The Design Challenge

interviewing critical geographic pedagogy, visual storytelling, and big data visualization in a day-long mapping workshop!

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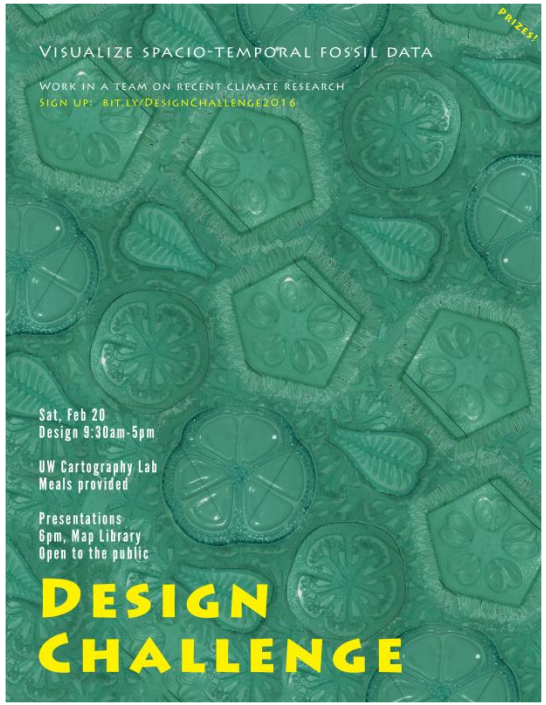
University of Wisconsin–Madison, Department of Geography

2017 AAG Annual Meeting
ICA Sessions on Cognition, Behavior, & Design
Sponsored by the AAG Cartography Specialty Group
Boston, MA | April 6

