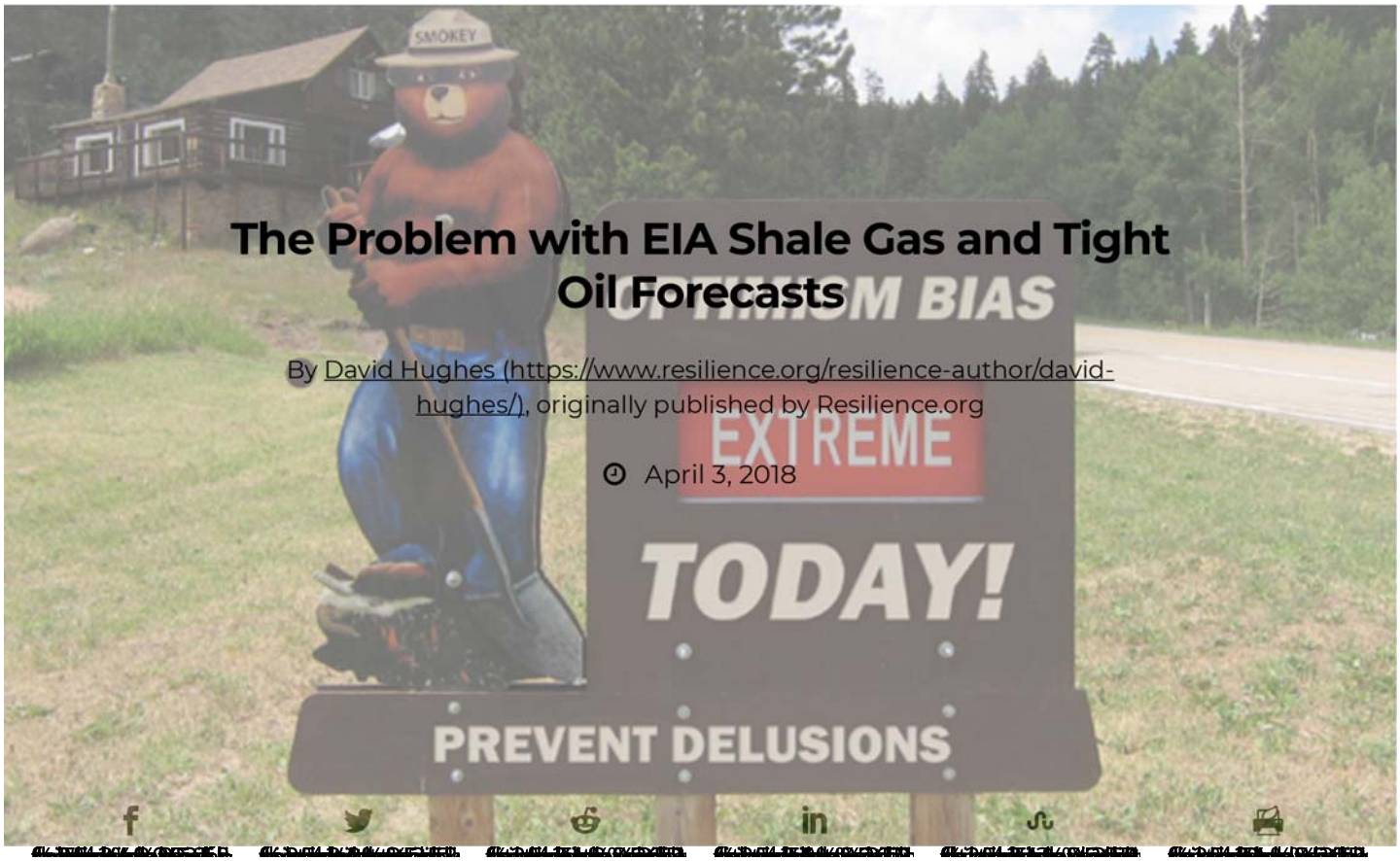


The Problem with EIA Shale Gas and Tight Oil Forecasts

By David Hughes (https://www.resilience.org/resilience-author/david-hughes/), originally published by Resilience.org

April 3, 2018

Each year the U.S. Energy Information Administration (EIA) produces forecasts of U.S. oil and gas production in its Annual Energy Outlook (AEO), which is widely viewed as an authoritative assessment of what to expect for future U.S. oil and gas output (the EIA prefers the term “projection” to “forecast”). The EIA’s reference case is considered as the most likely scenario by industry, policy makers, and the media.

