

The Fracking Mobius Strip: Connecting Endocrine Disruption and Climate Change

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And Health Sciences

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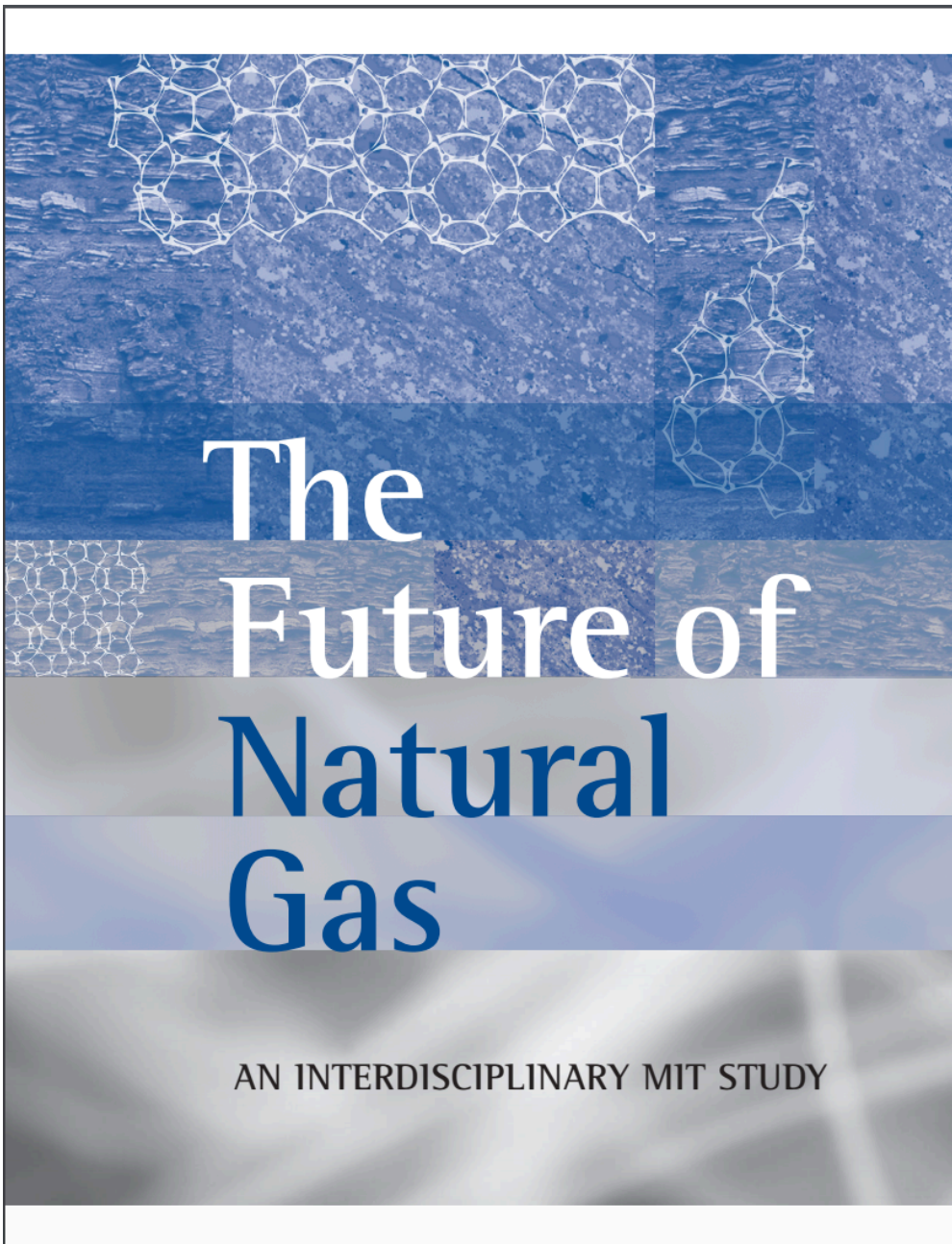
JPB Environmental Health Fellow



EDGI-co-founder



Publiclab.org co-founder/organizer



“...The analysis in this study provides the confirmation—natural gas truly is a bridge to a low-carbon future,”

MITEI Director Ernest J. Moniz, introducing the report

Laura Amos: 2 BE



https://www.earthworksaction.org/voices/detail/laura_amos

Theo Colborn



Laura Amos and a drilling rig on her property

October 22, 2002

Allen Belt
Bureau of Land Management
2505 So Townsend
Montrose, CO 81405

Robert Storch
United States Forest Service
2250 Highway 50
Delta, CO 81416

RE: An Analysis of Possible Increases in Exposure to Toxic Chemicals in Delta County, Colorado Water Resources as the Result of Gunnison Energy's Proposed Coal Bed Methane Extraction Activity

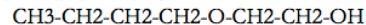
BACKGROUND

Gunnison Energy is proposing to extract coal bed methane in Delta County, Colorado. In its notices to the public it makes claims that "...the threats posed by hydraulic fracturing of CBM wells to USDWs [US drinking water supplies] are low and do not justify additional study." They also claim that the "...fluids used to extract coal bed methane from the ground do not substantially threaten public health."¹ The following addresses these claims and looks at possible direct and indirect health effects of CBM extraction on the citizens, domestic animals, and wildlife in Delta County.

THE FRACTURING FLUIDS

Gunnison Energy proposes to use a solvent, ethylene glycol monobutyl ether (2-butoxyethanol), hereafter designated as 2-BE, in a liquid fracturing mixture to facilitate the extraction of coal bed methane in Delta County. 2-BE will be present in the liquid component of the fluid at approximately 7 ppm (parts per million) based on data provided to Delta County Commissioners following three local Area Planning Committee meetings by Gunnison Energy Corporation (GEC), May 29, 2002.

The structural formula for 2-BE is:

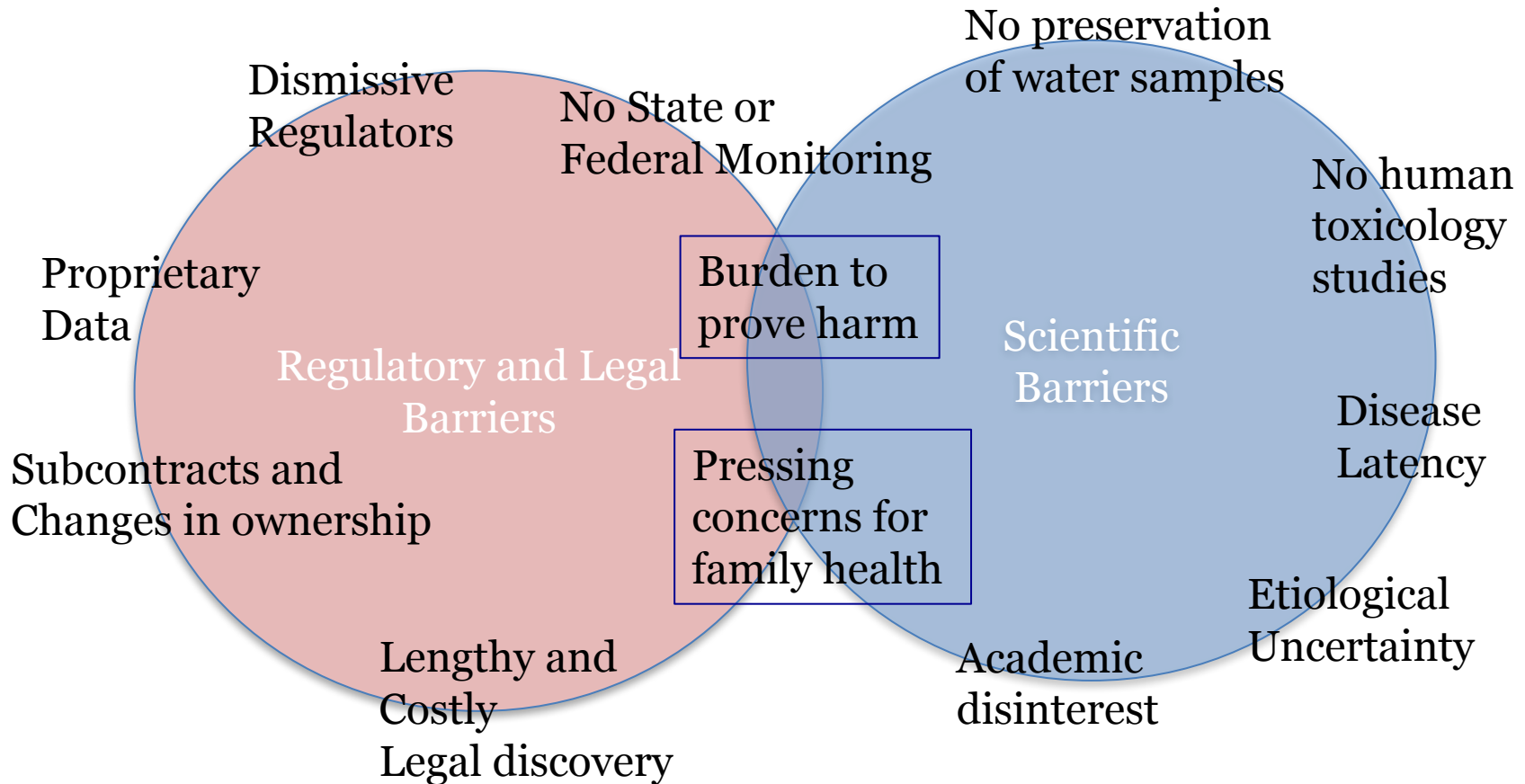


2-BE is a highly soluble, colorless liquid with a very faint, ether-like odor.² At the concentration it is to be

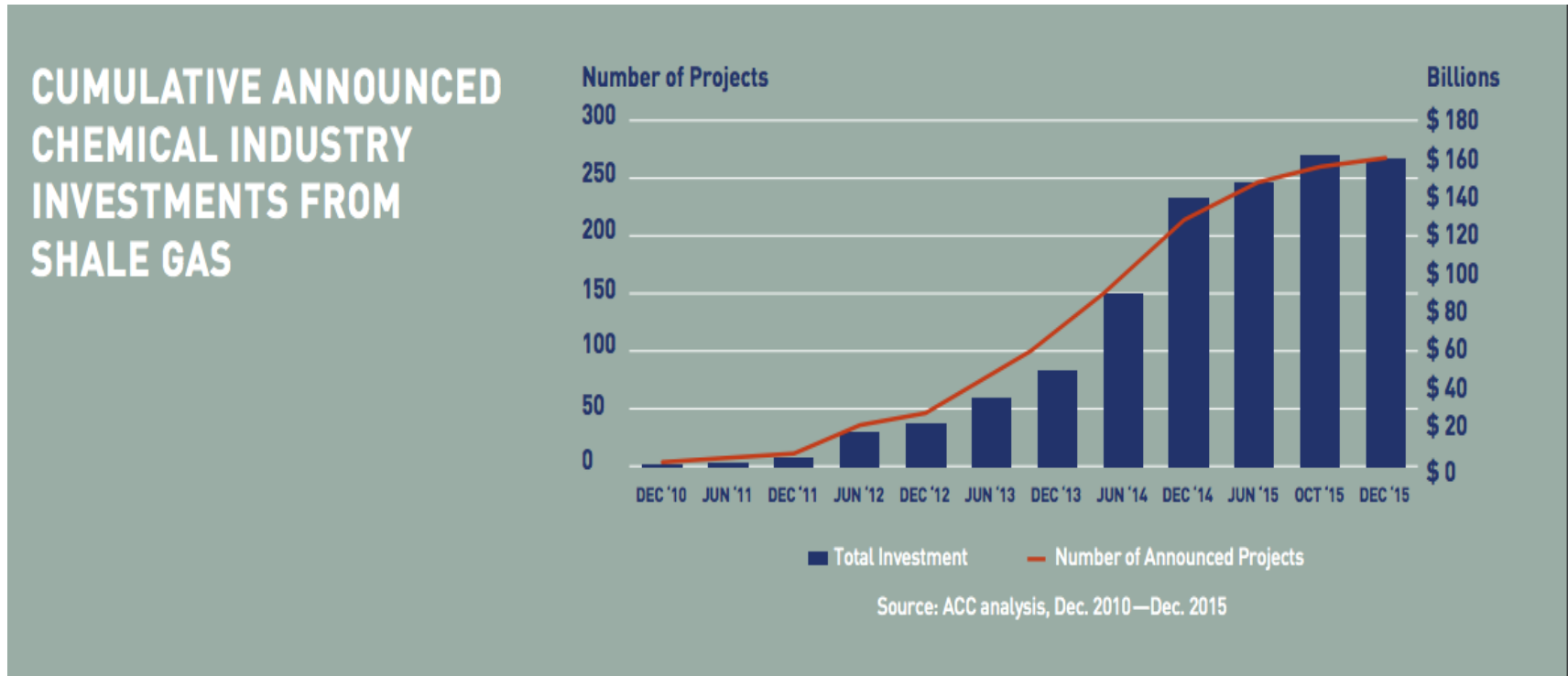
“Carcinogenicity:

At the end of a two year chronic bioassay, *elevated numbers of combined malignant and non-malignant tumors of the adrenal gland* were reported in female rats and male and female mice...No human epidemiological studies are available...”

Amos signed a Non-Disclosure Agreement



Boom in Ethylene Cracking



Natural Gas as raw material and energy = 70% of the total cost of manufacturing ethylene

RELEASE THE CRACKER!!!

