

Climatic 2: Keep Those Fossil Fuels in the Ground

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The CO₂ we've dumped into the atmosphere won't disappear
It's gonna last a hundred years while trappin' heat up
in the air¹
The reason temperature's up less than one degree
Is the climate's inertia it responds slowly,

Oceans two miles deep and water's high specific
heat means
Oceans have absorbed the heat what a feat and
Heat absorbing ice over Greenland and the poles
absorbs more heat it's kept things under control²

And keep in mind the notion that the ocean is a huge
carbon sink³
Keepin' CO₂ levels just below the brink
But it's lookin like the seas, with their dying coral
reefs
Can't absorb more CO₂, what we gonna do?⁴

Emissions over nine billion tons a year and rising⁵
Is there a climate tipping point over the horizon?
Is there an increase, that will release
Positive feedback⁶, with no turning back?

¹ See "Carbon is Forever," in *Nature Reports*,
<http://www.nature.com/climate/2008/0812/full/climate.2008.122.html>

² This is a summary of an extended argument in *The Case for Young People and Nature: A Path to a Healthy, Natural, Prosperous Future*, by James Hansen et. al, available at
http://www.columbia.edu/~jeh1/mailings/2011/20110505_CaseForYoungPeople.pdf

³ The concept of "carbon sink" in general and the oceans' role as carbon sinks can be explored at
http://en.wikipedia.org/wiki/Carbon_sink

⁴ See "Ocean Carbon Sinks Feeling the Heat" at
http://articles.cnn.com/2011-07-11/world/atlantic.ocean.carbon.warming_1_carbon-emissions-ocean-carbon-co2?_s=PM:WORLD

⁵ Note that emissions are nine billion tons of *carbon*. The amount of carbon dioxide is 3.67 times larger, or 33 billion tons. That's because the atomic weight of carbon is 12 atomic mass units, while that of CO₂ is 44 atomic mass units.

⁶ A positive feedback loop is one where a stimulus brings about a stronger response, which in turn acts as a

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*Keep those fossil fuels in the ground!
We don't need that carbon up there!⁷
Keep those fossil fuels in the ground!
Keep 'em buried For another couple million years!
Keep those fossil fuels in the ground!
It's time to protect the atmosphere!
Keep those fossil fuels in the ground!
Act like you care!*

I mean one degree C seems fine no one's dyin' from
the heat (except sometimes)
What's the big deal if we go up four or five
Degrees it's just warmth we'll all survive
Summer's fun! Who likes cold? Maybe we'll thrive!

Life's sweet in hot Iberia, in tropical Liberia,
The Russians would love a warmer Siberia
But wait! Up one degree, we're melting Arctic seas.
Note the glaciers' in retreat if you please

Arctic sea ice cover fell way down in '07,⁸
With a repeat performance in two thousand eleven,⁹
And the thickness of the ice is declining faster,¹⁰
A harbinger of climatological disaster.

stronger stimulus. In the context of climate change, there are several troublesome positive feedback loops where the initial stimulus is human initiated release of carbon dioxide. This warms the planet (see my first video about the greenhouse effect). But then this warming leads to changes on the planet that lead to more warming, and so one. Two of the changes discussed in this series are methane release (in this video) and changes in albedo in the last video.

⁷ Just to be clear: we don't need the *extra* carbon caused by release of fossil fuels. We need the base level of 280 ppm to maintain the base-level of the greenhouse effect that makes our planet habitable.

⁸ See "Arctic Sea Ice Shatters All Previous Record Lows,"
http://nsidc.org/news/press/2007_seaiceminimum/20071001_pressrelease.html

⁹ See
http://earthobservatory.nasa.gov/Features/WorldOfChange/sea_ice.php

¹⁰ You can explore interactive images and read about this at
<http://www.nasa.gov/topics/earth/features/thick-melt.html>

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If emissions keep rising at expected rates,
There'll be no summer sea ice in few decades,¹¹
We'll see permafrost melting, with potential gain
of billions of tons of released methane.¹²

Which traps 20 times the heat of CO₂
If that methane escapes, the climate is screwed!¹³
As positive feedback unleashes more warming,
We need to act now on this 1 degree warning.

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BRIDGE

*If we let CO₂ keep rising
The effects will hardly be surprising
Flooded coastlines, habitats in disarray
We know this all NOW, we gotta act today!*

Not to mention the danger of sea level rise,
From thermal expansion and melting glacial ice
It could be many meters, or maybe one or two,
But they're not gonna like it in Tuvalu!¹⁴

To avoid a future where most wildlife dies,
We need to (we got to) stop this temperature rise
And CO₂'s effect isn't just in degrees,
Yeah CO₂ has increased ocean acidity!

¹¹ See <http://www.newscientist.com/article/dn21626-arctic-sea-ice-may-have-passed-crucial-tipping-point.html>, or http://www.noaa.gov/features/monitoring_1008/arcticice.html

¹² This methane release seems to be well underway. See <http://www.independent.co.uk/news/science/vast-methane-plumes-seen-in-arctic-ocean-as-sea-ice-retreats-6276278.html>

¹³ See NY Times, As Permafrost Thaws, Scientists Study the Risks <http://www.nytimes.com/2011/12/17/science/earth/warmin-g-arctic-permafrost-fuels-climate-change-worries.html?pagewanted=all>. You can also read about this at the Huffington post: http://www.huffingtonpost.com/2013/02/22/permafrost-melting-rate-2013_n_2741486.html

¹⁴ For the US EPA's discussion of sea level rise, see <http://www.epa.gov/climatechange/effects/coastal/index.html>. For more about Tuvalu (a small Pacific island atoll), see <http://www.smithsonianmag.com/travel/tuvalu.html>

That right, pH falling, ocean life filled with grief
At the relentless demise of the Earth's coral reefs¹⁵
A system on which half a billion depend,
Reefs, heatwaves, ocean's rising part of a trend,

Of damage unleashed by a one degree gain,
If we go up two or three imagine the pain!
So let's stop the warming, let's do it now,
Hang on for the next part where we can see how!¹⁶

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¹⁵ For a discussion of the problems associated with ocean acidification caused by human carbon dioxide emissions, see <http://www.nrdc.org/oceans/acidification/>

¹⁶ An agreement to limit global temperature increase to less than two degrees was one of the outcomes of the Copenhagen accords. You can read a summary at <http://www.c2es.org/international/copenhagen-climate-summit-summary>. According to James Hansen, a 2 degree rise would be disastrous. See <http://blogs.scientificamerican.com/observations/2011/12/06/two-degree-global-warming-limit-is-called-a-prescription-for-disaster/>

¹⁶