Considering that AEO reference case forecasts for shale gas and tight oil production in recent releases are remarkably optimistic when considered at the play-level in terms of

well productivity, decline rates and prospective areas, I find this baffling and worrisome. It's one thing for industry to paint a rosy picture of future production, but something altogether different when a government agency—tasked with providing the American public with objective information—does it.

AEO2018 (https://www.eia.gov/outlooks/aeo/), for example, projects that shale gas production will be 130% higher in 2050 than in 2016, while tight oil production will grow by 74%, all at relatively low prices. This despite the fact that average production from individual wells falls 70–90% in the first three years and entire fields would decline 20-40% a year if new wells weren't constantly drilled.

I recently assessed the EIA's AEO2017 forecasts and assumptions for all major shale gas and tight oil plays using a proprietary commercial database of well production data—a database that the EIA itself uses for its own analysis. The study (http://www.postcarbon.org/publications/shale-reality-check/) revealed that the EIA has overestimated the likely future production of shale gas and tight oil for most plays by a wide margin. This is a result of overestimating the size of the prospective area and hence the number of wells that can be drilled, and underestimating future declines in well productivity. These declines in productivity are due to well interference (as sweet spots become saturated with wells) and from drilling lower quality rock outside of the limited sweet spot areas. The EIA's estimates are also much higher than those of the U.S. Geological Survey and the University of Texas Bureau of Economic Geology.

If the AEO2018 reference case projections are compared to the EIA's most recent assumptions of proven reserves plus unproven resources, tight oil production would extract 96% of remaining tight oil and shale gas production would extract 77% of remaining shale gas by 2050, even though unproven resources (which are 86% of remaining potential) have not been demonstrated to be economically recoverable and are based on unrealistically large estimates of productive area for most plays. Furthermore, as the EIA projections assume that production will be at much higher levels in 2050 than today, they imply that there are vastly more additional resources to be recovered after 2050 than suggested by the EIA's own estimates. Indeed, in several plays the EIA's projections assume that more than 100% of its estimates of proven reserves plus

unproven resources will be recovered before 2050. In essence, the EIA is banking on recovering resources that do not exist according to its current best estimates.

In the weeks following the release of AEO2018, the EIA published a report (https://www.eia.gov/outlooks/aeo/section_issues.php#grt) on the methodology behind its projections. Using the Eagle Ford play as an example, this report provided a reasonable overview of the evolution of shale plays—from discovery to full development to infill drilling of sweet spots and moving on to lower quality rock outside of sweet spots. This part of the report built on an assessment (https://www.eia.gov/outlooks/archive/aeo14/section_issues.cfm#tight_oil) done by the same author in 2014. To my knowledge, the Eagle Ford play is the only county level assessment the EIA has ever published.

The report goes on, however, to dispel any confidence that the Eagle Ford example is actually how the EIA comes up with its projections. The EIA apparently assumes that the estimated ultimate recovery (EUR) of wells will continue to increase for the foreseeable future due to better technology, and that drilling and operating costs will decrease for the foreseeable future, given this table of assumptions of annual changes in costs and EURs from the report:

