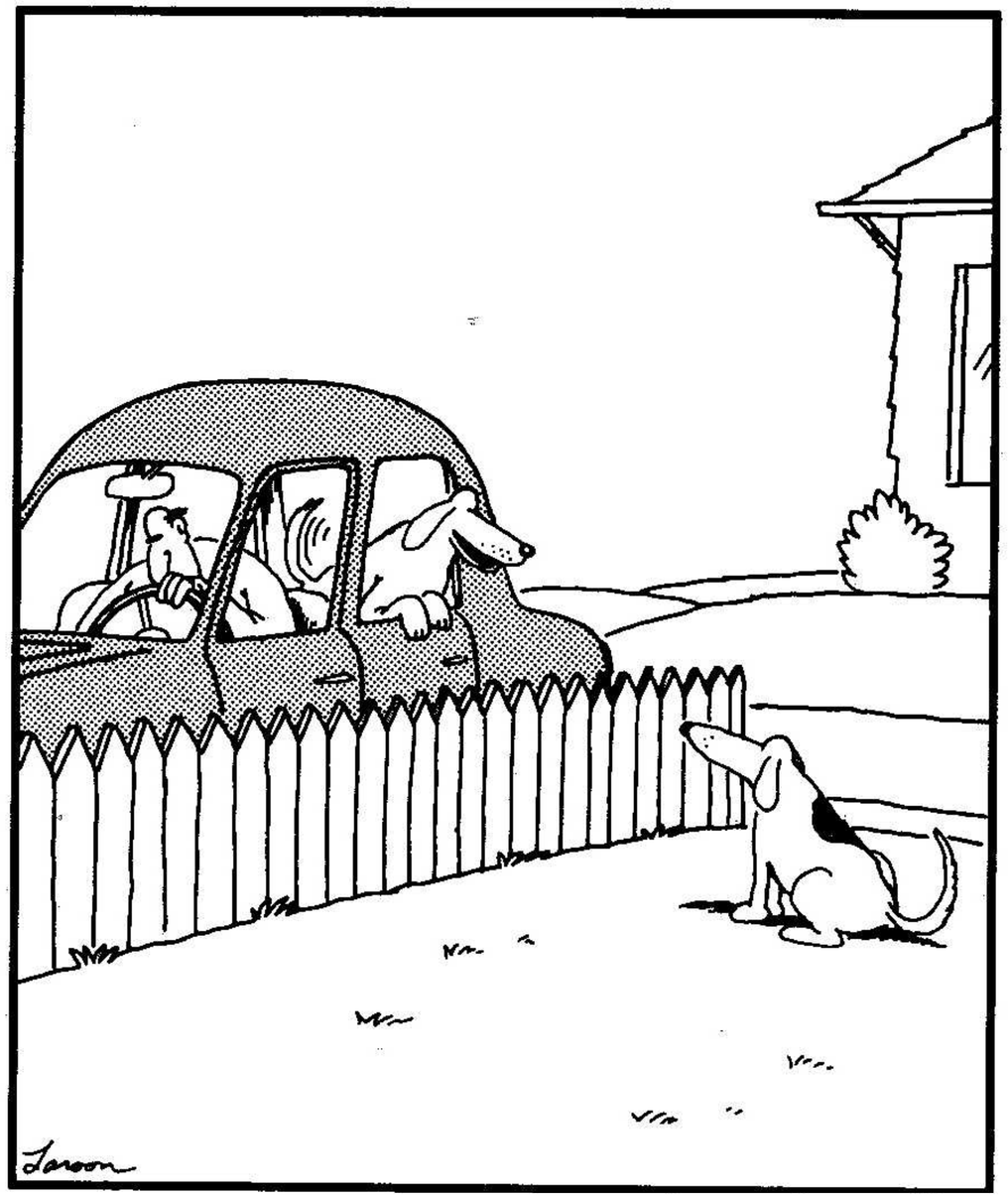
SHIFTING TO A 21ST CENTURY ENERGY PRODUCTIVITY MINDSET:

RETHINKING ENERGY PRODUCTIVITY TO DRIVE OUR SOCIAL, ENVIRONMENTAL, AND OUR LONG-TERM ECONOMIC WELL-BEING

In Discussion with Tucson, Pima County and Sustainable Tucson Summit Colleagues, Tucson, Arizona, April 23, 2026

John A. "Skip" Laitner

And as we are reminded by my favorite American philosopher, Gary Larson, small differences in assumptions can lead to very big differences in outcomes!!



"Ha ha ha, Biff. Guess what? After we go to the drugstore and the post office, I'm going to the vet's to get tutored."