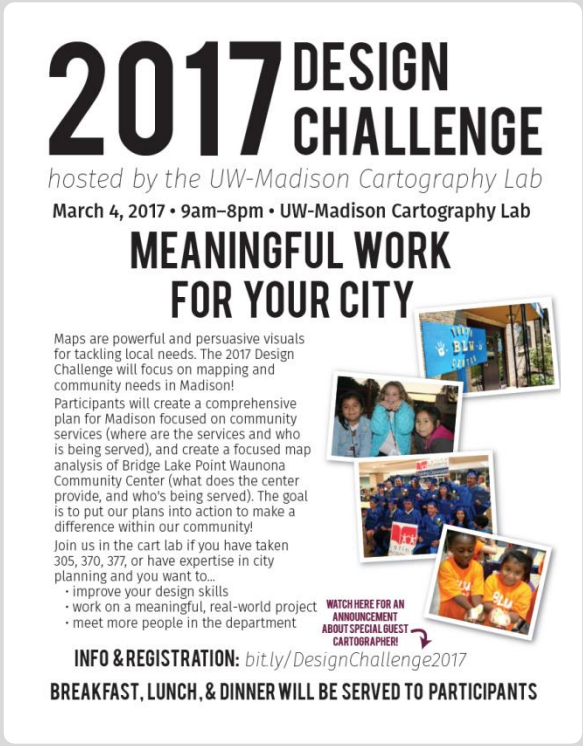
#uwcart

CARTOGRAPHY LAB
University of Wisconsin–Madison

environmental justice



climate change



community organization

pedagogy

active learning

real-world problems

service learning

portfolio building

expert feedback

self management

self assessment

innovation

process over product

mixed methods

hybridized epistemologies

spontaneous insights