*After Shell's Historic Announcement, Will
Appalachia Become the Next Petrochemical Hub?*

A Special Report Brought to you by Natural Gas Intelligence



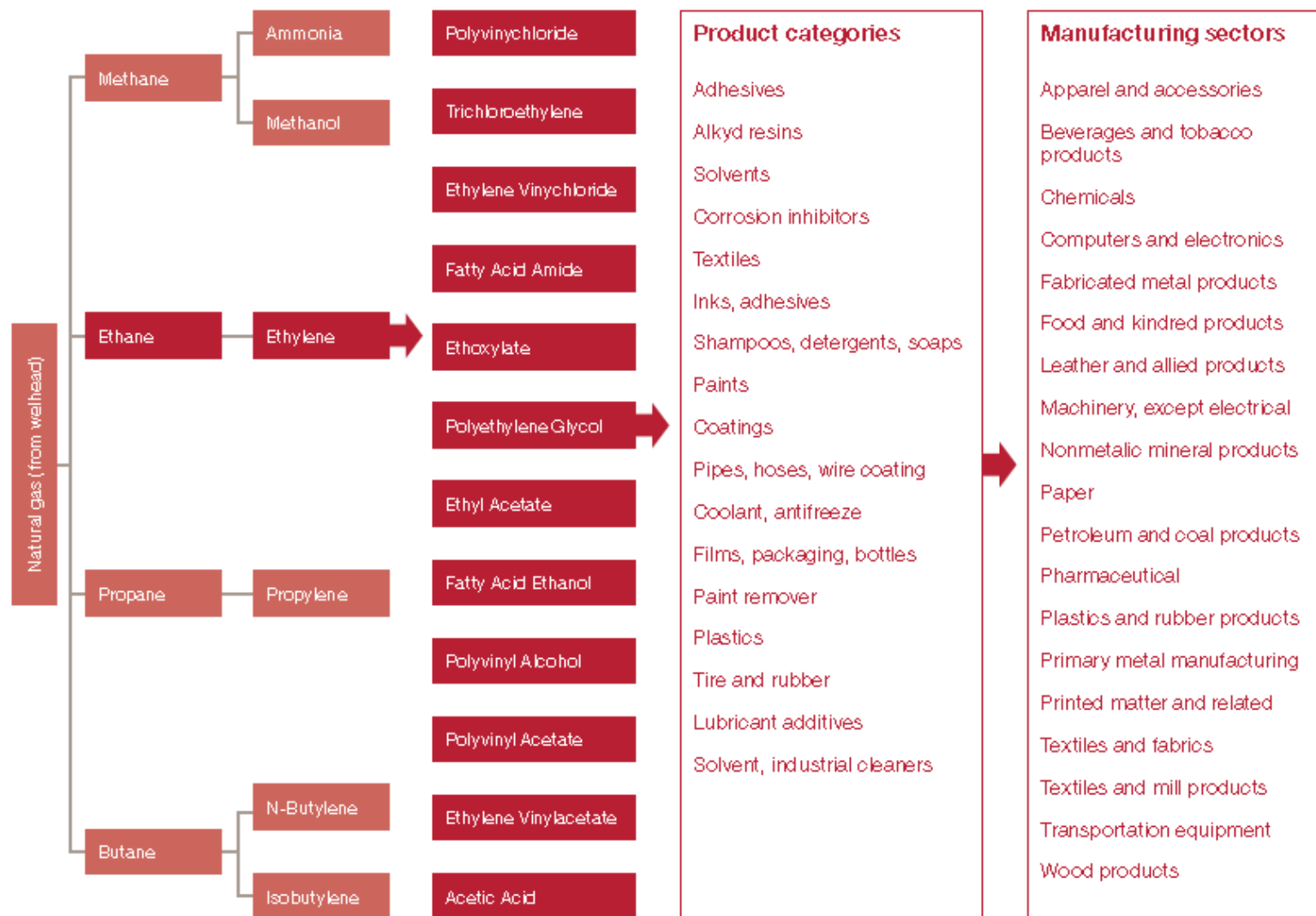
In 2015 DOW invested \$ 6 Billion to expand its chemical production facilities in the U.S. by 40 % based on another 10 years of low natural gas costs due to fracking.

Shell is building a multi-billion dollar ethane cracking and poly-ethylene production facility in Pennsylvania to benefit from the low cost of fracked Marcellus Shale gas. Hence, low prices now help ensure a fossil fueled future as these resources will continue to be demanded by these industries and their financiers in the future.

<http://www.naturalgasintel.com/cracker-report>

Ethylene: Highest Production Volume Domestically and Globally.

Figure 1: Shale gas through the ethane chain into manufactured products



Sources: PwC and TopLine Analytics

Connecting Shale Gas, Petrochemicals and Oil Production...

TOP 10 ETHYLENE PRODUCERS¹ Table 4

	Company	Sites ²	Capacity, tpy	
			Of wholly owned complexes	Of partially owned complexes
1	Saudi Basic Industries Corp.	15	13,392,245	10,273,759
2	Dow Chemical Co.	21	13,044,841	10,529,421
3	ExxonMobil Chemical Co.	20	12,515,000	8,550,550
4	Royal Dutch Shell PLC	13	9,358,385	5,946,693
5	Sinopec	13	7,895,000	7,275,000
6	Total AS	11	5,933,000	3,471,750
7	Chevron Phillips Chemical Co.	8	5,607,000	5,352,000
8	LyondellBasell	8	5,200,000	5,200,000
9	National Petrochemical Co.	7	4,734,000	4,734,000
10	Ineos	6	4,656,000	4,286,000

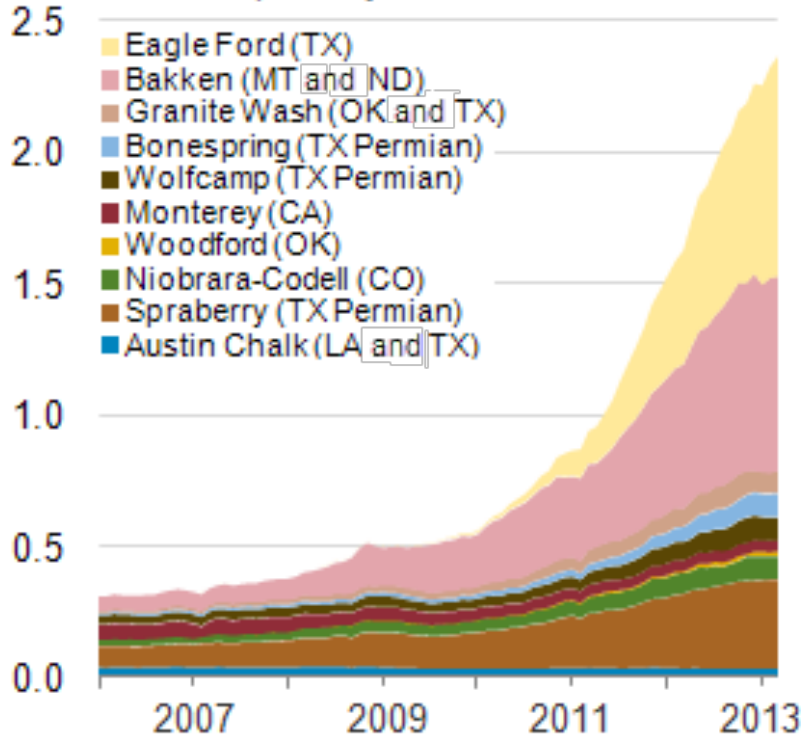
¹As of Jan. 1, 2013. ²Wholly owned plus partially owned.

Dow chemical, Royal Dutch Shell, Chevron Phillips and ExxonMobil are a few of the companies making infrastructural and capital investment in U.S. ethylene production to capture low gas prices' market edge (HIS 2012: 30).