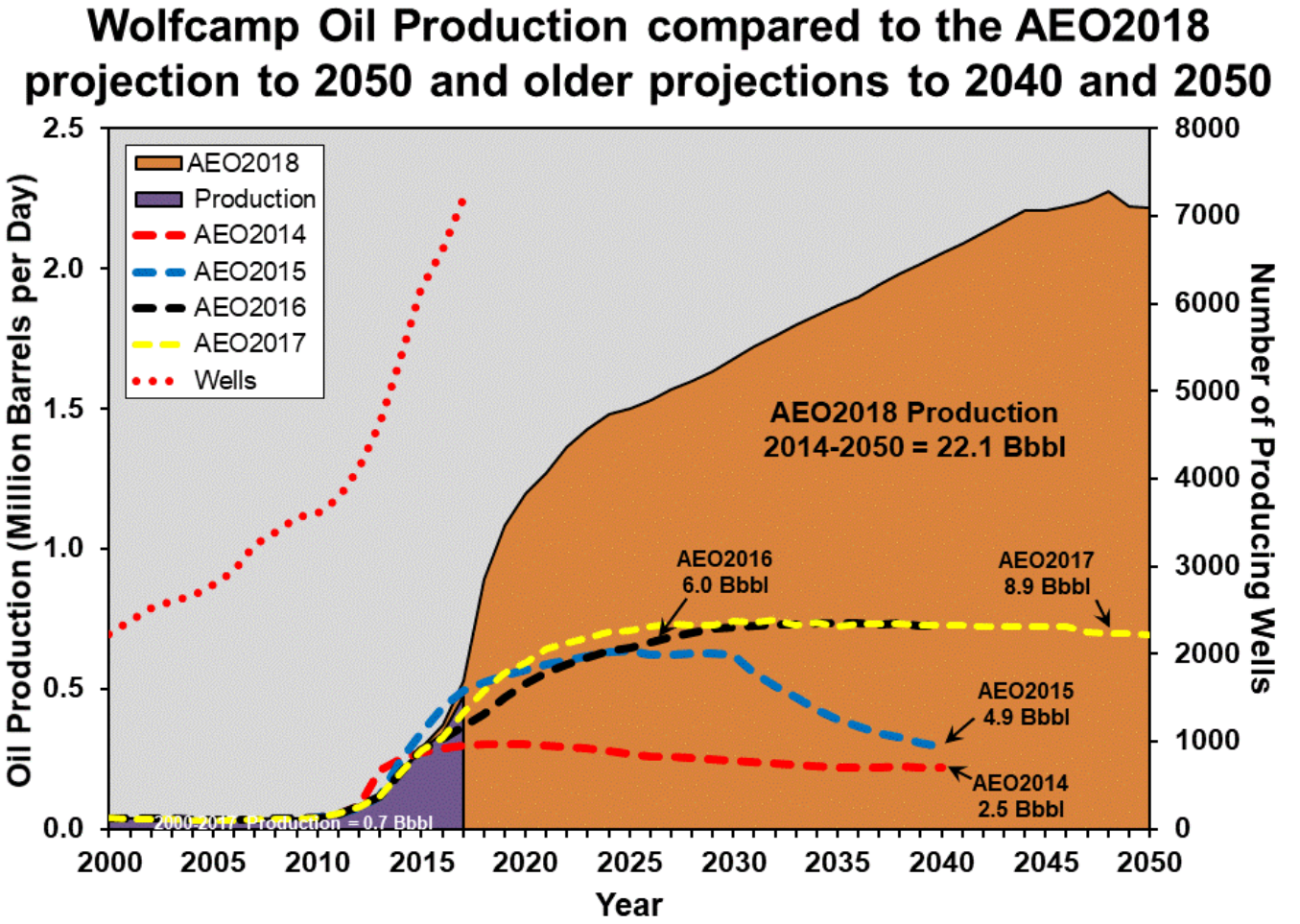
Table 1. Onshore Lower 48 technology assumptions

Crude Oil and Natural Gas Resource Type	Drilling Cost	Lease Equipment & Operating Cost	EUR-Tier 1	EUR-Tier 2	EUR-Tier 2 drilling ramp-up period
Tight oil, tight gas, & shale gas	-1.00%	-0.50%	1.00%	3.00%	6.00%
All other	-0.25%	-0.25%	0.25%	N.A.	N.A.