April 14, 2026 marked the 91st anniversary of

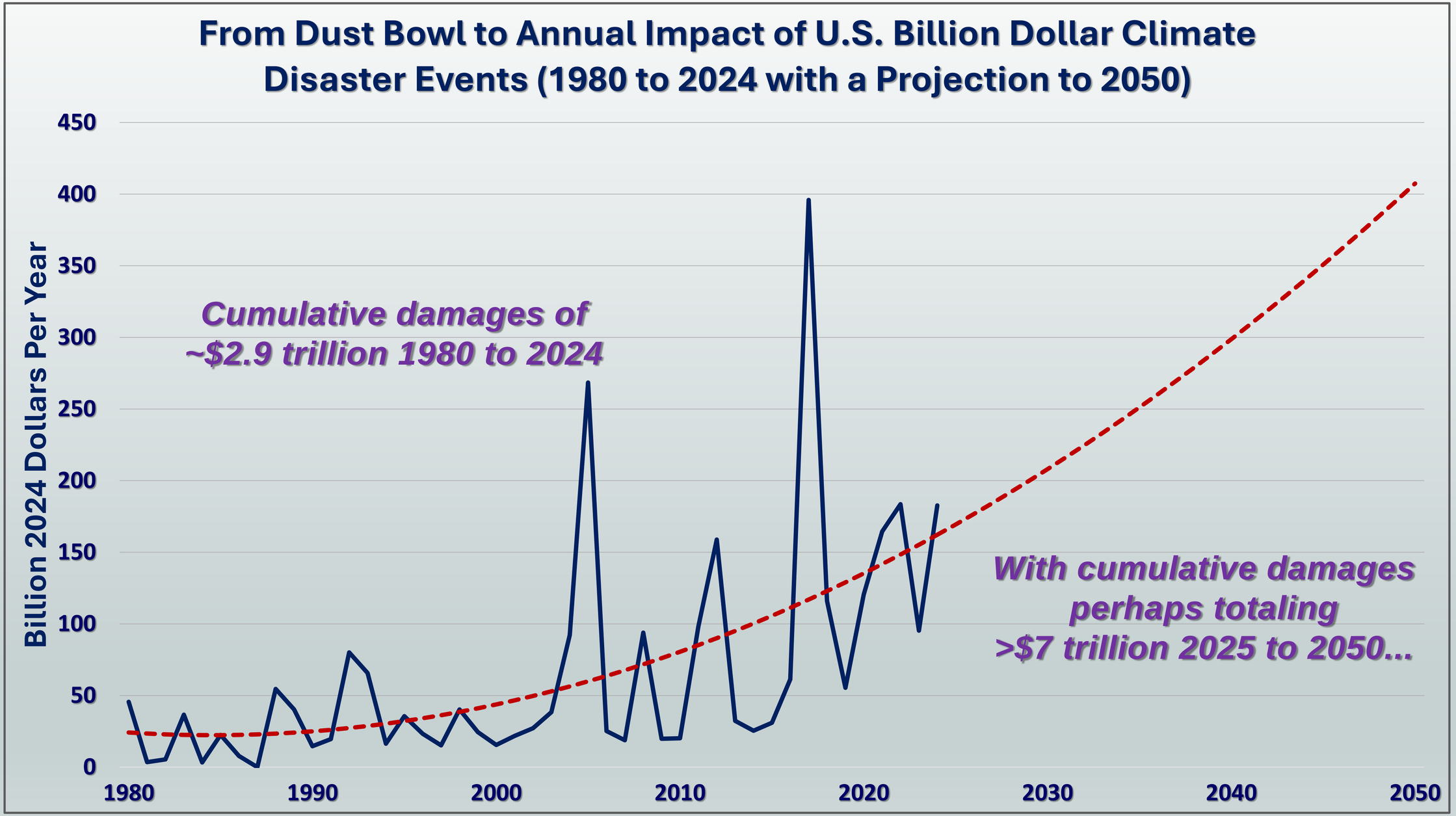
BLACK SUNDAY

We created **The Dust Bowl** drought of the 1930s – one of the **worst environmental disasters** of the Twentieth Century anywhere **in** the world.

And we’re about to do it again, only worse and in a different way...



From Dust Bowl to Annual Impact of U.S. Billion Dollar Climate Disaster Events (1980 to 2024 with a Projection to 2050)



Source: Laitner Calculation and Working Projection based on NCEI-NOAA Data April 2025.

So Let’s Continue With a Critical Question:

Might limited data and metrics also limit both our insights, as well as our understanding of what our larger economic opportunities might actually be?

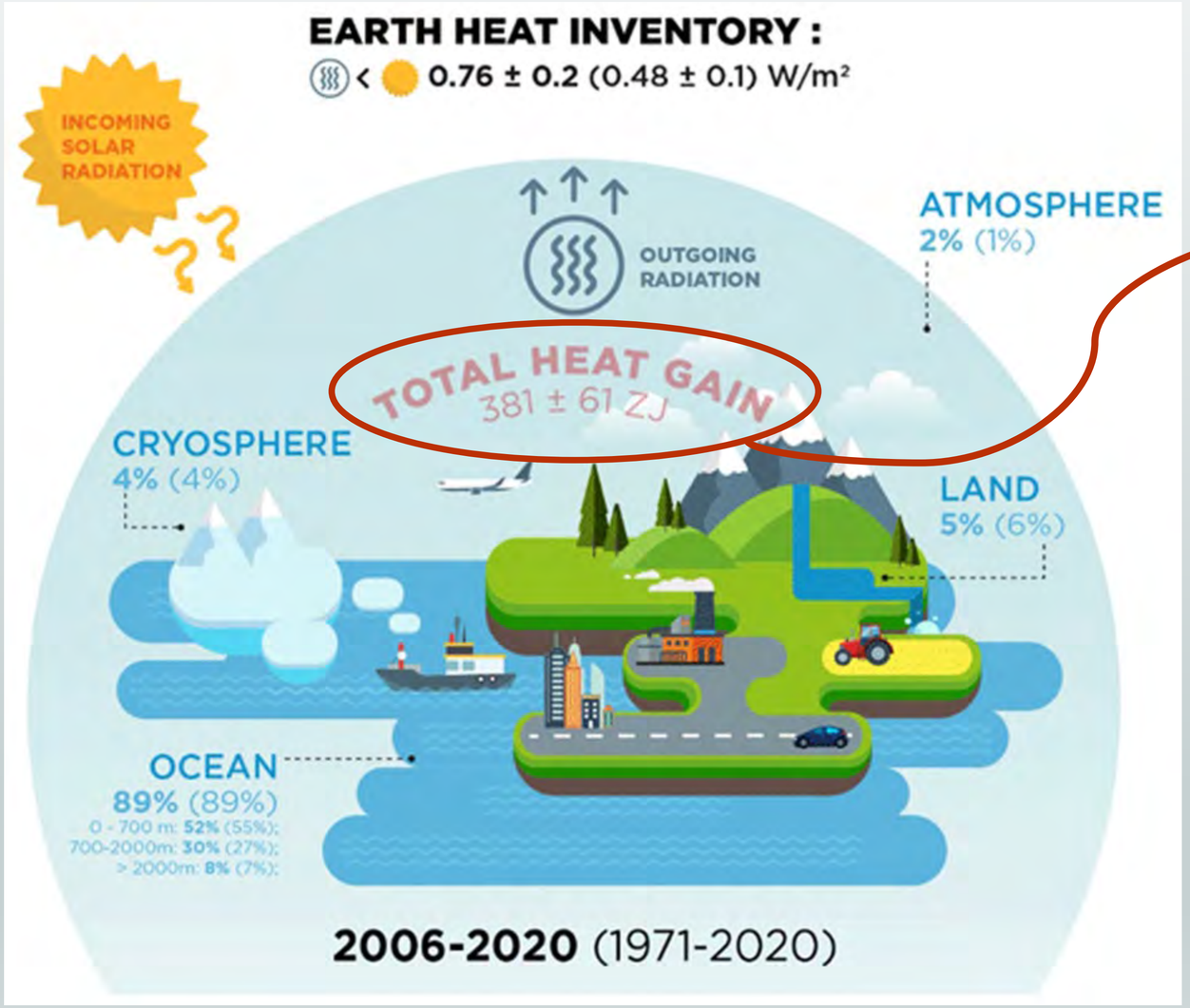
Do Limited Data and Metrics Also Limit Insights and Understanding?

"If I could leave you with one last thought, it's this: There are no such things as limits to growth, because there are no limits on the human capacity for intelligence, imagination, and wonder (emphasis added). A century ago, oil was nothing more than so much dark, sticky, ill-smelling liquid. It was the invention of the internal combustion engine that turned oil into a resource, and today oil fuels the world's economy." ***And yet. . .***

President Ronald Reagan, Remarks at Convocation Ceremonies at the University of South Carolina in Columbia, SC on September 20, 1983



Understanding the Earth-Energy Imbalance (EEI): The Build-up of Heat in the Earth's System



Updated to 2025, now ~424 zettajoules (ZJ) of heat which is ~600 times (or more) of all the energy used by the entire global economy in a single year

Perhaps equally critical, the scale of both energy and resource consumption is driving very big changes in our environment and economy in ways that may erode our long-term social, community, and economic well-being.

Source: *Heat stored in the Earth system 1960–2020: where does the energy go?* https://essd.copernicus.org/articles/15/1675/2023/

So. . .

However “imaginative” our (in)efficient use of fossil fuels, other energy, water, and resources altogether, the economic burdens of energy, water, and resource wastes have grown big time. . .