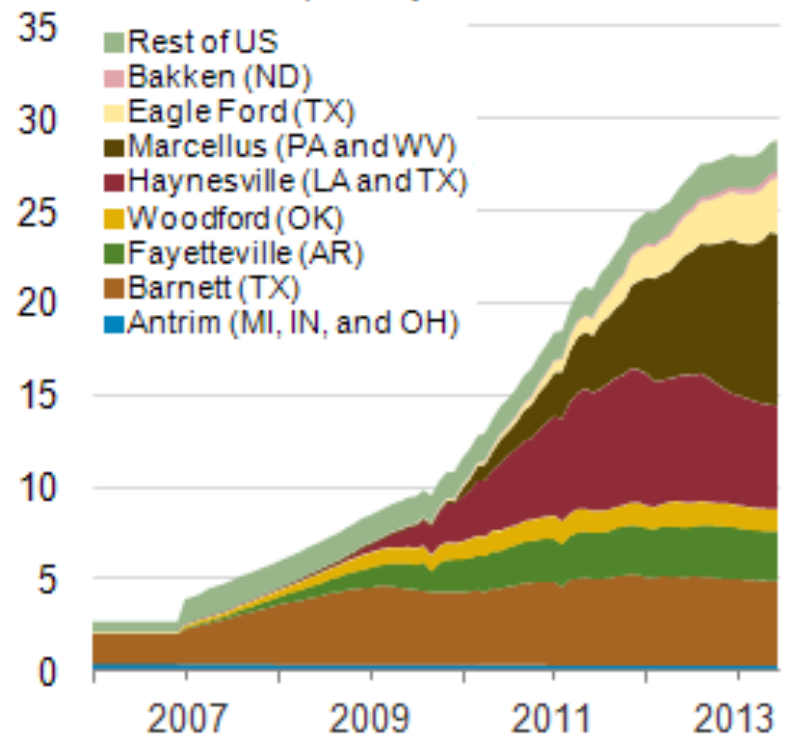
<http://www.ogj.com/articles/print/volume-111/issue-7/special-report-ethylene-report/global-ethylene-capacity-poised-for-major.html>

Boom in Oil Production

Shale and tight oil production
million barrels per day



Dry shale gas production
billion cubic feet per day



<https://www.eia.gov/todayinenergy/detail.php?id=13451>

Under the Obama administration domestic oil production increased by 88%, the largest increase under any administration in U.S. history.

Financing Oil Infrastructure = Future Commitment to Fossil Fuels

“I am, to a large extent, an environmentalist, I believe in it,” Mr. Trump said during a meeting with auto industry executives. “But it’s out of control, and we’re going to make it a very short process. And we’re going to either give you your permits, or we’re not going to give you your permits. But you’re going to know very quickly. And generally speaking, we’re going to be giving you your permits.”

[\(U.S. President Donald Trump January 24th\)](#)

On January 24th Trump signed an executive order (EO) supporting the development of the Keystone and Dakota Access pipelines (DAPL).

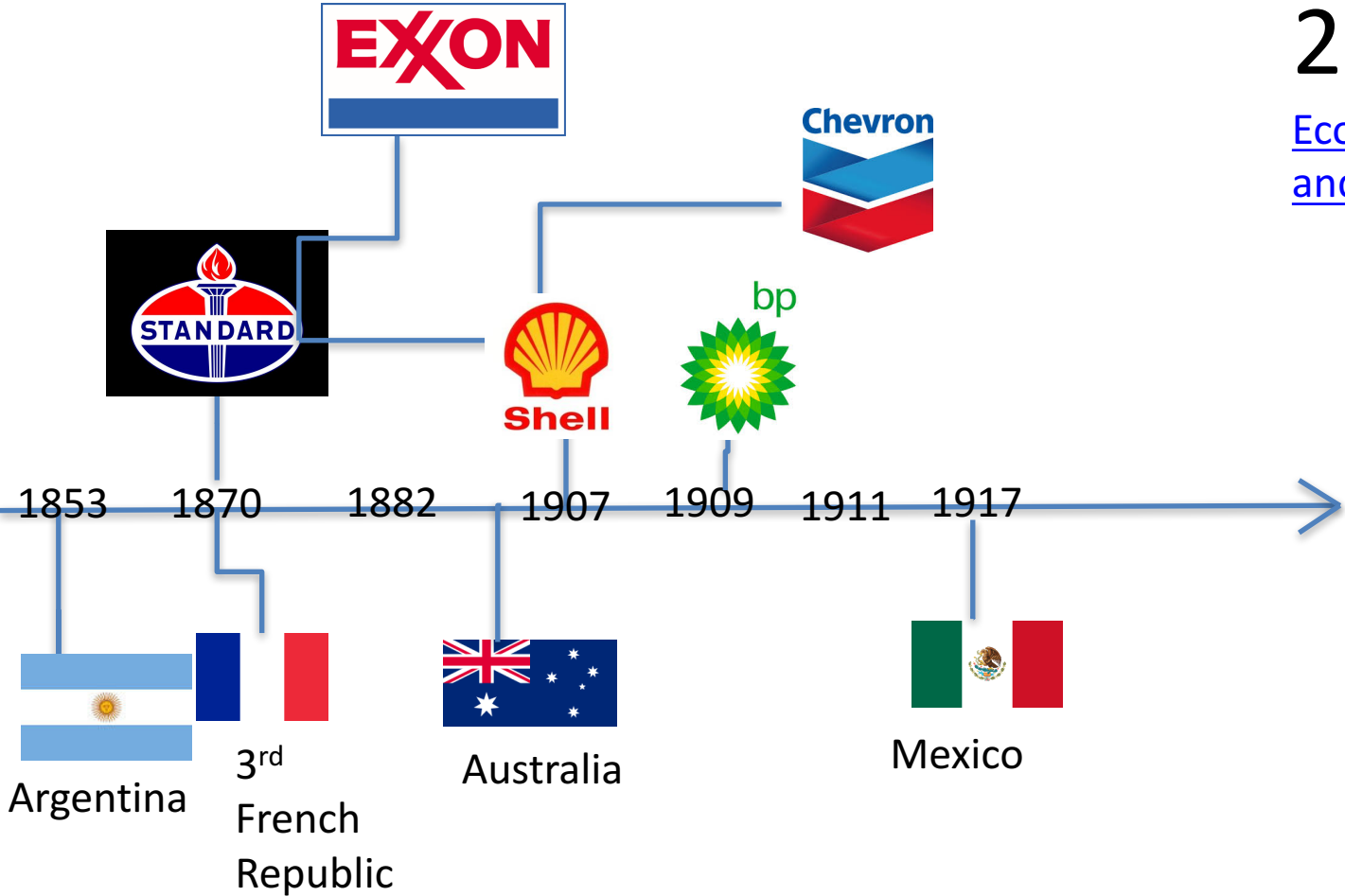
[Jobs](#): it requires only 40 or so employees to operate

[Investment](#): DAPL cost \$3.78 billion, \$2.5 billion of which is financed by loans from 17 different banks including Citibank and Wells Fargo.

