Global greening versus global warming

Matt Ridley
Why do I think the risk from global warming is being exaggerated?

• Environmental predictions of doom almost always are;
• the models have been consistently wrong for more than 30 years;
• climate sensitivity is now known to be relatively low;
• the climate science establishment has a vested interest in alarm.
Failed Forecasts of Doom

- the population explosion would be unstoppable;
- global famine would be inevitable;
- crop yields would fall;
- a cancer epidemic caused by pesticides would shorten our lives;
- the desert would advance;
- rainforests would disappear;
- acid rain would destroy forests;
- oil spills would worsen;
- oil and gas would run out;
- and so would most metals;
- the Great Lakes would die;
- dozens of bird and mammal species would become extinct each year;
- a new ice age would begin;
- Nanotechnology would run riot
- GMOs would wreck ecosystems
- Sperm counts would fall
- Y2k
Carbon dioxide levels
Global Greening
Global greening

Trend in Annual Gross Productivity per Decade in % (1982 to 2011)

14% greener over 30 years

By How Much did the Earth Green over the Past 30 years?

<table>
<thead>
<tr>
<th>IGBP Land Cover Classes</th>
<th>Area</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G (%)</td>
<td>B (%)</td>
</tr>
<tr>
<td>Evergreen broadleaf forests</td>
<td>5.62</td>
<td>0.15</td>
</tr>
<tr>
<td>Deciduous broadleaf forests</td>
<td>0.54</td>
<td>0.09</td>
</tr>
<tr>
<td>Cropland/Natural vegetation mosaics</td>
<td>2.27</td>
<td>0.13</td>
</tr>
<tr>
<td>Savannas</td>
<td>1.67</td>
<td>0.40</td>
</tr>
<tr>
<td>Mixed forests</td>
<td>3.56</td>
<td>0.40</td>
</tr>
<tr>
<td>Woody savannas</td>
<td>2.85</td>
<td>0.05</td>
</tr>
<tr>
<td>Croplands</td>
<td>3.41</td>
<td>0.21</td>
</tr>
<tr>
<td>Closed shrublands</td>
<td>1.80</td>
<td>0.19</td>
</tr>
<tr>
<td>Evergreen needleleaf forests</td>
<td>0.92</td>
<td>0.01</td>
</tr>
<tr>
<td>Deciduous needleleaf forests</td>
<td>0.18</td>
<td>0.09</td>
</tr>
<tr>
<td>Grasslands</td>
<td>2.86</td>
<td>0.48</td>
</tr>
<tr>
<td>Open shrublands</td>
<td>5.18</td>
<td>0.57</td>
</tr>
<tr>
<td>Total</td>
<td>30.87</td>
<td>2.76</td>
</tr>
</tbody>
</table>

- **31% of the global vegetated area greened**
- **This greening translates to a 14% increase in gross productivity**
- **The greening is seen in all vegetation types**
The CO2 fertilisation effect

Parts per million CO2
How Fossil Fuels Have Greened the Planet

By MATT RIDLEY
Jan. 4, 2013 9:40 p.m. ET

Did you know that the Earth is getting greener, quite literally? Satellites are now confirming that the amount of green vegetation on the planet has been increasing for three decades. This will be news to those accustomed to alarming tales about deforestation, overdevelopment and ecosystem destruction.

This possibility was first suspected in 1985 by Charles Keeling, the scientist whose meticulous record of the content of the air atop Mauna Loa in Hawaii first alerted the world to the increasing concentration of carbon dioxide in the atmosphere. Mr. Keeling’s
“Our work was able to tease-out the CO2 fertilization effect by using mathematical modeling together with satellite data adjusted to take out the observed effects of other influences such as precipitation, air temperature, the amount of light, and land-use changes.”
– R. Donohue, 2013

“The greening over the past 33 years reported in this study is equivalent to adding a green continent about two times the size of mainland USA (18 million km²).”