maps that matter

broader impacts

design + critique

community

social engineering

peer-to-peer learning

capacity building

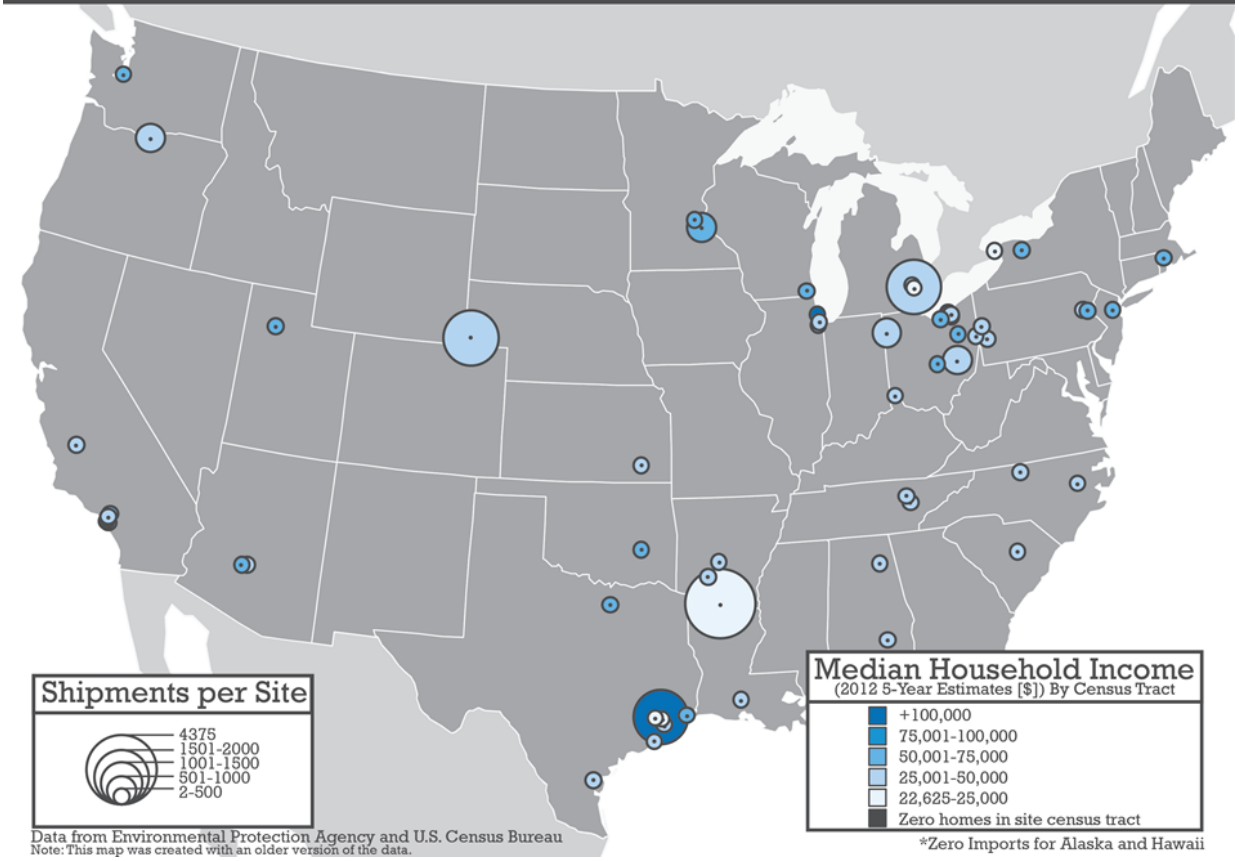
outreach

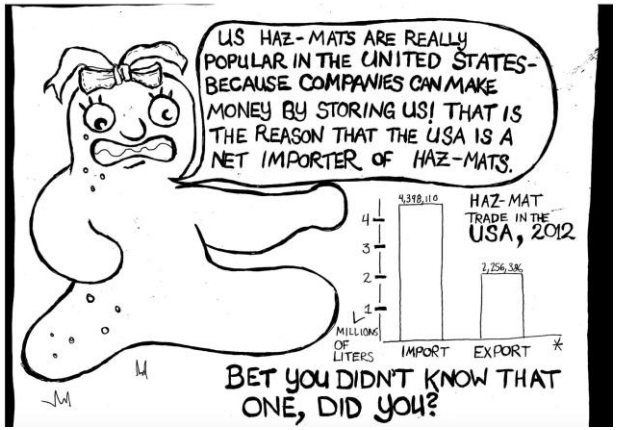
cartographic stewardship

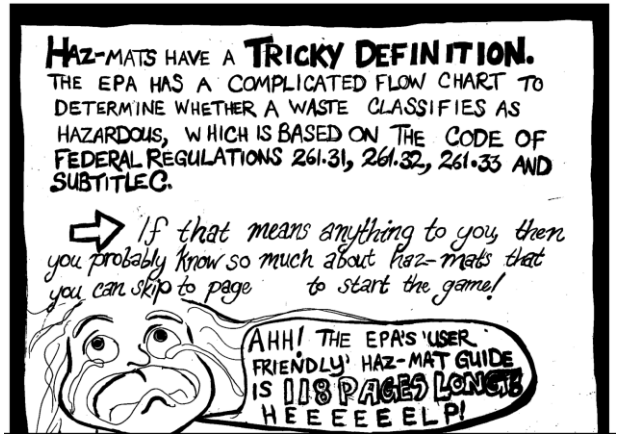
leveling hierarchies

undisciplining geography

Hazardous Waste Imports: 2007, 2009-2012