And the Scale of Resource Use by Pima County?*

Pima Domestic Material Footprint: **21.0 million metric tons**

Pima Energy Use Tonnes of Coal Equivalent: **8.5 million metric tons**

Pima Fresh Water Consumption: **372.8 billion gallons**

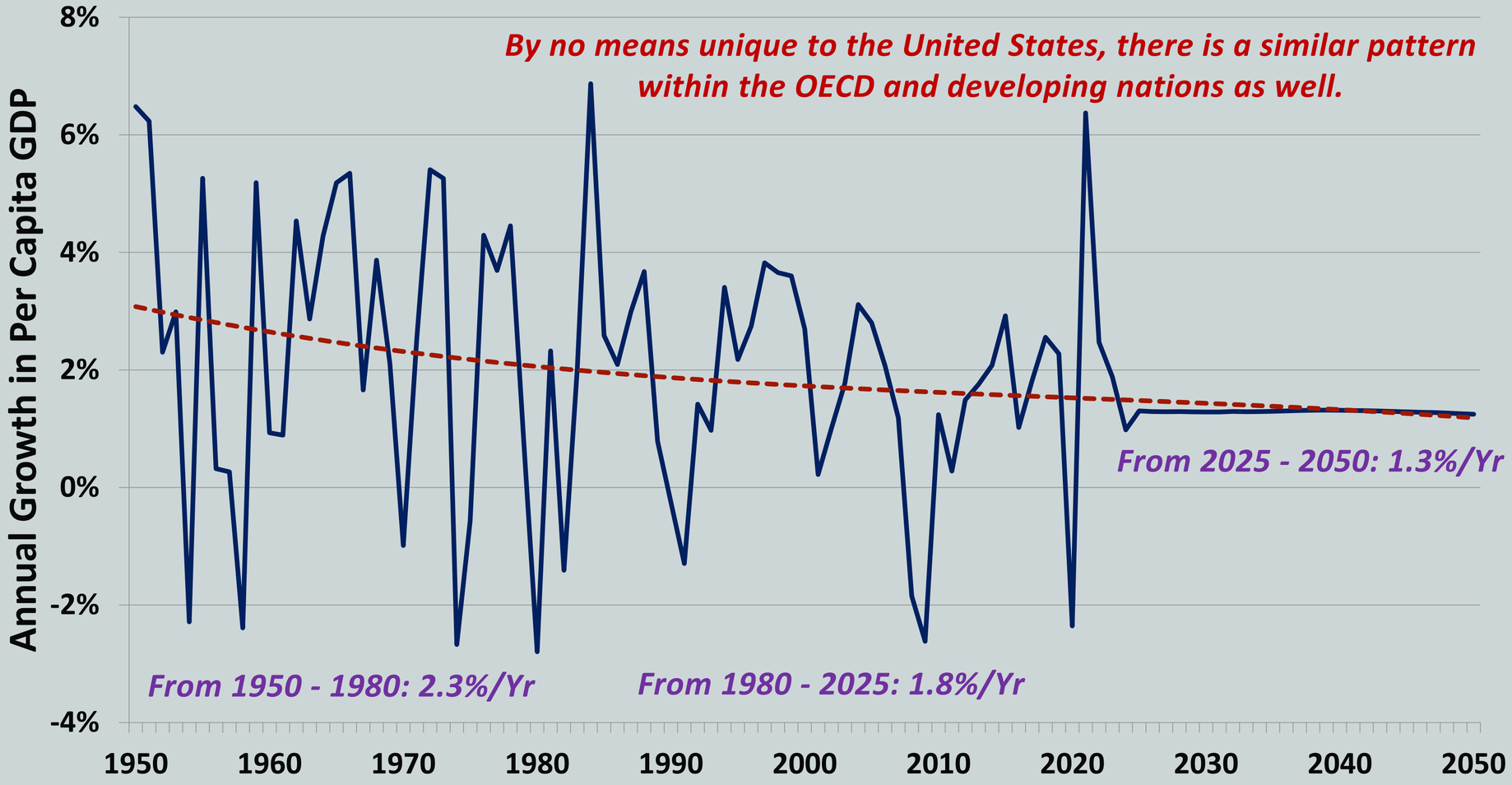
Pima Total Scope 1, 2, & 3 GHG Emissions: **19.5 million metric tons**

And to highlight the scale of economic costs which might be imposed only by GHG emissions? My working estimate of the "Social Cost of GHG" for Pima County alone is an annual economic burden of ~$3.6 billion per year. . .

** The metrics shown are based on a variety of data sources as adjusted for both per capita consumption and income. They are intended to show the insight of scale rather than precise estimates. But I am happy to discuss and extend this thinking as people may find it useful.*

Growth of Real U.S. Per Capita GDP (1950 – 2050)