Zaichun Zhu, Beijing University, 2016
PUBLIC RELEASE: 25-APR-2016

CO2 fertilization greening the earth

International team reports CO2 fertilization prompted plants and trees to sprout extra green leaves equivalent in area to two times the continental USA, or nearly 4.4 billion General Shermans (largest giant Sequoia tree)

BOSTON UNIVERSITY

The beneficial aspect of CO2 fertilization in promoting plant growth has been used by contrarians, notably Lord Ridley (hereditary peer in the UK House of Lords) and Mr. Rupert Murdoch (owner of several news outlets), to argue against cuts in carbon emissions to
Figure 4 | Global average CWP (%) relative to 2000 simulated under RCP 8.5 for each GGCM driven by five different GCMs. Solid lines show median CWP under both climate change and CO₂ effects, whereas dashed lines show median CWP under climate change effects only—that is, with constant [CO₂]. Shaded areas show the range across the GGCM-GCM ensemble under CC w/o CO₂ (yellow) and CC w/ CO₂ (blue), distinctively, and overlap between CC w/o CO₂ and CC w/ CO₂ (red).
Global greening

Table 3. LAI trends for each vegetation type and over each continent (units are $10^{-2}$ m$^2$ m$^{-2}$ yr$^{-1}$). The percentage of area of each continent covered by each vegetation type is given in bracket in %. Bold values highlight high trend values (greater than 3.5 m$^2$ m$^{-2}$ yr$^{-1}$) over significant areas (greater than 10%).

<table>
<thead>
<tr>
<th>Product</th>
<th>Vegetation Type</th>
<th>Africa</th>
<th>Asia</th>
<th>Europe</th>
<th>North America</th>
<th>South America</th>
<th>Oceania</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOV1</td>
<td>All</td>
<td>2.28</td>
<td>2.71</td>
<td>3.48</td>
<td>2.73</td>
<td>2.80</td>
<td>2.25</td>
<td>2.75</td>
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<tr>
<td>LAI-MC</td>
<td>Broadleaf forests</td>
<td>1.32 (5)</td>
<td>2.05 (3)</td>
<td>4.65 (17)</td>
<td>3.11 (7)</td>
<td>3.87 (8)</td>
<td>0.92 (7)</td>
<td>3.51 (6)</td>
</tr>
<tr>
<td>LAI-MC</td>
<td>Coniferous forests</td>
<td>- (0)</td>
<td>4.11 (14)</td>
<td>4.74 (20)</td>
<td>3.94 (24)</td>
<td>4.37 (1)</td>
<td>- (0)</td>
<td>4.19 (11)</td>
</tr>
<tr>
<td>LAI-MC</td>
<td>Evergreen forests</td>
<td>3.03 (14)</td>
<td>3.22 (7)</td>
<td>- (0)</td>
<td>3.66 (4)</td>
<td>3.07 (43)</td>
<td>4.82 (12)</td>
<td>3.16 (13)</td>
</tr>
<tr>
<td>LAI-MC</td>
<td>Summer crops</td>
<td>2.63 (3)</td>
<td>4.28 (13)</td>
<td>3.95 (18)</td>
<td>3.01 (7)</td>
<td>0.29 (1)</td>
<td>2.80 (6)</td>
<td>3.95 (8)</td>
</tr>
<tr>
<td>LAI-MC</td>
<td>Winter crops</td>
<td>1.86 (1)</td>
<td>1.85 (3)</td>
<td>1.88 (2)</td>
<td>2.59 (5)</td>
<td>3.36 (5)</td>
<td>- (0)</td>
<td>2.02 (3)</td>
</tr>
<tr>
<td>LAI-MC</td>
<td>Grasslands</td>
<td>2.93 (30)</td>
<td>2.84 (30)</td>
<td>3.89 (21)</td>
<td>2.39 (34)</td>
<td>2.89 (32)</td>
<td>2.05 (40)</td>
<td>2.78 (31)</td>
</tr>
</tbody>
</table>

https://www.mdpi.com/2072-4292/10/3/424/htm
Total annual monetary value of the direct CO2 benefit on crop production for 45 crops

http://www.co2science.org/education/reports/co2benefits/MonetaryBenefitsofRisingCO2onGlobalFoodProduction.pdf
WORLDS IN THE MAKING
THE EVOLUTION OF THE UNIVERSE
BY
SVANTE ArrHENIUS
DIRECTOR OF THE PHYSICO-CHEMICAL INSTITUTE, STOCKHOLM
TRANSLATED BY
DR. H. Borns
ILLUSTRATED
NEW YORK AND LONDON
HARPER & BROTHERS PUBLISHERS
MCMVIII
“By the influence of the increasing percentage of carbonic acid in the atmosphere, we may hope to enjoy ages with more equable and better climates.”
Global Warming
Global warming