In the past 3 years the world’s largest investments banks collectively invested \$306 billion in “extreme” oil. [Bank Tracker](#)

The 25 top banks invested 9x more in fossil fuels than renewables from 2004 to 2014
[Bank Tracker](#)

Unconventional Energy Retrenches Industries as Wealthy and Long Lived as Nations...



2015: World's Largest Economic Entities (Companies and Country by Revenue).

- 18. Shell
- 21. Exxon
- 27. bp
- 58. Chevron

13: The number of nations with a higher GDP than Shell's revenues in 2015

How could we develop systems to study and hold accountable these global industries?

- Combine advocacy and research efforts on Climate Change and EDCs/Toxics
- Develop Grassroots Community Based Research with Frontline Communities
- Digitally Network Grassroots Community Organizations, Non-profit and Academics
- Build Open-Source Public Data Infrastructures and Research Tools
- Theorize and defend:
 - The Public Right to Research
 - The Rights of Researched Publics

WellWatch: Networked Research and Monitoring through grassroots reporting

WellWatch is a community tool for people living with gas extraction.

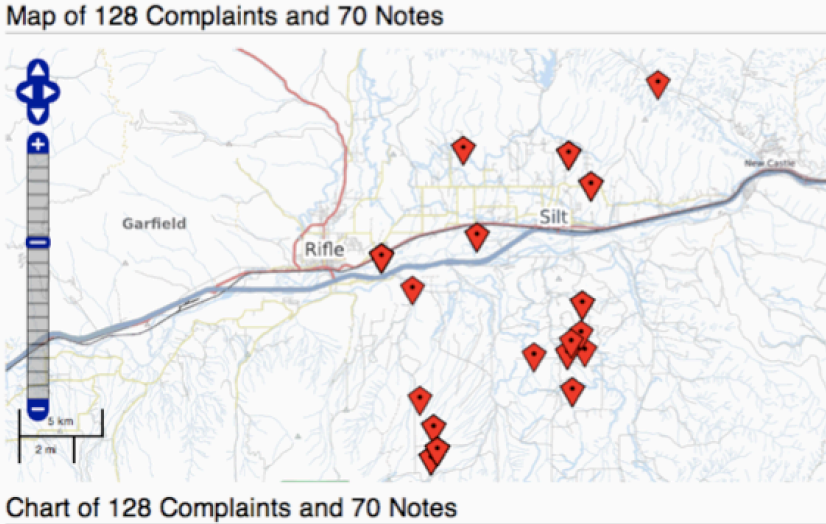
Main Resources	State Information	View Complaints By Topic
<ul style="list-style-type: none">Video TutorialImage GalleryWell ReportsNews & ArticlesCommunity ResourcesMeet Members	<ul style="list-style-type: none">ColoradoNew YorkOhioPennsylvaniaTexas	<ul style="list-style-type: none">AirHealthLandLivestockPropertyWater

User Photos

Find Local Wells (Or Leave A Report)

Enter an address, a local intersection, a zipcode, or similar information in the box below and click "search" to locate wells in your area on the map. Click on a red dot to show the API number, which uniquely identifies that well. Click on that API number to go to the informational page about that well. You can click and drag the map to move the view.

search



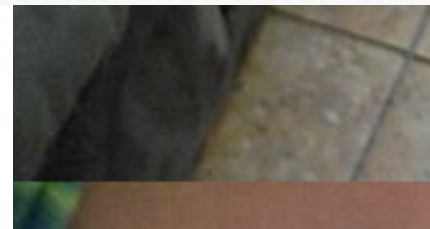
[WellWatch: reflections on designing digital media for multi-sited para-ethnography](#)
S Wylie, L Albright. *Journal of Political Ecology* 21, 321

What were there symptoms? One family's oldest son had an **unexplained red raised rash** like hives after being exposed to the flaming fracking gas. He previously had no reported history of similar rashes. The father and younger son **developed nose bleeds for no apparent reason**, again after the exposure not before. The mother had fatigue and headaches not to the degree pre-exposure. Yes, these symptoms could be related to a long differential diagnosis, but a list of vague symptoms have all been attributed to volatile toxic gases like benzene, toluene, ethylbenzene, and xylene from the gas fracking again, starting after exposure. I was taught at medical school - if you hear hoof beats think of horses not zebras, but this is an exotic extreme, so I thought of the worse case scenario, and thought zebras - before the horse ran out of the barn at full gallop. It is always best to be safe than sorry, I told those families to leave to avoid further health damage until I learned what they were exposed to, but I'm still waiting for an answer from (gas company). The other family has a wide range of symptoms: unexplained **flu-like symptoms - headaches, body aches, fatigue, dizziness**, emotional spells for no apparent reason, gastrointestinal symptoms - nausea, lack of appetite, etc. Again, from an otherwise healthy family that didn't need to see a doctor very often. I visited the home of the second family days after the high benzene reading, and developed an unexplained headache. I was chemically injured in medical school from formaldehyde outgassing from cadavers. So I recognize how chemicals could cause symptoms otherwise unexplained. The headache went away after getting to Palisade without any medications. Since then, I have been having headaches for no reason - once chemically injured - always chemically susceptible.

If you could get (gas company) to disclose their Fracking chemicals, I could help these families' and potentially other families in the future. Do you want to have it on your conscious that you didn't do what was right? Also, if I can get permission from the families to give their exact locations other than Silt and Peach Valley environs, then I would like their pre-drilling testing of the water results, so I could analyze any changes pre to post drilling. I will contact the CO Oil and Gas Commission as well as contact the Endocrine Disruption Exchange and the Western Colorado Congress with this information.

Sincerely, **Joe Wezensky, MD**









Documentation with images and Dr.'s notes



Forum for Public R+D



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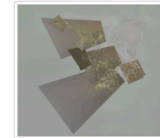
Maps open data from balloon and kite photography (326 and counting)

Do-It-Yourself "satellite" imagery

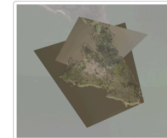
These maps were largely made by [taking photos from balloons and kites](#), a technique adopted and refined by Public Lab contributors. [Make one yourself](#) and it can be featured here.



[Barataria Site ABH1. Barataria Bay, Louisiana.](#)



[Barataria Site ABH2. Barataria Bay, Louisiana.](#)













[Barataria Site ABH3. Barataria Bay, Louisiana.](#)



[Barataria Site ABH5. East. Barataria Bay, Louisiana.](#)

Popular tags

-  [oil-spill](#)
-  [wetlands](#)
-  [landfill](#)
-  [garden](#)
-  [NDVI](#)
-  [gowanus](#)
-  [protest](#)

by Cartography by Stewart Long | Mapping by Scott Eustis over 3 years ago |   

by Cartography by Stewart Long | Mapping by Scott Eustis

by Cartography by Stewart Long | Mapping by Scott Eustis

by Cartography by Stewart Long | Mapping by Scott Eustis

Activities

Purpose	Category	Status	Author	Time	Difficulty	Replications
Host a balloon mapping workshop	-	-	@liz	-	-	36 replications: Try it >
Make or buy a balloon mapping kit	build	complete	@liz	-	-	0 replications: Try it >
Selecting Kite Flight Launch Sites in Centerville	-	-	@Olivia	-	-	0 replications: Try it >
Make a \$25 minimal-helium balloon mapping rig	-	-	@natevw	-	-	0 replications: Try it >
Add GPS logging to a Saturn V Rig	build	-	@cfastie	-	medium	0 replications: Try it >
PET Bottle & Rubber Band Rig	build	-	@mathew	3h	easy	1 replications: Try it >
Use a rubber band and knotted string to trigger a camera	build	complete	@mathew	15m	easy	0 replications: Try it >
super simple KAP mount with small tripod	-	-	@conzoearth	-	-	0

Grassroots Mapping Toolkit

Our aerial mapping toolkit is a simplified kite and balloon aerial photography system for easy and accessible high-resolution map-making. The toolkit consists of:

Flight platforms: Assembling a balloon kit will cost from \$100-200, including helium.