Source: U.S. Energy Information Administration, *Annual Energy Outlook 2018*

By overestimating prospective play areas and hence the number of available drilling locations, by assuming well EURs will continue to increase indefinitely, and by assuming drilling and operating costs will continue to fall, the EIA can come up with whatever forecast it wants. This is amply illustrated by the wild fluctuations from year to year in the EIA's play-level forecasts pointed out in my study (http://www.postcarbon.org/publications/shale-reality-check/) (the play-level forecasts are not published in the AEO—they are only provided if a special request is made to the EIA).

An example from AEO2018 is the Wolfcamp Play in the Permian Basin below. The EIA projects 148% more oil will be recovered in the AEO2018 projection than it projected in AEO2017, just one year earlier (22.1 billion barrels recovered by 2050 in AEO2018 compared to 8.9 billion barrels in AEO2017). This is 87% more oil than the total of Wolfcamp proven reserves plus unproven resources that the EIA estimated in 2017 (11.8 billion barrels).



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How can this be? Most major shale plays have now been extensively drilled so the dimensions of the plays and location of sweet spots are well known. Over 400,000 wells have been drilled in the Permian Basin over many decades. Geology doesn't change year to year and technology doesn't improve at those rates over a single year (in fact average well productivity in 2017 declined in the Wolfcamp—see Figure 48 (http://www.postcarbon.org/publications/shale-reality-check/)).

Given an analysis of play fundamentals based on current drilling data, there is no credible basis for the highly to extremely optimistic forecasts offered by the EIA. Actual production

is likely to be far less. Assuming the EIA forecasts are accurate in a long-term energy plan is likely to end very badly. And yet these forecasts are uncritically accepted by policy makers and the media, the consequences of which will be borne by all of us.

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David Hughes is an earth scientist who has studied the energy resources of Canada for four decades, including 32 years with the Geological Survey of Canada as a scientist and research manager. He developed the National Coal Inventory to determine the availability and environmental constraints associated with Canada's coal resources. As Team Leader for Unconventional...

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mjgould • a month ago

There is one word often used is articles on tight oil which pretty well sums up the whole tight oil scenario: PLAY.

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mulga mumblebrain ➚ mjgould • a month ago

'The play's the thing'.

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Tony • a month ago

The EIA not getting it right, why aren't the ASPO/ David Hughes/ Resilience.org estimates from back when such things done right substituted in instead? Surely the EIA can be shown the error of their ways by someone who did a better job predicting the shale revolution showing up and demonstrating how they did just that, and why their numbers should be used instead?

Also, that last graph seems to line up with something very important, which is a geologic study done by the USGS that wasn't known during the prior AEOs. So maybe the EIA has access to top notch geologists like them and are simply incorporating the best geologic knowledge available? Is there geology that can be presented to the EIA to convince them that the geology of the USGS is incorrect?

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Rockdoc ➚ Tony • a month ago

The USGS assessed a mean estimate of 19.9 billion barrels of undiscovered technically recoverable oil in 2016 (ie. economics unproven) . The EIA's projection counts on RECOVERING 21.9 billion barrels from 2016-2050, at which time the EIA projects Wolfcamp production will be near an all-time high of 2.2 million barrels per day, implying that at least another 20 billion barrels are left to recover (assuming 2050 is the peak year with a bell-shaped production profile). So, the EIA is assuming far more oil will be recovered than the USGS estimate of undiscovered resources.

The EIA's estimate of proven reserves plus unproven resources as of July 2017 for the Wolfcamp was 11.8 billion barrels. So the AEO2018 is suggesting 87% more than this will be recovered by 2050 and implies that nearly four times its own estimate will ultimately be recovered (21.9 by 2050 and 20 billion barrels post-2050).