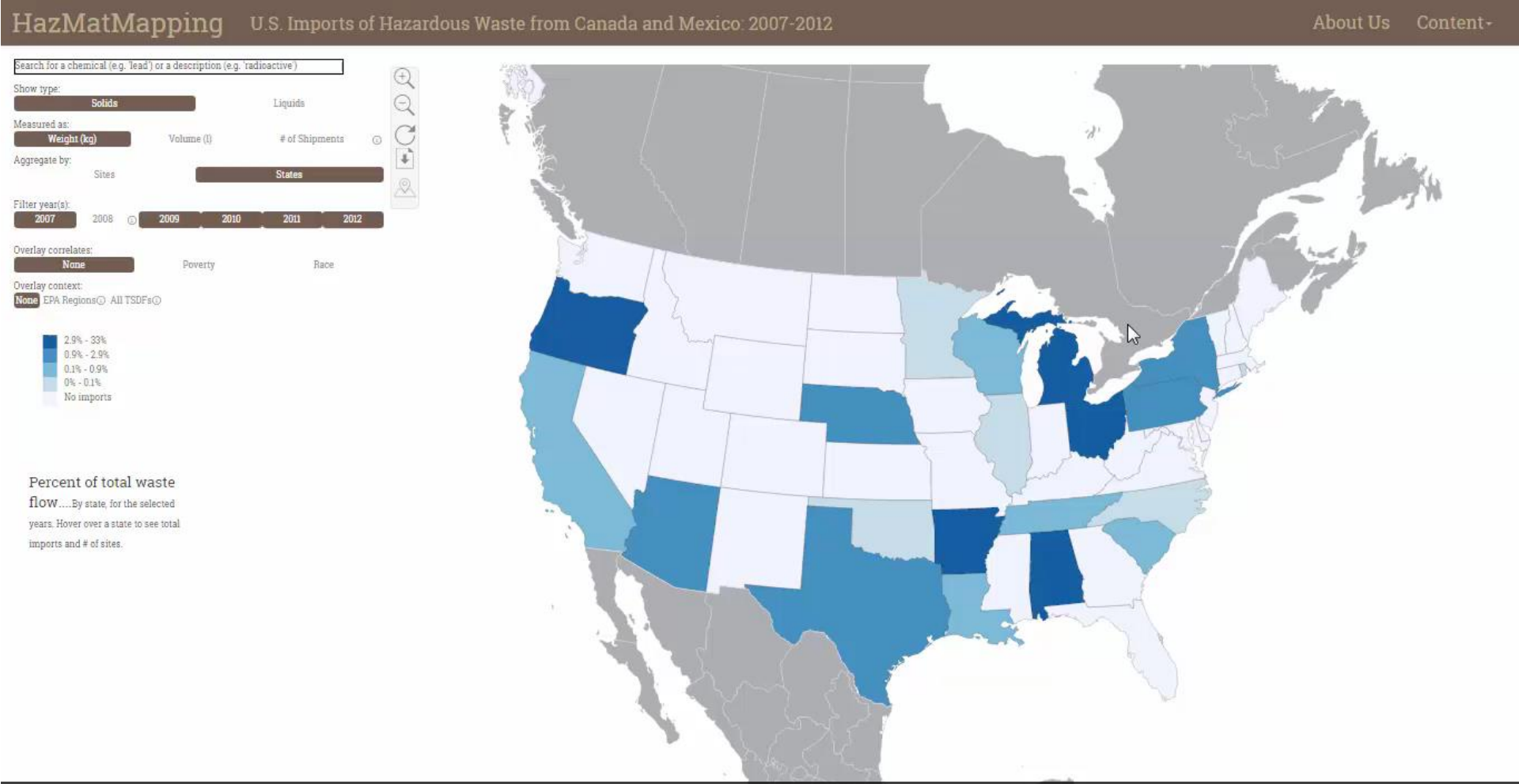




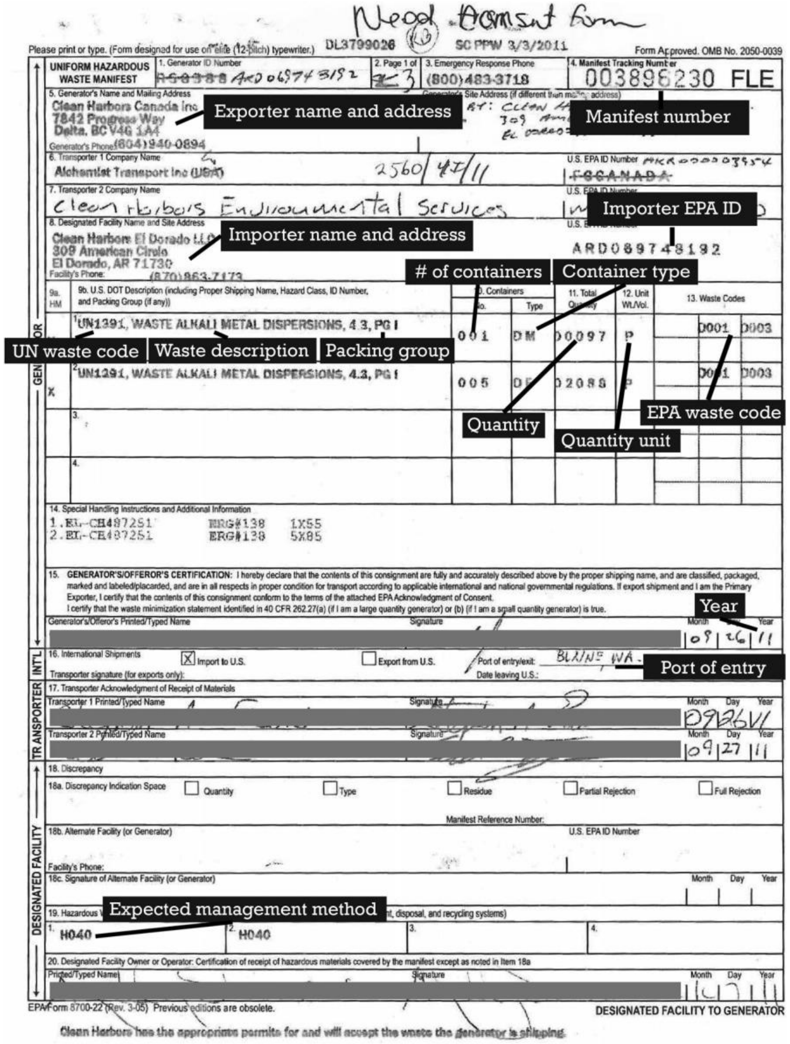


#DC2015

Kristen Vincent (left) *Chelsea Nestel (right)*



www.geography.wisc.edu/hazardouswaste/map/


Need Consent Form

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) DL3799026 SC PPW 3/3/2011 Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	~~RS8388~~ ARD 069748192	3	(800)483-3718	003898230 FLE