Ole Humium, http://www.climate4you.com
Global warming

0.15°C per decade over 39 years
Based on current model results, we predict:

- under the IPCC Business-as-Usual (Scenario A) emissions of greenhouse gases, a rate of increase of global mean temperature during the next century of about 0.3°C per decade (with an uncertainty range of 0.2°C to 0.5°C per decade), this is greater than that seen over the past 10,000 years. This will result in a likely increase in global mean temperature of about 1°C above the present value by 2025 and 3°C before the end of the next century. The rise will not be steady because of the influence of other factors.
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IPCC, FAR, 1990, Summary for Policymakers, p 1
“For the period from 1998 to 2012, 111 of the 114 available climate-model simulations show a surface warming trend larger than the observations”

IPCC, AR5, 2015
Warming by latitude

Latitude-Average Global Land Surface Air Temperatures (GHCN-CAMS)

Period Averages:
Jan 1979 to Dec 1988
Jan 2003 to Dec 2012

South Pole

Equator

North Pole
Thermometer adjustments

GISS adjustments from May 2008 to July 2016 of January temperature 1910 and 2000

GISS anomaly value for January 2000

May 2008: Difference 0.45 °C

July 2016: Difference 0.69 °C

GISS anomaly value for January 1910
Impacts of climate change
Tropical cyclones

Global Tropical Cyclone Accumulated Cyclone Energy (ACE)
24-month Running Sums -- Dr. Ryan N. Maue -- Updated July 31, 2016

Accumulated Cyclone Energy (10^4 knots²)

70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18
Snow cover
Sea level rise – 3.16 mm a year
Sea Ice
“Global area burned appears to have overall declined over past decades, and there is increasing evidence that there is less fire in the global landscape today than centuries ago.”

Doerr and Santin 2016, Phil Trans Roy Soc

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4874420/
Global malaria deaths by world region, 2000 to 2015

From 2000 to 2015, malaria deaths fell in all world regions.

- Africa: 9 out of 10 malaria victims are from Africa in 2015.
- Malaria deaths in Africa:
  - In 2000: 764,000
  - In 2015: 395,000

Data obtained from: WHO

The author Max Roser licensed this visualization under a CC BY-SA license. You are welcome to share but please refer to its source where you can find more information: www.OurWorldInData.org/Data/Health/Malaria
Global deaths from natural disasters, by type (1900-2016)

Global annual deaths from natural catastrophes, differentiated by disaster type from 1900 to 2016. The size of the bubble represents the total death count per year.
UNEP’s “disappeared” forecast

Fifty million climate refugees by 2010

Today we find a world of asymmetric development, unsustainable natural resource use, and continued rural and urban poverty. There is general agreement about the current global environmental and development crisis. It is also known that the consequences of these global changes have the most devastating impacts on the poorest, who historically have had limited entitlements and opportunities for growth.
"Humanity is sitting on a time bomb. If the vast majority of the world's scientists are right, we have just ten years to avert a major catastrophe that could send our entire planet's climate system into a tail-spin of epic destruction involving extreme weather, floods, droughts, epidemics and killer heat waves beyond anything we have ever experienced - a catastrophe of our own making."

Al Gore 2006
Failed climate forecasts

- malaria would increase
- snow would become a thing of the past
- hurricanes/cyclones would get worse
- droughts would get worse
- the Arctic sea ice would be gone by 2013
- glacier retreat would accelerate
- sea level rise would accelerate
- the Gulf Stream would fail
- 50m climate refugees by 2010
Luke-warming
Climate change is real and dangerous

Climate change is real and NOT dangerous

Climate change is not happening
A range of possible outcomes

http://www.springerlink.com/content/f29664537804p75/fulltext.html#CR11
“Even the vaunted scientific consensus around climate change — which largely rests on fundamental physics that has been well understood for more than a century — applies only to a narrow claim about the discernible human impact on global warming. The minute you get into questions about the rate and severity of future impacts, or the costs of and best pathways for addressing them, no semblance of consensus among experts remains.”
Professor Daniel Sarewitz, Professor of science and society at Arizona State University
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Professor Daniel Sarewitz, Professor of science and society at Arizona State University
Only one scenario is dangerous—and then only with high sensitivity