- The Public Laboratory [Balloon Mapping Kit](#) is assembled from our preferred parts.
- For alternative and low-cost materials, see the [Balloon Mapping Materials page](#).
- [Use this chart to calculate the lift you'll need.](#)

Camera housings: Single Line systems: [The PET Bottle & Rubber Band Rig](#) wraps around the small and medium sized cameras (up to micro 4/3) for crash protection while firmly mounting it in a position for vertical images.

For heavy cameras, a [Trash Can Rig](#) offers more protection.

Multiple Line Systems: these are more complex to build but can provide added stability, especially useful for video. [Several people have created Picavet rigs.](#)

Cameras: A small camera that supports continuous shooting mode and a large storage card, or an excellent camera phone are our preferred options.

- Help [selecting a camera](#)
- Different ways of [triggering the camera shutter](#)

Mapmaking software: Public Laboratory's [MapKnitter](#) is easy to use browser software for map making. Continue on to [MapKnitter Guide](#) and [MapKnitter Help](#) for more information.

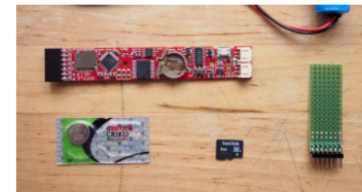
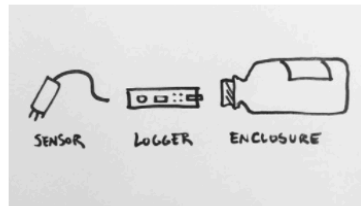
- When mapmaking, efficient image sorting [either on your desktop](#), or using [Mapmill](#) is a must.
- Some people also use proprietary software such as Photoshop, [Hypr3d](#), or [PhotoSynth](#). For a freely distributed desktop option, check out the [GNU Image Manipulation Program](#).

Useful guides: Our latest guides can always be found on the [Guides](#) page, including:

- The four-page [Grassroots Mapping Guide](#)
- The [Balloon Mapping Quick Start Guide to filling and flying](#) (pdf) and [editable Google Doc](#)
- The [Balloon Mapping Check Lists](#) (pdf) and [editable Google Doc](#), which are extremely useful in planning field expeditions, even for experienced fliers.
- We also maintain a [guide to FAA regulations](#) page.

Curricula and workshops: Our [Curriculum-Guide](#) covers the entire process and some theory behind mapping. It is still in beta.

Public Lab Tools



Water Sensors

last edit by [warren](#) 8 minutes ago | 484 views | 3 stars

0 activities 0 upgrades

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Data Logging

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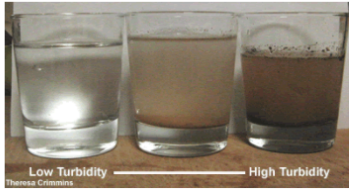
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Sensor enclosures

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Riffle: an Open Source Water Monitoring Approach

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<https://publiclab.org/methods>



Aerial photos with Passenger Pigeon

last edit by [warren](#) about 1 month ago | 3,721 views | 2 stars



Balloon & Kite Mapping

last edit by [stevie](#) about 1 month ago | 148,044 views | 6 stars

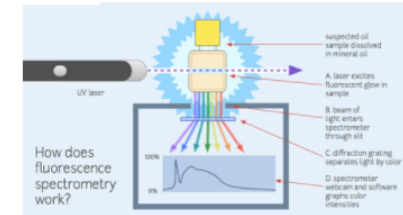
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Infragram

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0 activities 0 upgrades



Spectrometry

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26 activities 21 upgrades

Environmental Protection Belongs to the Public

A Vision for Citizen Science at EPA



National Advisory Council for Environmental Policy
and Technology (NACEPT)

December 2016

Released on December 13th 2016
By National Advisory Council for
Environmental Policy and
Technology (NACEPT)

<https://www.epa.gov/faca/nacept-2016-report-environmental-protection-belongs-public-vision-citizen-science-epa>

- Embrace citizen science as a core tenet of environmental protection.
- Invest in citizen science for communities, partners and the Agency.
- Enable the use of citizen science data at the Agency.
- Integrate citizen science into the full range of work of EPA.

Networked Collaborations for Rapid Data Driven Response



About Our Work Publications Events Blog Press

Care About the Future of Evidence-Based Environmental and Climate Programs?

LEARN MORE

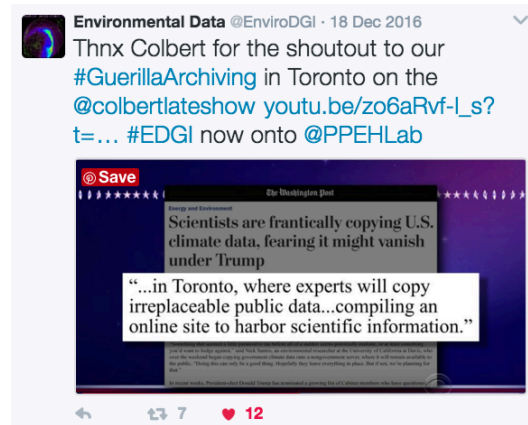
<https://envirodatagov.org/>

Mission

EDGI documents, contextualizes, and analyzes, current changes to environmental data and governance practices through multidisciplinary and cross-professional collaborative work. EDGI fosters the stewardship and expansion of public knowledge through building participatory civic technologies and infrastructures to make data and decision-making more **accessible**. EDGI creates new communities of practice to enable government and industry accountability.

Vision

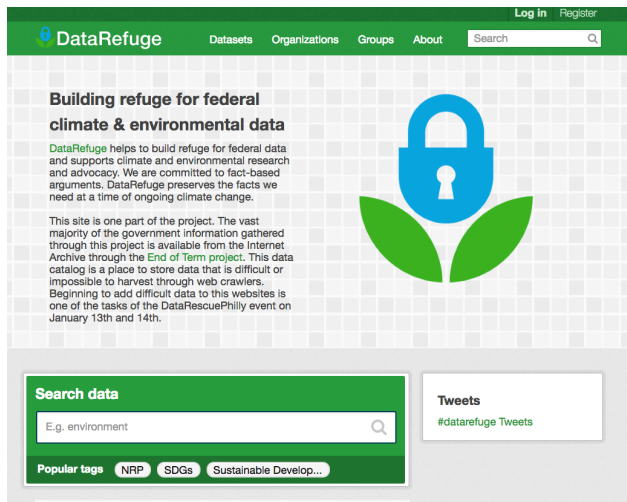
We envision a future in which justice and equity are at the center of environmental, climate, and data governance. Governing agencies and industries will be held accountable through transparent, collaborative, community-centered environmental research, technology, and decision-making. We seek to realize a world that creates and maintains healthy, just, bountiful, and beautiful environs in which people thrive.