5. Generator's Name and Mailing Address
Clean Harbors Canada Inc
7842 Progress Way
Delta, BC V4G 1A4
Generator's Phone: (604)940-0894

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: Alchemist Transport Inc (USA) 2560/41/11
U.S. EPA ID Number: ~~FCCANADA~~

7. Transporter 2 Company Name: Clean Harbors Environmental Services
U.S. EPA ID Number

8. Designated Facility Name and Site Address
Clean Harbors El Dorado LLC
309 American Circle
El Dorado, AR 71730
Facility's Phone: (870)863-7173
U.S. EPA ID Number: ARD069748192

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes	
	1. UN1391, WASTE ALKALI METAL DISPERSIONS, 4.3, PG I	001	DM	00097	P	D001	D003
X	2. UN1391, WASTE ALKALI METAL DISPERSIONS, 4.3, PG I	005	DF	02088	P	D001	D003
	3.						
	4.						

14. Special Handling Instructions and Additional Information
1. EL-CH487251 ERG#138 1X55
2. EL-CH487251 ERG#138 5X85

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.
Generator's/Offeror's Printed/Typed Name [redacted] Signature Month Day Year 09 26 11

16. International Shipments ☒ Import to U.S. ☐ Export from U.S. Port of entry/exit: BLAINE WA
Transporter signature (for exports only): Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name [redacted] Signature Month Day Year 09 26 11
Transporter 2 Printed/Typed Name [redacted] Signature Month Day Year 09 27 11

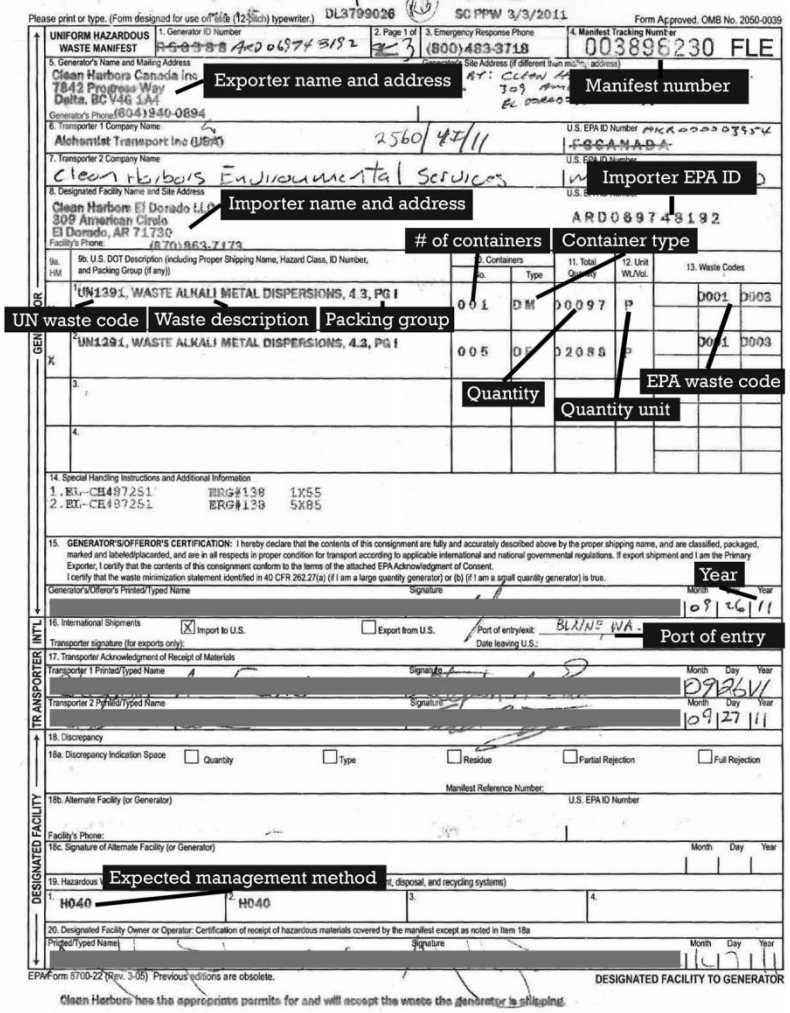
18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
18b. Alternate Facility (or Generator) U.S. EPA ID Number
Facility's Phone:
18c. Signature of Alternate Facility (or Generator) Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)
1. H040 2. H040 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name [redacted] Signature Month Day Year