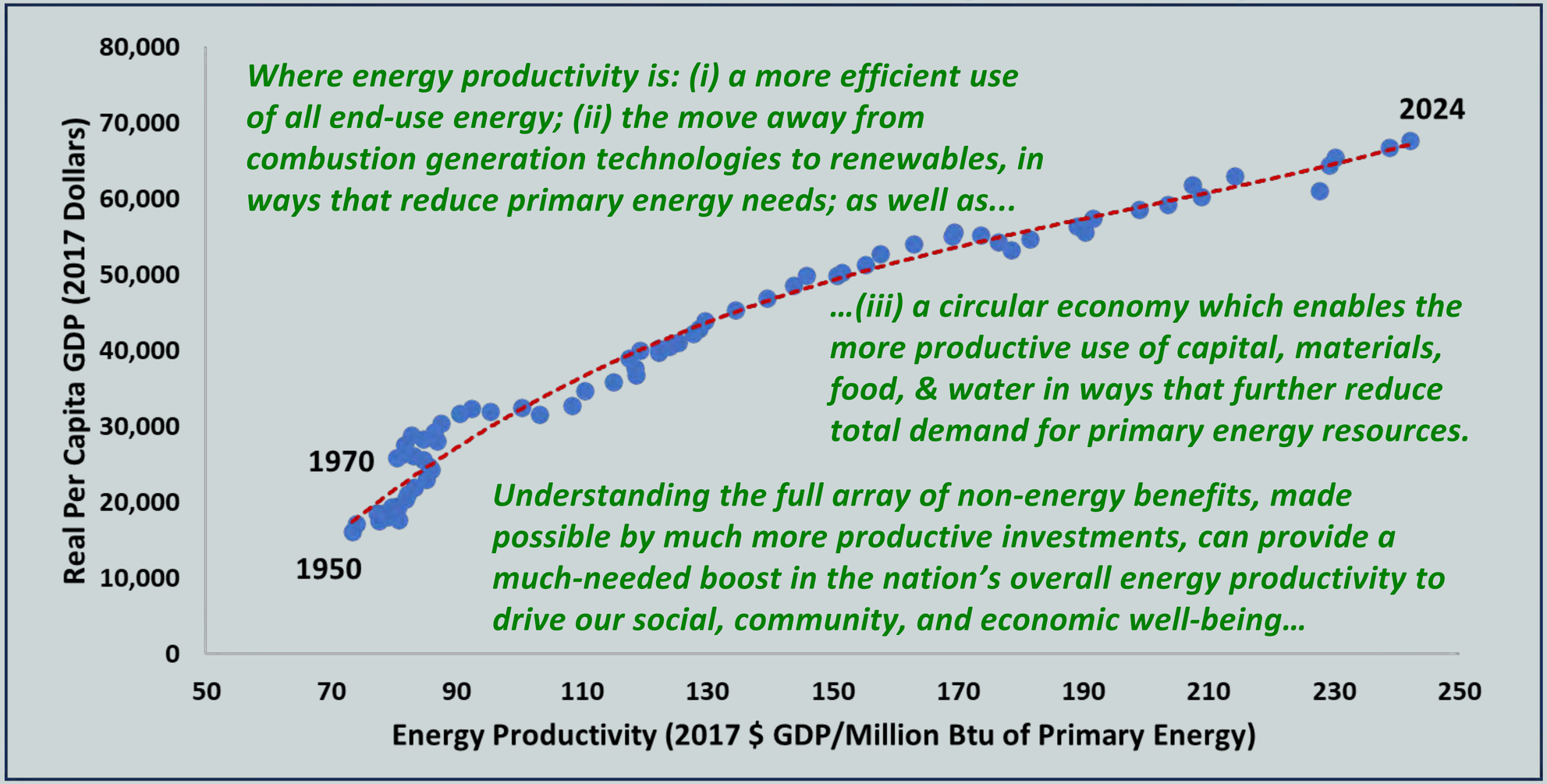
A Slow Erosion Over Time



Source: *Economic and Human Dimensions Research Associates calculations based on various BEA and W&P Data (2025).*

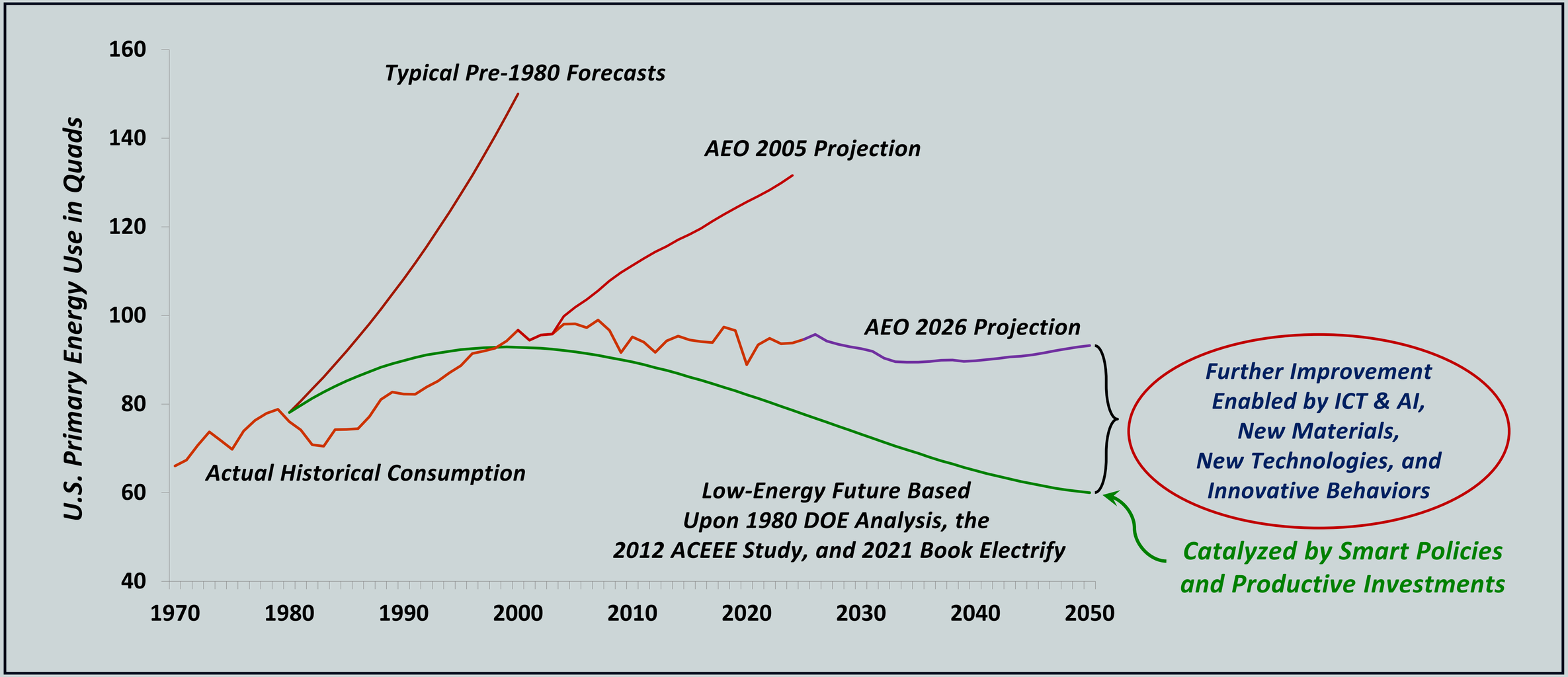
Question: *Might we imagine the economic erosion is a result of the cumulative $2.9 trillion U.S. losses from climate change over the period 1980 to 2024 (slide #5)? With perhaps a growing burden of waste, but also a lagging energy productivity??*

The Connection Between U.S. Energy Productivity and Real Per Capita GDP (1950-2024)