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Warming in 2081–2100 based on: CMIP5 models °C</th>
<th>TCR of 1.35°C °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1850–1900 2012*</td>
<td>1850–1900* 2012</td>
</tr>
<tr>
<td>Baseline</td>
<td>1.6 0.8</td>
<td>1.0 0.2</td>
</tr>
<tr>
<td>RCP2.6</td>
<td>2.4 1.6</td>
<td>1.6 0.8</td>
</tr>
<tr>
<td>RCP4.5</td>
<td>2.8 2.0</td>
<td>2.0 1.2</td>
</tr>
<tr>
<td>RCP6.0</td>
<td>4.3 3.5</td>
<td>2.9 2.1</td>
</tr>
<tr>
<td>RCP8.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lewis and Crok 2013
RCP 8.5
Global energy assumptions
Fig. 2.—Change of surface temperature with atmospheric carbon dioxide
(H₂O vapour pressure, 7.5 mm. Hg.)
Temperature Projections From CO2
IPCC A2 (no Abatement) Case

\[ \Delta T = F(C_2) - F(C_1) \]
\[ \text{Where } F(c) = \ln(1 + 1.2c + 0.005c^2 + 0.0000014c^3) \]

Source: Mann, 1998; IPCC

Likely CO2 Range by 2100:
- No Feedback
- 1.0 - 1.3°C by 2100
Catastrophic Global Warming Theory Based on Two Chained Theories

From Climate Positive Feedback Theory

From Greenhouse Gas Theory

Climate sensitivity

Published Measurements of Climate Sensitivity to CO2 Doubling

Sensitivity in models 2.6-4.1°C

https://landshape.files.wordpress.com/2015/06/climate_sensitivity5.png
“The findings of the Resplandy et al paper were peer reviewed and published in the world’s premier scientific journal and were given wide coverage in the English-speaking media. Despite this, a quick review of the first page of the paper was sufficient to raise doubts as to the accuracy of its results. Just a few hours of analysis and calculations, based only on published information, was sufficient to uncover apparently serious (but surely inadvertent) errors in the underlying calculations.”

Nic Lewis, 6 Nov 2018
Natural climate change
Jakobshavn Isbrae, Greenland: retreating since 1850

http://www.buffalo.edu/content/dam/www/news/imported/hires/jakobs_retreat1.jpg
Medieval Warm Period

18 non-tree-ring proxies

Polar Ural tree-line

The past 10,000 years in Greenland

https://calderup.wordpress.com/2010/05/06/warming-of-greenland/
A summary graph of all the factors that play a role in glacial modulation.

Ice sheet extent grows (light blue), forcing the temperature to fall (red). And CO₂ concentrations (yellow) fall alongside temperatures, as CO₂ is absorbed by the cooler oceans. When CO₂ concentrations reach a minimum of 190 ppm there is desertification and large dust storms (purple). And when the next Great Summer comes along (blue sine wave), the dusty-ice sheets can melt and the world warms into another interglacial (red peaks). Sources: Laskar 2004 orbital cycles, Epica3 2007 temperature data
Scepticism
Matt Ridley wants to gamble the Earth's future because he won't learn from the past

Ridley argues against climate action because he believes zombie myths

People dressed as zombies which, like some myths about climate change, keep coming back from the dead.
Photograph: Yuya Shino/Reuters
“In the APS it is ok to discuss whether the mass of the proton changes over time and how a multi-universe behaves, but the evidence of global warming is incontrovertible?”

Professor Ivar Giaever, resigning from the American Physical Society, 2011
“I looked at 73 climate models going back to 1979 and every single one predicted more warming than happened in the real world.”

John Christy, University of Alabama, Huntsville
“If you fund scientists to find evidence of something, they will be happy to find it for you. For over 20 years we have been funding them to find evidence of the human influence on climate. And they dutifully found it everywhere, hiding under every rock, glacier, ocean, and in every cloud, hurricane, tornado, raindrop, and snowflake. So, just tell scientists 20% of their funds will be targeted for studying natural sources of climate change. They will find those, too.”