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete. DESIGNATED FACILITY TO GENERATOR

Clean Harbors has the appropriate permits for and will accept the waste the generator is shipping.



#DC2015

Data: EPA Scanned Manifests

- 21,184 import/export shipments (27% of total FOIA)
- imports: 41 unique attributes (3370 unique entries)
- exports: 29 unique attributes (3570 unique entries)

Participants (25 DCers)

- 17 students: 2 PhD, 4 MS, 6 cert, 5 undergrad
- 8 helpers: 2 faculty, 2 staff, 2 visitors, 2 PAs

The Challenge

"visualize unique stories in the dataset"

Logistics (February 14th, 2015)

- dataset curated by Cart Lab PA (~two weeks)
- dataset sent to participants one week in advance
- 8 hours to design + 90 minutes of presentation
- $900 in prizes + $600 for three meals

Interviews (Spring 2015)

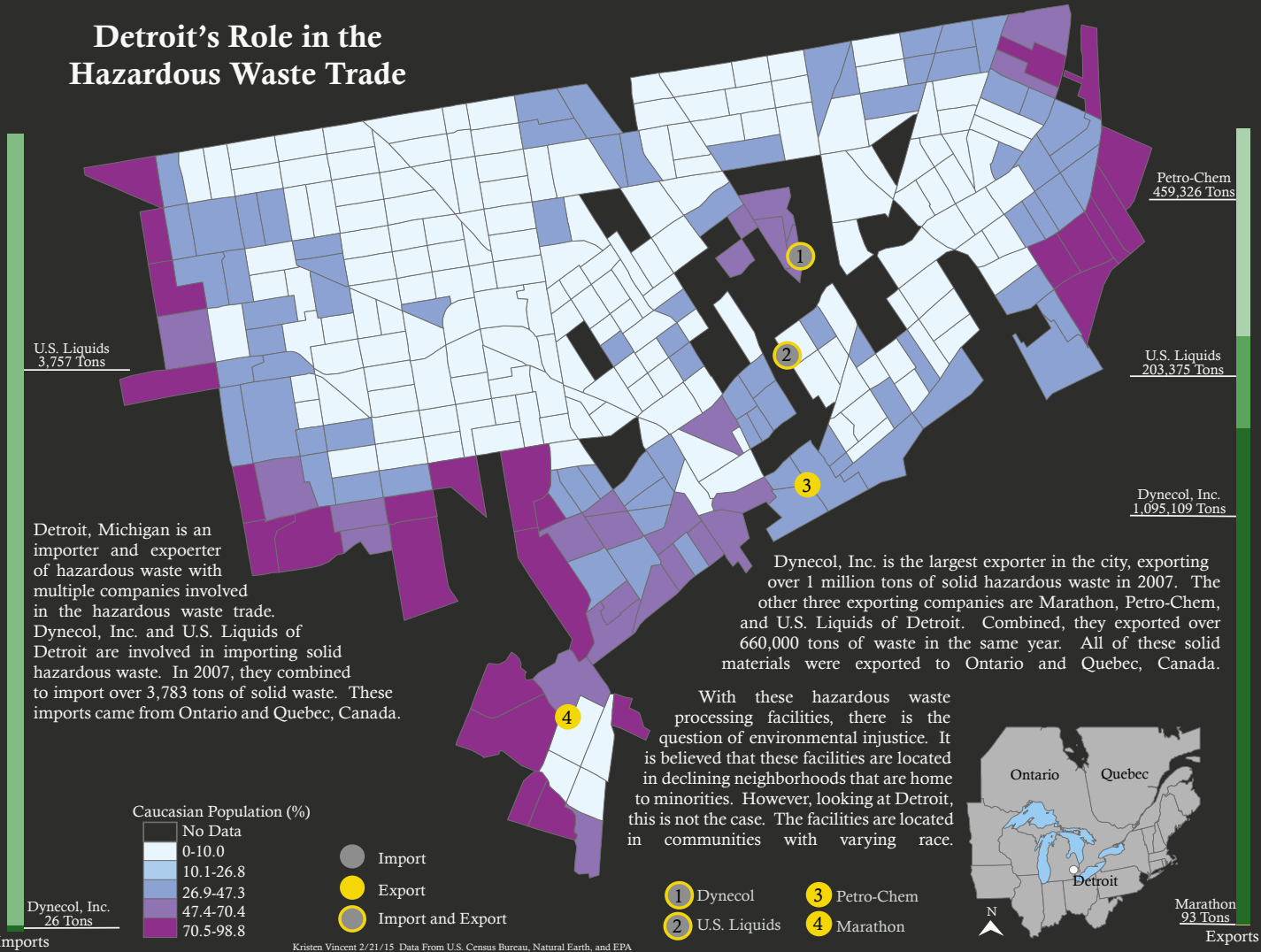
- 14/17 participants reflected on lasting impressions