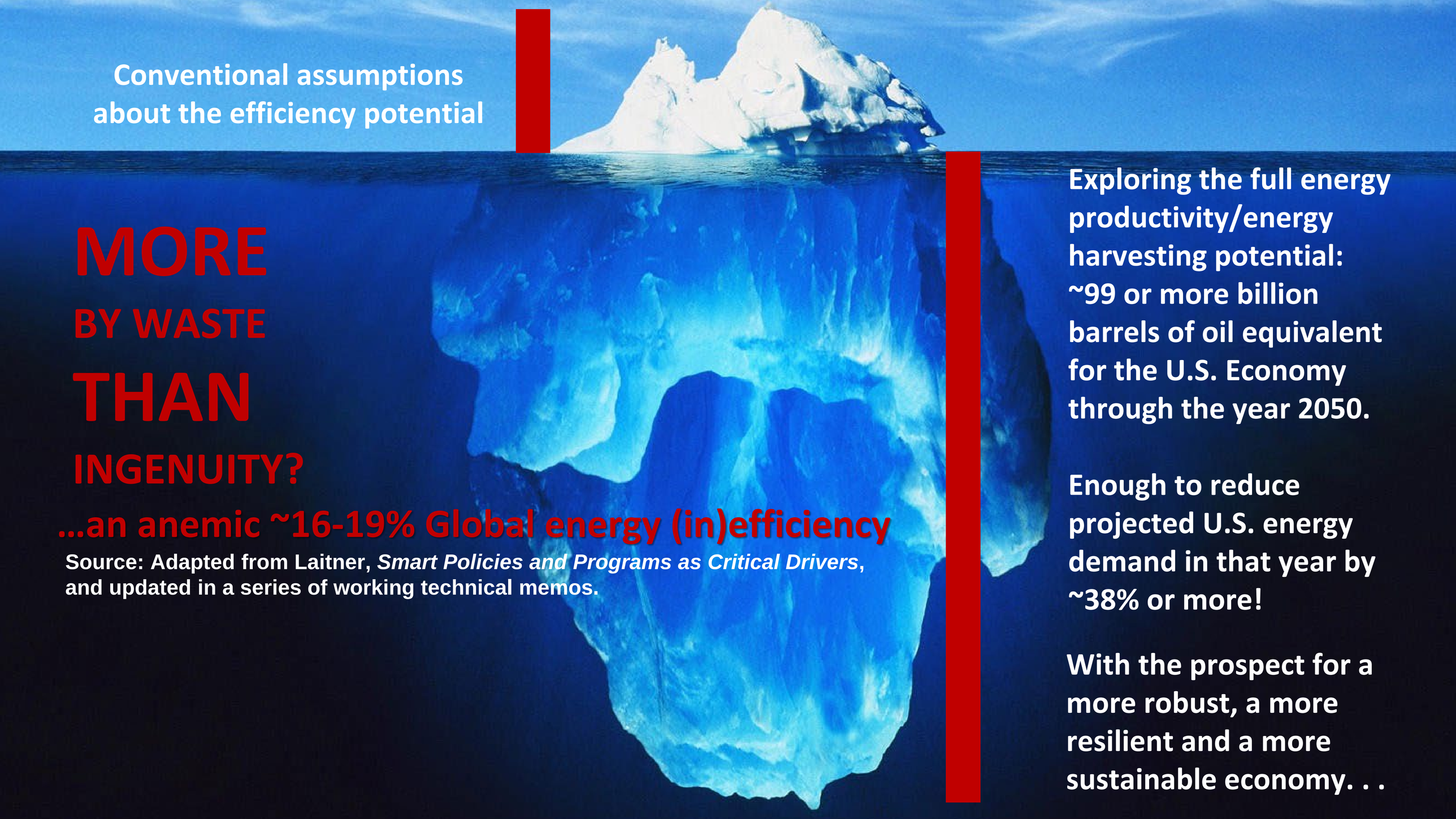


Source: Calculations by John A. "Skip" Laitner using EIA and BEA data for the United States, October 2025.

Key Insight: The Energy Productivity Resource Is Larger than Generally Understood or Believed



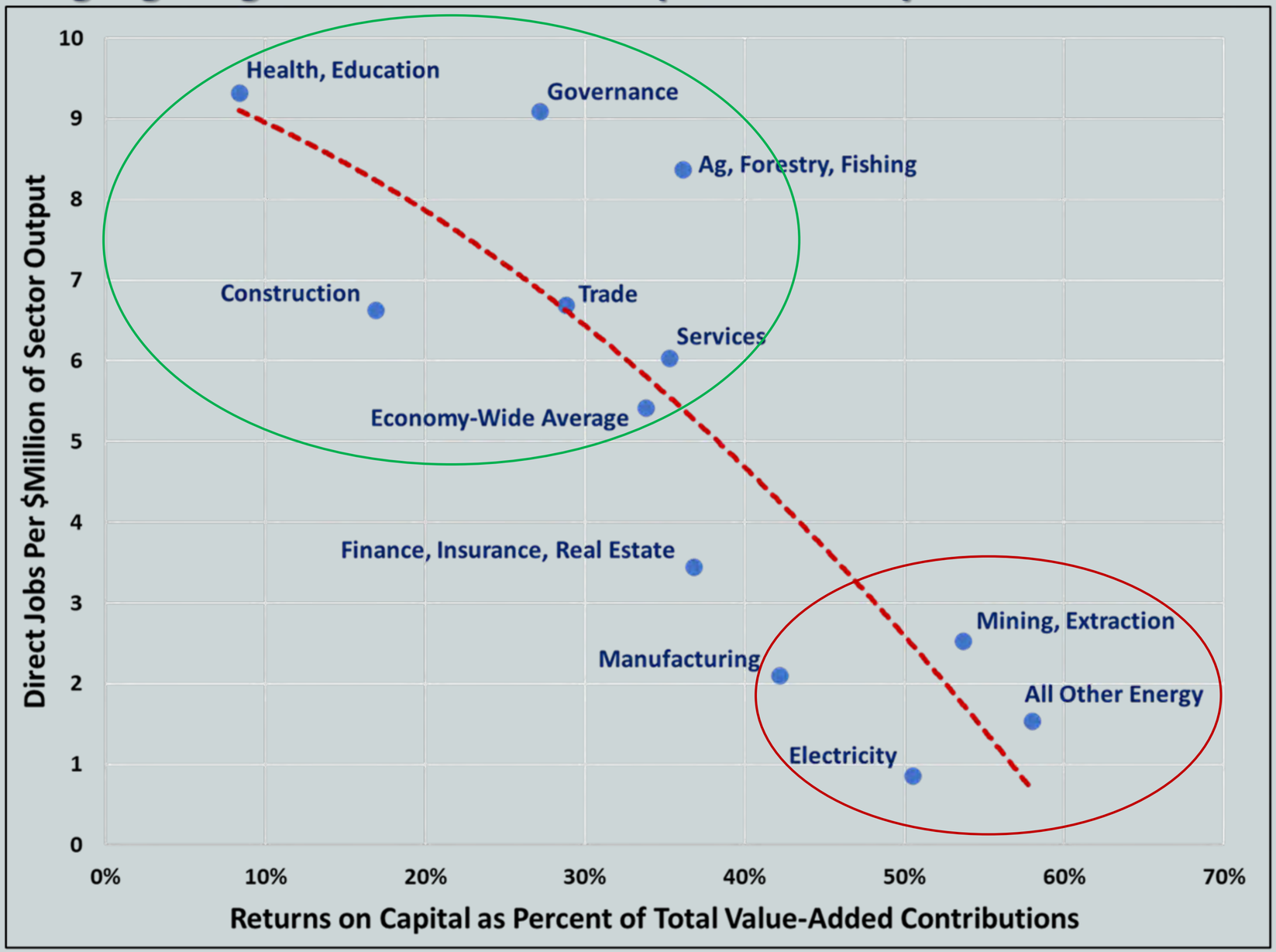
Sources: *Laitner April 2026, based on DOE 1980 Policy Analysis, AER 2026, ACEEE 2012, AEO 2005, AEO 2026, Griffith 2021.*


Conventional assumptions
about the efficiency potential
MORE
BY WASTE
THAN
INGENUITY?
…an anemic ~16-19% Global energy (in)efficiency
Source: Adapted from Laitner, *Smart Policies and Programs as Critical Drivers*, and updated in a series of working technical memos.
Exploring the full energy productivity/energy harvesting potential: ~99 or more billion barrels of oil equivalent for the U.S. Economy through the year 2050.
Enough to reduce projected U.S. energy demand in that year by ~38% or more!
With the prospect for a more robust, a more resilient and a more sustainable economy. . .

AND WHAT ABOUT JOBS?