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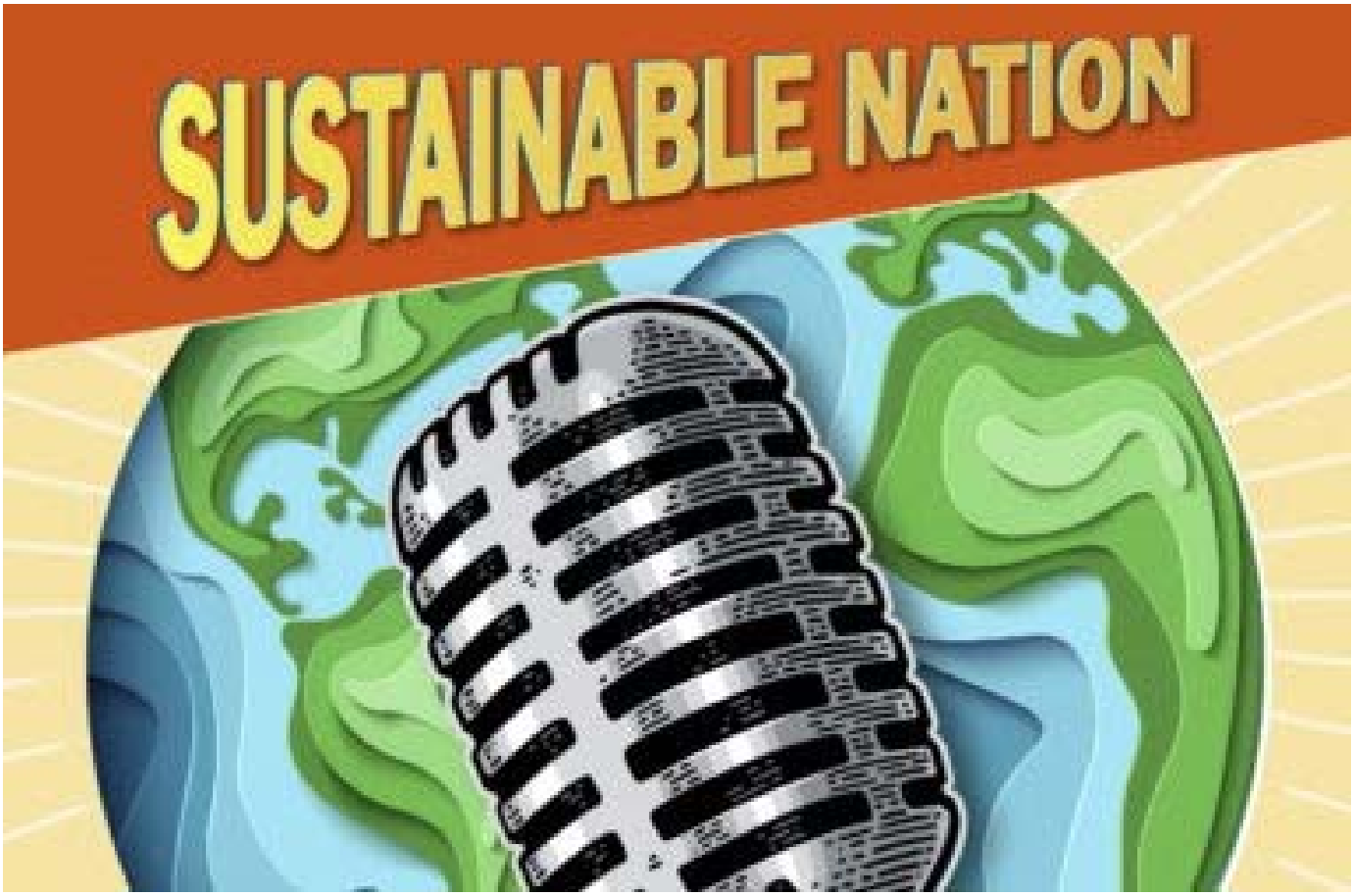