30+

Archiving: 200 terabytes of government websites and data. This includes over 100TB of public websites and over 100TB of public data from federal FTP file servers totaling, together, **over 350 million URLs/files.**

This includes over **70 million html pages, over 40 million PDFs;** 8 files of the text/turtle mime type.



EPA Superfund Data and Reports

Data migrated from the legacy CERCLIS (Comprehensive Environmental Response, Compensation, and Liability Information System) to SEMS (Superfund Enterprise Management System)...

JSON ZIP

Urban Environmental Program: Region 1: EPA New England

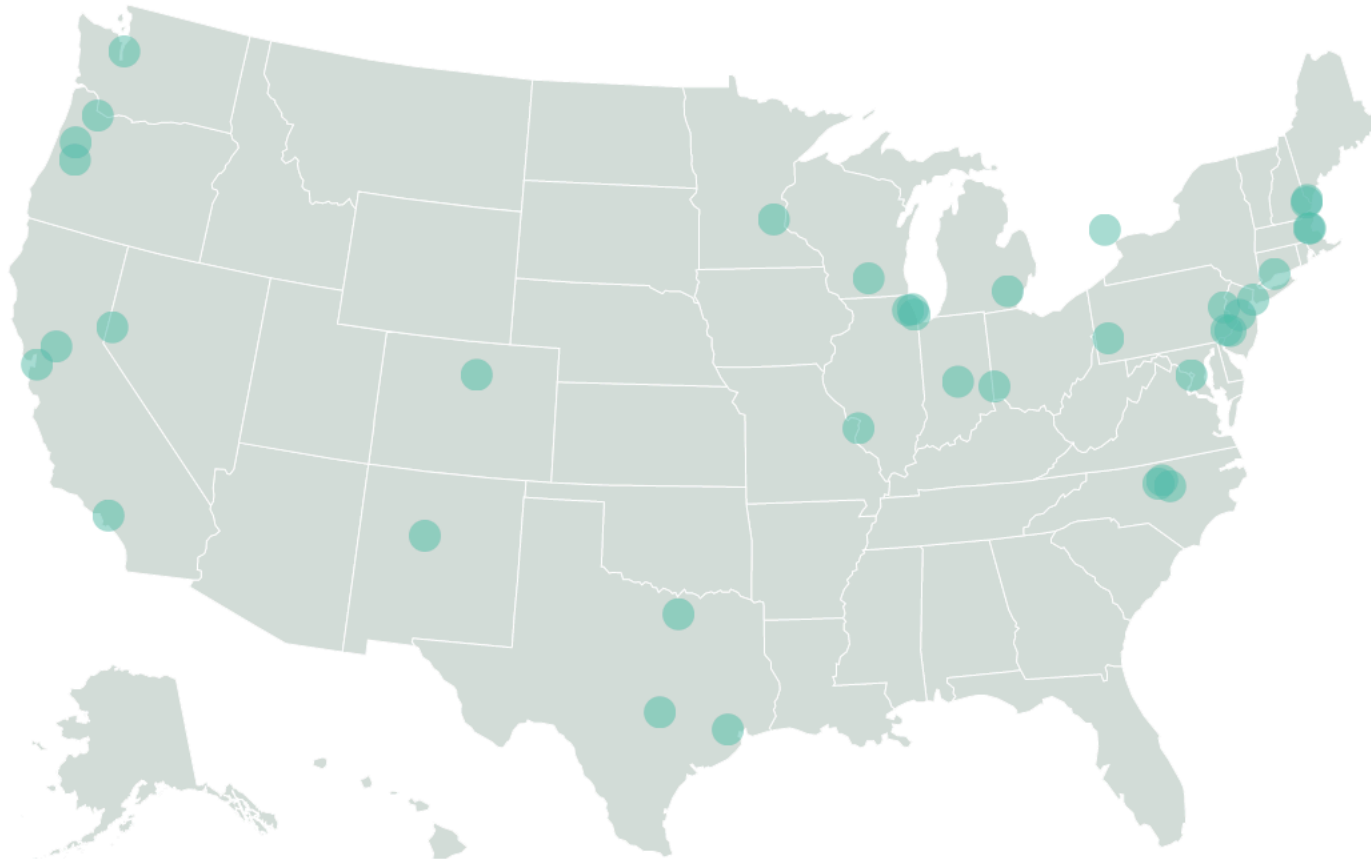
The Urban Environmental Program's mission is to improve the environment and enhance the quality of life for urban residents throughout New England by building community capacity...

ZIP

EPA Environmental Justice Grant Programs

The primary purpose of EPA's environmental justice grant programs are to support communities as they develop and implement solutions that significantly address environmental...

ZIP



DataRescue

DataRescue events were organized by local communities with support from EDGI and DataRefuge. From Fall 2016 through Spring 2017 they brought together scientists, coders, librarians, and volunteers to identify and preserve at-risk datasets in collaboration with the Internet Archive. In the three months following the 2016 election, events worked to extensively seed the Internet Archive's End of Term Harvest project.

<https://envirodatagov.org/datarescue/>

Monitoring

EDGI is tracking 25,000 Federal websites for changes to data and text. We produce reports for a network of investigative journalists, including *ProPublica*, *The New York Times*, *Washington Post* and *The Intercept*



Sara Ann Wylie @SaraAnnWylie · Feb 15
fracking rule description cut from Interior Dept. website
[interc.pt/2lJTDtN](#) by @AleenBrown Great investigative: #EDGI @EnviroDGI



Text Describing Federal Fracking Rule Disappears From Interior Depa...
Text describing two rules regulating the oil and gas industry was removed from the Interior Department website.
[theintercept.com](#)

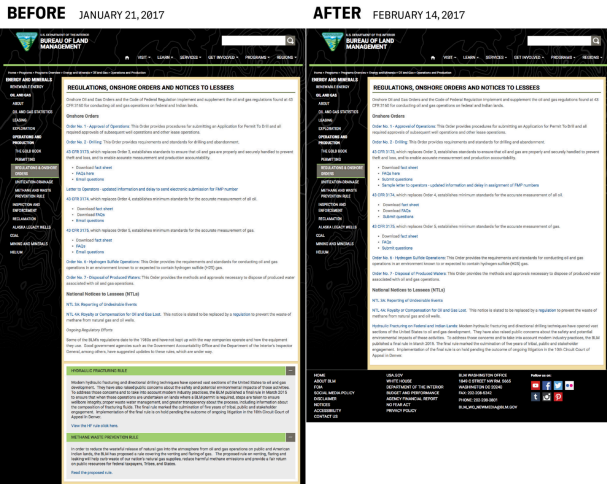


A Government Website for Kids Scrubbed Its Climate Warnings
In recent weeks, "Energy Kids" has reworked and cut information about fossil fuels' environmental impact.
[theatlantic.com](#)

Sara Ann Wylie @SaraAnnWylie · 11s
investigative #EDGI@EnviroDGI EPA Removes Mentions of Climate Change' in Water Utilities Program



EPA Website Change Suggests Self-Censorship on C..
The agency removed the words 'climate ready' from a page title even before President Trump took office
[insideclimatenews.org](#)



Environmental Data Retweeted
Andy Revkin @Revkin · Feb 17
#TrumpEffect? Coal/CO2 deletions from @EIAgov #EnergyKids website? @patricklee @propublica @EnviroDGI [propublica.org/article/childs...](#) #scitech



A page from the U.S. Energy Information Administration's "Energy Kids," an education website for children about energy sources. On the right, two pie charts depicting the link between coal and greenhouse gas emissions have been removed.