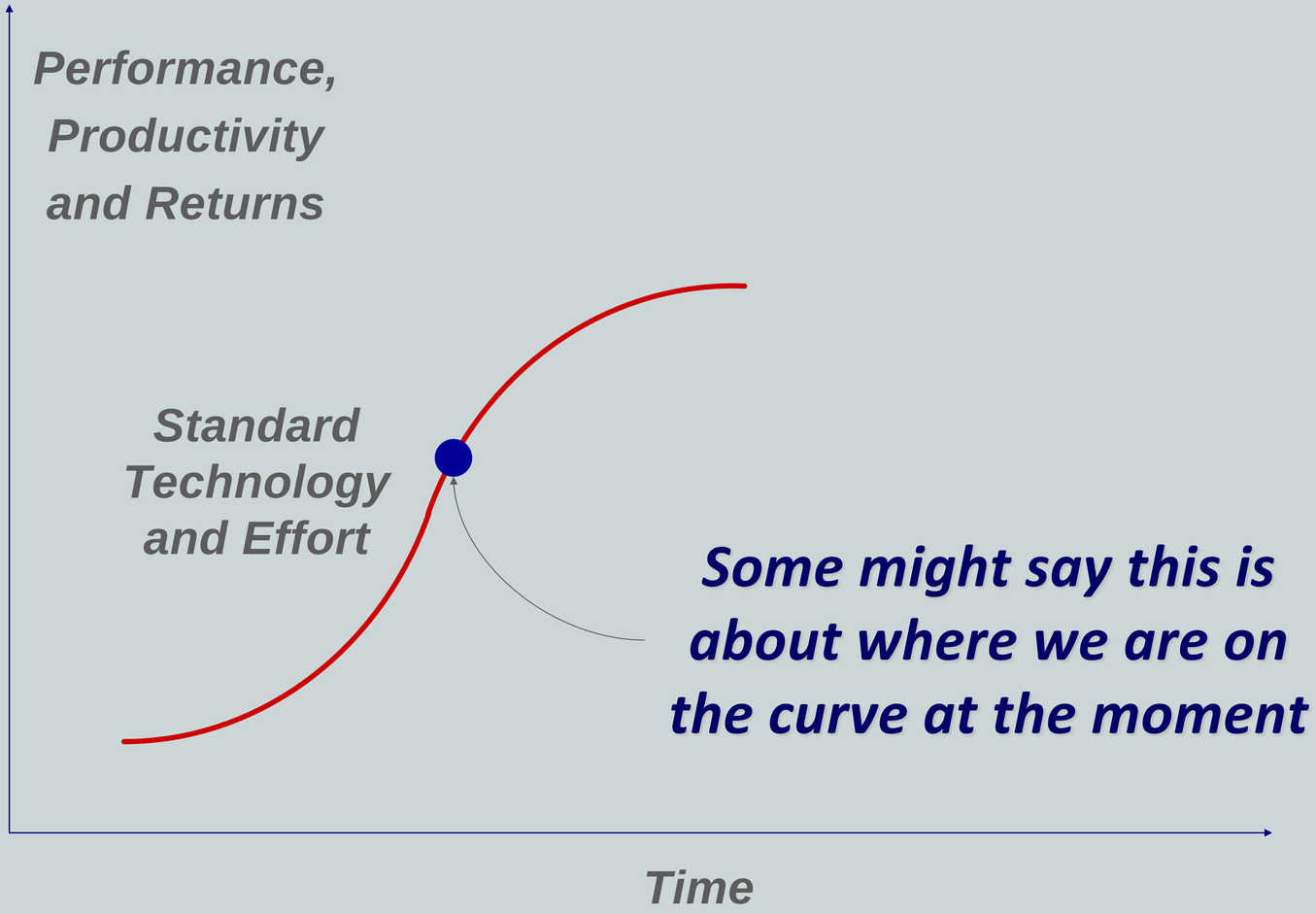


Highlighting the Link Between Capital Intensity and Job Creation

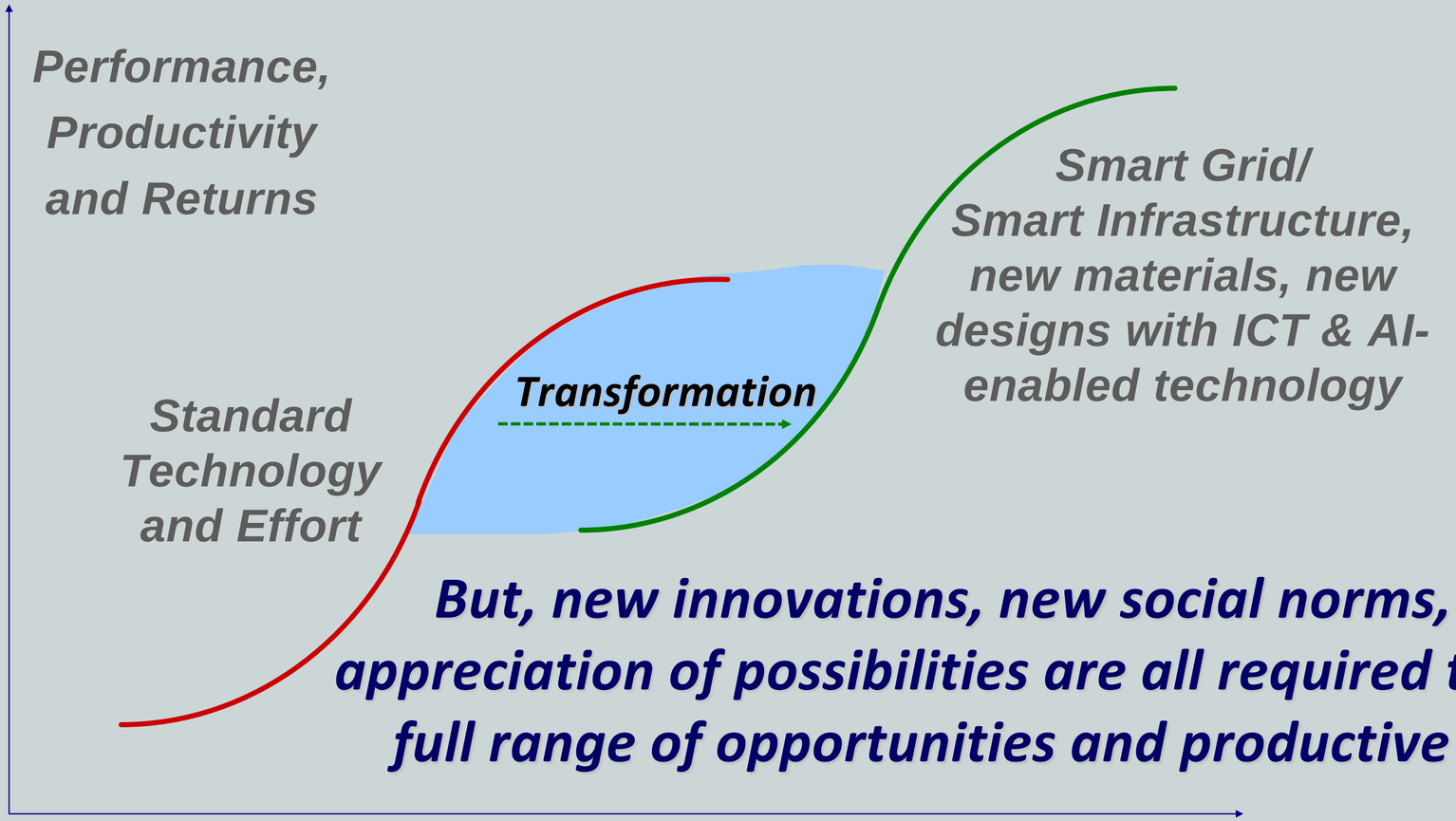


Source: Author calculations based on US 2018 data from IMPLAN (October 2020).