#	Title	Story Theme
1	Burying Hazardous Waste: Continental Imports to United States Landfills from 2007–2012	Flows (Transboundary)
2	Choose Your Own HazMat Adventure Game	Political Economics
3	Detroit's Role in the Hazardous Waste Trade	Uneven Risk (City)
4	Hazardous Waste Import Locations by Packing Group	Uneven Risk (Country)
5	Hazardous Waste Treatment Facilities: The Communities	Political Economics, Uneven Risk (Country)
6	How One Line on a Map Explains 9% of the US–Mexico Hazardous Waste Trade	Flows (Transnational), Political Economics
7	One Company and the North American Hazardous Waste Trade	Flows (Transnational), Political Economics
8	Solid Lead from Canada to the United States from 2007–2009	Flows (Regional)
9	Untitled	Uneven Risk (State)
10	Ways We Eliminate Waste	Uneven Risk (Country)

uneven risk

local disparity

Detroit's Role in the Hazardous Waste Trade



Detroit, Michigan is an importer and expoerter of hazardous waste with multiple companies involved in the hazardous waste trade. Dynecol, Inc. and U.S. Liquids of Detroit are involved in importing solid hazardous waste. In 2007, they combined to import over 3,783 tons of solid waste. These imports came from Ontario and Quebec, Canada.

Dynecol, Inc. is the largest exporter in the city, exporting over 1 million tons of solid hazardous waste in 2007. The other three exporting companies are Marathon, Petro-Chem, and U.S. Liquids of Detroit. Combined, they exported over 660,000 tons of waste in the same year. All of these solid materials were exported to Ontario and Quebec, Canada.