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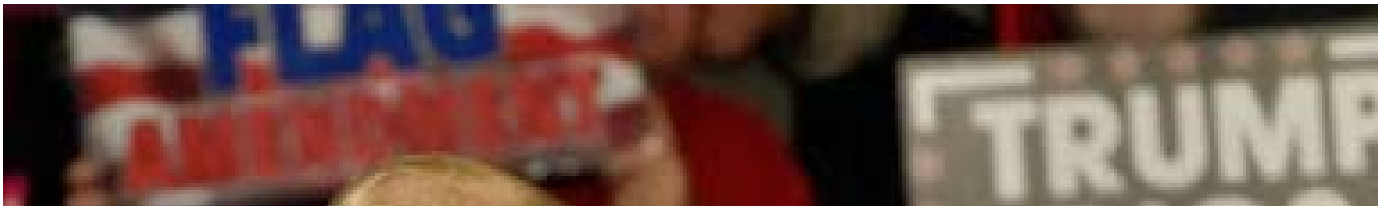

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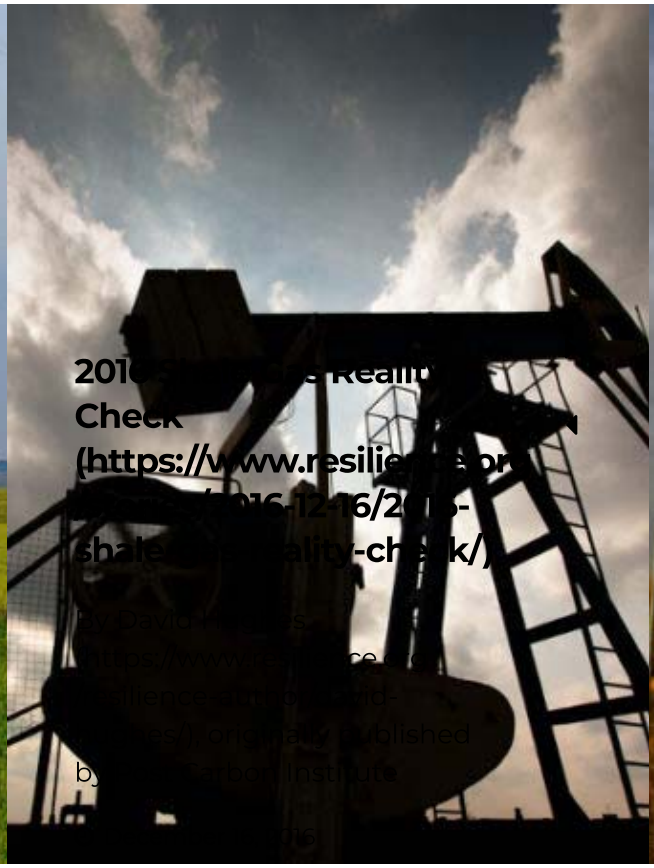