Roy Spencer, NASA
“Motivated by the precautionary principle to avoid dangerous anthropogenic climate change, attempts to modify the climate through reducing CO2 emissions may turn out to be futile.”

Professor Judith Curry,
Georgia Tech
"The IPCC process is related to environmental activism, politics and opportunism...The IPCC process is unrelated to science”

Ian Plimer, University of Melbourne
“I have been put under such an enormous group pressure in recent days from all over the world that has become virtually unbearable to me. If this is going to continue I will be unable to conduct my normal work and will even start to worry about my health and safety. I see therefore no other way out therefore than resigning from GWPF.”

Professor Lennart Bengtsson 2014
“An implausible conjecture backed by false evidence and repeated incessantly has become politically correct ‘knowledge,’ and is used to promote the overturn of industrial civilization. What we will be leaving our grandchildren is not a planet damaged by industrial progress, but a record of unfathomable silliness as well as a landscape degraded by rusting wind farms and decaying solar panel arrays. False claims about 97% agreement will not spare us, but the willingness of scientists to keep mum is likely to much reduce trust in and support for science.”

Richard Lindzen 2018.

Richard S. Lindzen was Alfred P. Sloan Professor of Meteorology at the Massachusetts Institute of Technology until his retirement in 2013.
“The improver of natural knowledge absolutely refuses to acknowledge authority, as such. For him, scepticism is the highest of duties; blind faith the one unpardonable sin.”

Thomas Henry Huxley
“Science is the belief in the ignorance of experts.”

Richard Feynman 1966
Why it matters
STUDENTS STUDYING UNDER STREETLIGHTS

+ PAUL ROMER
Turning food into fuel
A global poll

<table>
<thead>
<tr>
<th>Issue</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A good education</td>
<td>6,521,854</td>
</tr>
<tr>
<td>Better healthcare</td>
<td>5,520,164</td>
</tr>
<tr>
<td>Better job opportunities</td>
<td>5,425,600</td>
</tr>
<tr>
<td>An honest and responsive government</td>
<td>4,417,695</td>
</tr>
<tr>
<td>Affordable and nutritious food</td>
<td>3,983,222</td>
</tr>
<tr>
<td>Protection against crime and violence</td>
<td>3,674,763</td>
</tr>
<tr>
<td>Access to clean water and sanitation</td>
<td>3,577,225</td>
</tr>
<tr>
<td>Support for people who can't work</td>
<td>3,271,670</td>
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<tr>
<td>Better transport and roads</td>
<td>3,183,916</td>
</tr>
<tr>
<td>Equality between men and women</td>
<td>2,920,473</td>
</tr>
<tr>
<td>Reliable energy at home</td>
<td>2,897,997</td>
</tr>
<tr>
<td>Political freedoms</td>
<td>2,785,276</td>
</tr>
<tr>
<td>Freedom from discrimination and persecution</td>
<td>2,690,636</td>
</tr>
<tr>
<td>Protecting forests, rivers and oceans</td>
<td>2,501,220</td>
</tr>
<tr>
<td>Phone and internet access</td>
<td>2,456,107</td>
</tr>
<tr>
<td>Action taken on climate change</td>
<td>1,977,985</td>
</tr>
</tbody>
</table>
A global poll

9,727,506 votes for All Countries & Country Groups / All Genders / All Education Levels / Age Group (All Age Groups)

- A good education: 6,521,854 votes
- Better healthcare: 5,520,164 votes
- Better job opportunities: 5,425,600 votes
- An honest and responsive government: 4,417,695 votes
- Affordable and nutritious food: 3,983,222 votes
- Protection against crime and violence: 3,674,763 votes
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- Support for people who can't work: 3,271,670 votes
- Better transport and roads: 3,163,916 votes
- Equality between men and women: 2,920,473 votes
- Reliable energy at home: 2,897,997 votes
- Political freedoms: 2,785,276 votes
- Freedom from discrimination and persecution: 2,690,636 votes
- Protecting forests, rivers and oceans: 2,501,220 votes
- Phone and internet access: 2,456,107 votes
- Action taken on climate change: 1,977,985 votes
"How much do you personally worry about global warming/climate change?"

Gallup Poll 1989 - 2015

- A great deal
- A fair amount
- Only a little
- Not at all
- No Opinion

joannenova.com.au
The End