A Key Insight: Purposeful Effort and Productive Investments Are Required If We Are to Respond to the Imperative of Greater Energy Productivity



A Key Insight: Purposeful Effort and Productive Investments Are Required If We Are to Respond to the Imperative of Greater Energy Productivity



But, new innovations, new social norms, and a new appreciation of possibilities are all required to leverage the full range of opportunities and productive investments

How ‘moonshot’ thinking could save the world.

– Mariana Mazzucato

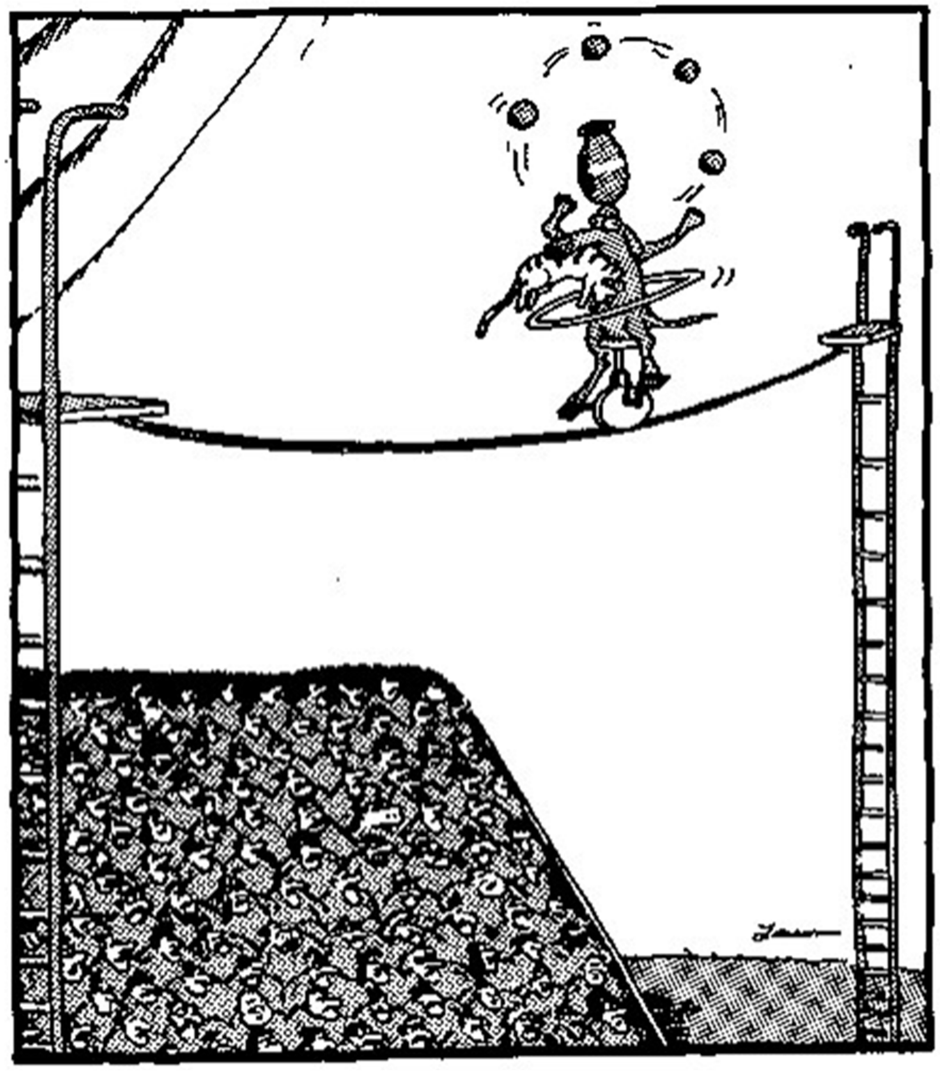
Mission Economy: A Moonshot Guide to Changing Capitalism (2021).



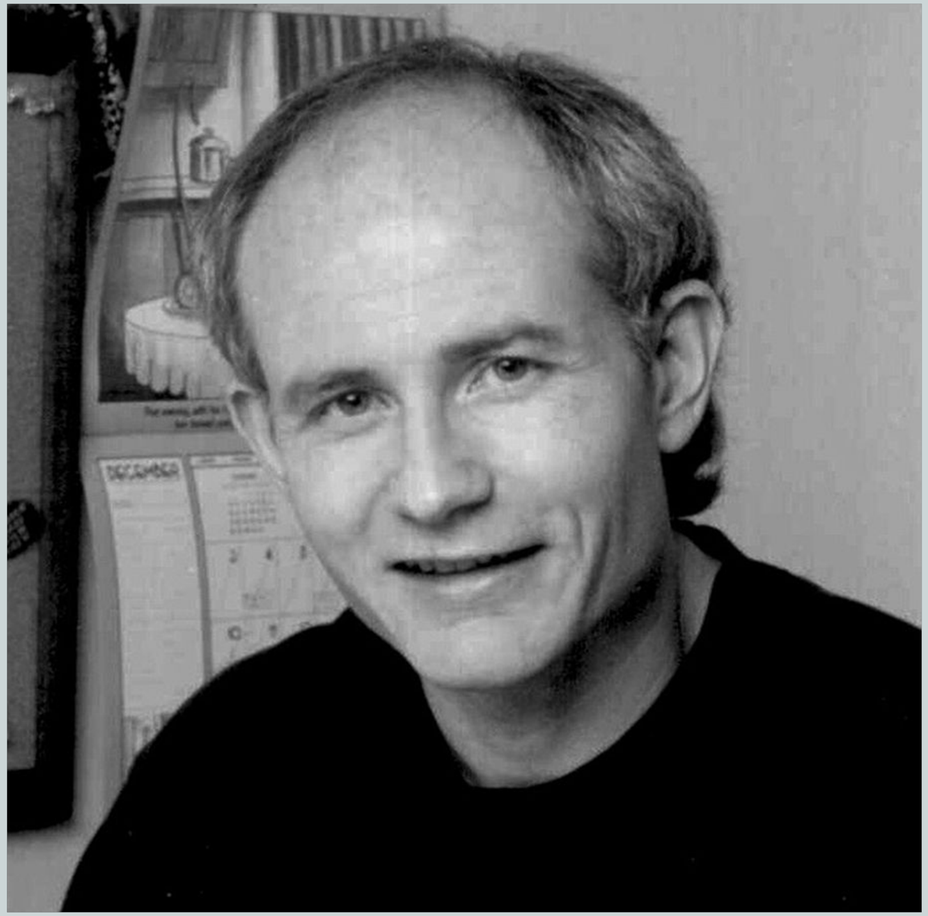


“Thinking is the hardest work there is which is the probable reason why so few engage in it.”