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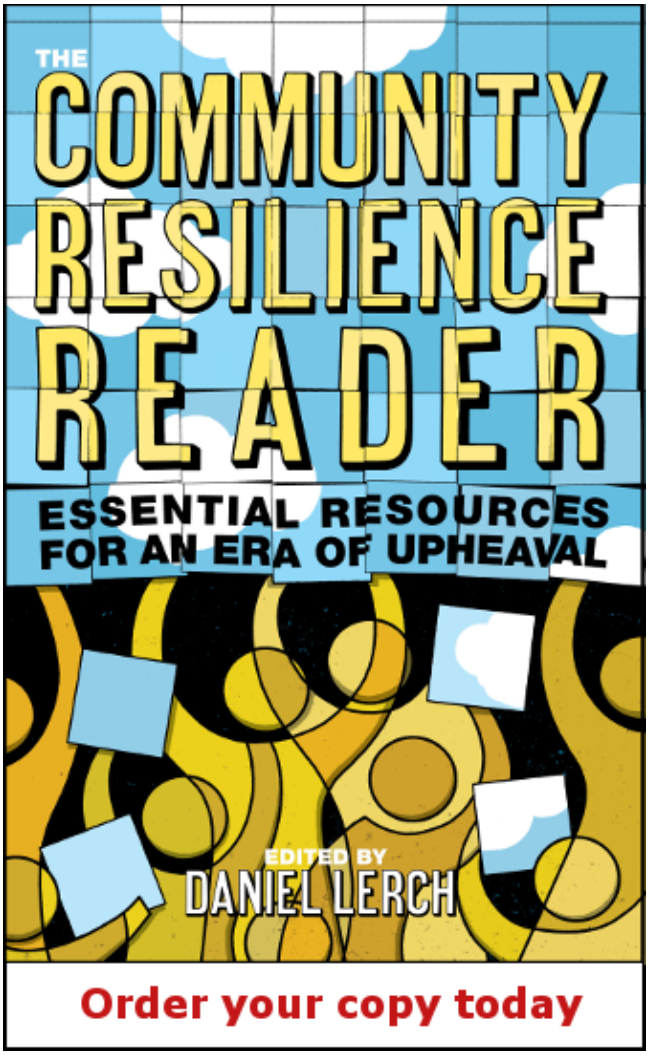

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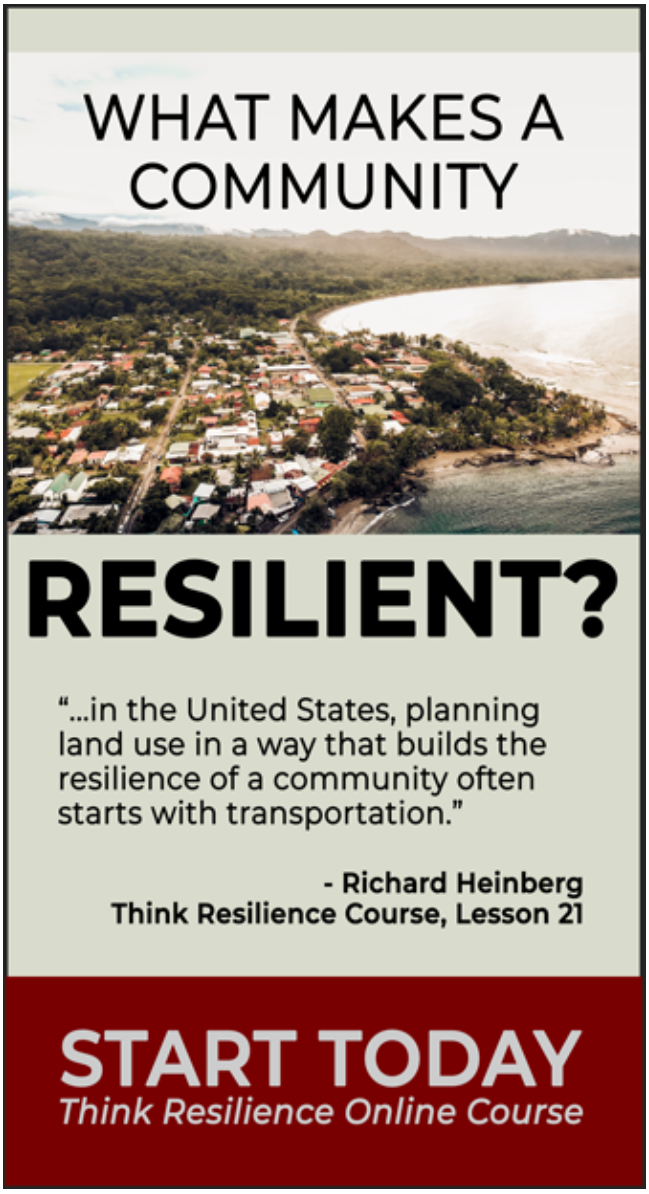

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