Rick Perry
1 10 7

Climate Ready Water Utilities (CRWU)

The CRWU initiative provides the water sector (drinking water, wastewater and stormwater utilities) with the practical tools, training, and technical assistance needed to adapt to climate change by promoting a clear understanding of climate science and adaptation options. Based about the Climate Ready Water Utilities Initiative.

Plan for Climate Change at Your Utility

- Understand the climate ready framework
- Learn about utility adaptation strategies
- Conduct a planning workshop
- Explore and share adaptation case studies

Assess Your Risk to Climate Change

- Conduct a climate risk assessment
- View case studies
- See resources

Get Climate Training for Your Utility

- Workshops and webinars

Access CRWU Resources

- View case studies
- View resources

Creating Resilient Water Utilities (CRWU)

The CRWU initiative provides drinking water, wastewater and stormwater utilities with the practical tools, training, and technical assistance needed to increase resilience to extreme weather events. Through a comprehensive planning process, CRWU assists water sector utilities by providing a clear understanding of potential long-term adaptation options.

Adaptation in Action

- Indianapolis, IN
- Camden, NJ
- Hamburg, PA
- Manchester by the Sea, MA
- Fairfax, VA
- Waynesboro, TN

Plan for Extreme Weather

- Learn about utility adaptation strategies
- Conduct a planning workshop
- Explore and share adaptation case studies

Assess Your Risk and Find Resources

- Conduct a risk assessment
- See coastal storm surge scenarios
- View resources

Sign up for CRWU News

CRWU Tool and Resource Updates

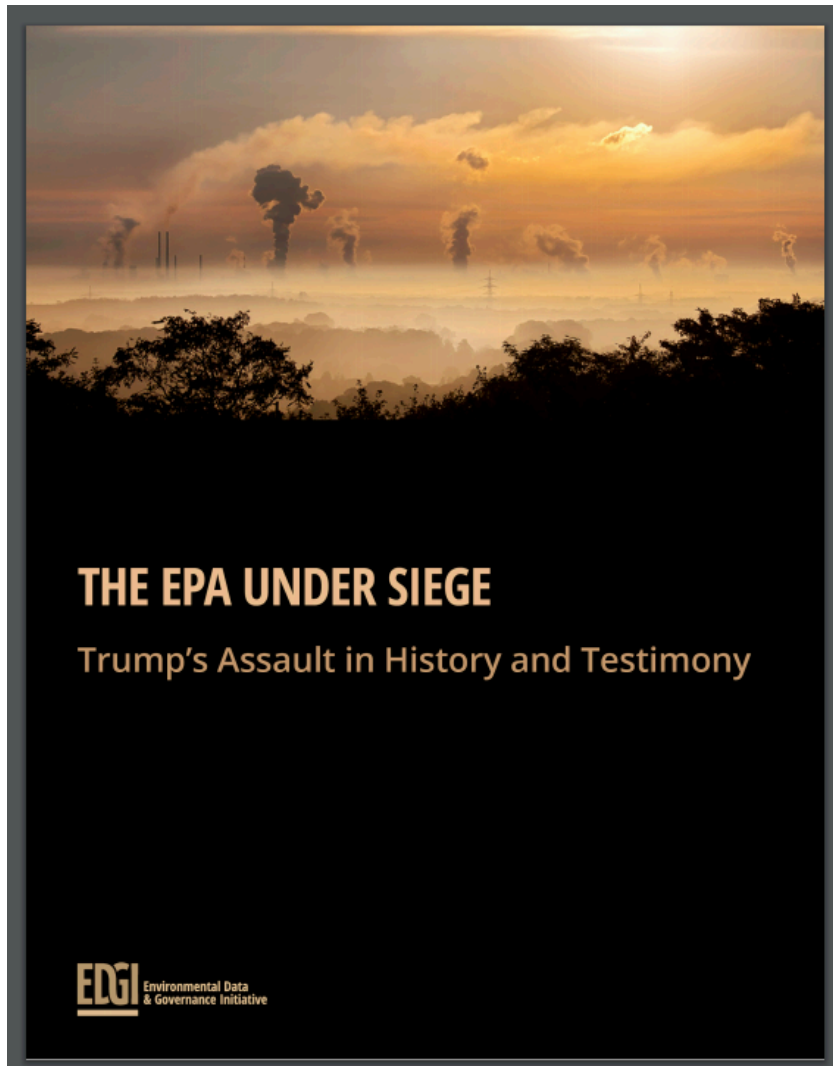
Adapt and plan for extreme weather impacts at your utility using EPA's CRWU!

The original webpage for the EPA's Climate Ready W...

Current, slimmed-down webpage of the EPA's Climate Ready Water Utilities climate change changed to resilient or stripped

<https://envirodatagov.org/website-monitoring/>

Rapid Public Academic Reports



<http://100days.envirodatagov.org/>

How could we develop systems to study and hold accountable these global industries?

- Combine advocacy and research efforts on Climate Change and EDCs/Toxics
- Develop Grassroots Community Based Research with Frontline Communities
- Digitally Network Grassroots Community Organizations, Non-profit and Academics
- Build Open-Source Public Data Infrastructures and Tools
- Theorize and defend:
 - The Public Right to Research
 - The Rights of Researched Publics

Acknowledgements

Theo Colborn and The Endocrine Disruption Exchange (TEDX)

WellWatch: The ExtrAct Research Group

*Chris Csikszentmihályi, Dan Ring, Christina Xu, Matt Hockenberry,
Lisa Sumi, Jennifer Goldman and Tara Meixsell*

Earthworks/OGAP

The Public Lab Staff and Community

EDGI's Steering Committee and Members

Archiving/Data Together Contact: Dawn Walker

Web Monitoring Contact: Toly Rinberg

Interview Team Contact: Chris Sellers

100 Days and Counting Report Contact: Rebecca Lave

Environmental Data Justice Contact: Michelle Murphy

Steering Committee Chairs: Lindsey Dillion and Nick Shapiro

Fundraising: Phil Brown

The Wylie Lab

Lourdes Vera (Northeastern University)

Taylor Braswell (Northeastern University)

Mia Renault (Northeastern University)

Erik Hanley (Northeastern University)

Drew Michanowicz (Harvard T.H. Chang School of Public Health)

Max Liboiron and Nick Shapiro

Social Science Environmental Health Research Institute (SSEHRI)

JPB Environmental Health Fellows Harvard T.H. Chang School of Public Health