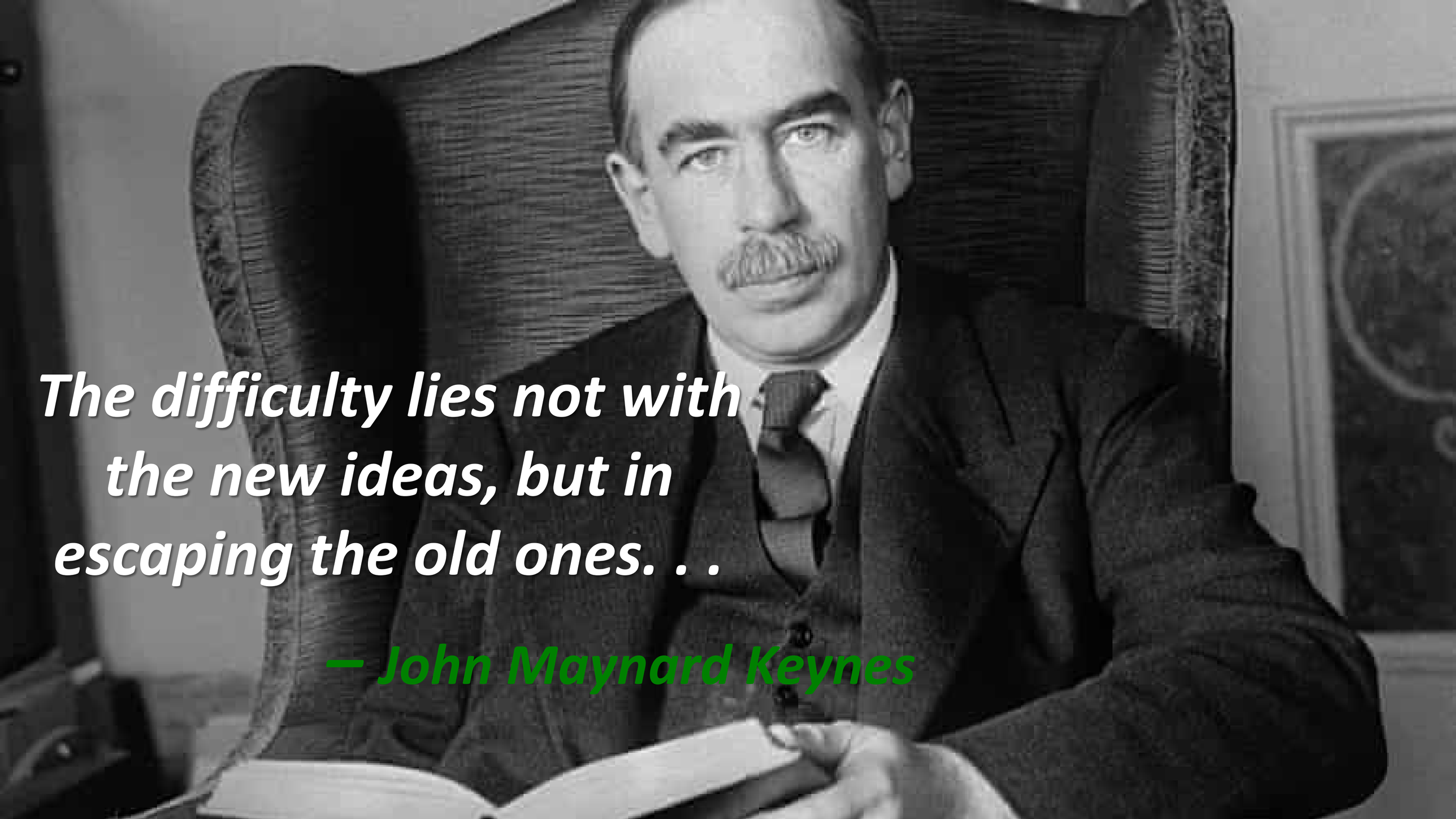
– Henry Ford



High above the hushed crowd, Rex tried to remain focused. Still, he couldn't shake one nagging thought: He was an old dog and this was a new trick.



Perhaps a last word from, not my favorite physicist, but my favorite American Philosopher, Gary Larson. . .


The difficulty lies not with
the new ideas, but in
escaping the old ones. . .
– John Maynard Keynes

Selected References

- **ASCE. 2021.** *Failure to Act: Economic Impacts of Status Quo Investment Across Infrastructure Systems*. Washington, DC: American Society of Civil Engineers. https://infrastructurereportcard.org/wp-content/uploads/2021/02/FTA_Econ_Impacts_Status_Quo-1.pdf
- **Ayres, Robert U. and Benjamin Warr. 2009.** *The Economic Growth Engine: How Energy and Work Drive Material Prosperity*. Northampton, MA: Edward Elgar Publishing, Inc. https://www.e-elgar.com/shop/usd/the-economic-growth-engine-9781848441828.html
- **Energy Information Administration. 2026.** *The Annual Energy Outlook 2026: With Projections to 2050*. Washington, DC: U.S. Department of Energy. https://www.eia.gov/outlooks/aeo/
- **Griffith, Saul. 2021.** *Electrify: An Optimist's Playbook for Our Clean Energy Future.* Cambridge, MA: MIT Press. https://www.rewiringamerica.org/electrify-the-book
- **Kümmel, Reiner. 2011.** *The Second Law of Economics: Energy, Entropy, and the Origins of Wealth*. New York, NY: Springer. https://link.springer.com/book/10.1007/978-1-4419-9365-6
- **Laitner, John A. "Skip", Steven Nadel, R. Neal Elliott, Harvey Sachs, and A. Siddiq Khan. 2012.** *The Long-Term Energy Efficiency Potential: What the Evidence Suggests*. Washington, DC: American Council for an Energy-Efficient Economy. http://aceee.org/research-report/e121
- ***Laitner, John A. "Skip." 2015.*** Linking Energy Efficiency to Economic Productivity: Recommendations for Improving the Robustness of the US Economy. *Wiley Interdisciplinary Reviews: Energy and Environment*. Volume 4: 235-52. http://onlinelibrary.wiley.com/doi/10.1002/wene.135/abstract
- **Laitner, John A. "Skip". 2020.** Institutional Perspectives on the Productive Use of Resources. An overview article as a guest editor in a special issue of the Russian Journal*, Economic Policy.* April 2020. Available from the author.
- **Rifkin, Jeremy, Rob Wilhite, Gordon Gill, John A. "Skip" Laitner, Daniel Lashof, et al. 2021.** *America 3.0: A Smart Third Industrial Revolution Infrastructure and the Recovery of the American Economy.* A Report Prepared for Senator Charles Schumer, U.S. Senate. https://www.foet.org/wp-content/uploads/2021/07/Jeremy-Rifkin-America-3.0-The-Resilient-Society-20210728.pdf
- **WMO 2021.** *Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019)*. Geneva, Switzerland: World Meteorological Organization. https://library.wmo.int/index.php?lvl=notice_display&id=21930#.YhePnN_MI2w

With many thanks for your attention, but do also note:



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