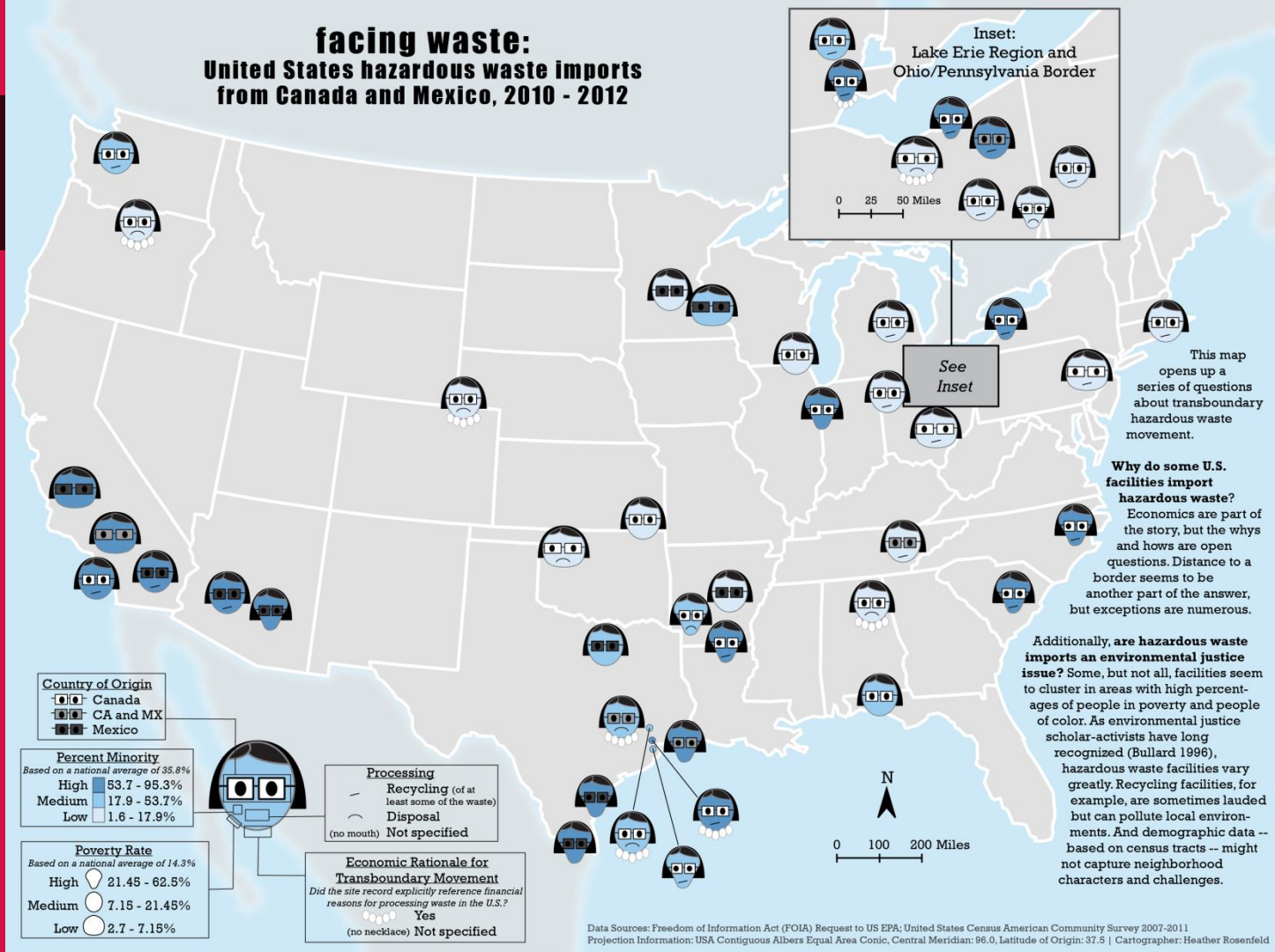
With these hazardous waste processing facilities, there is the question of environmental injustice. It is believed that these facilities are located in declining neighborhoods that are home to minorities. However, looking at Detroit, this is not the case. The facilities are located in communities with varying race.

Kristen Vincent 2/21/15 Data From U.S. Census Bureau, Natural Earth, and EPA

Kristen Vincent

uneven risk

national disparity



Heather Rosenfeld

flows
specific materials

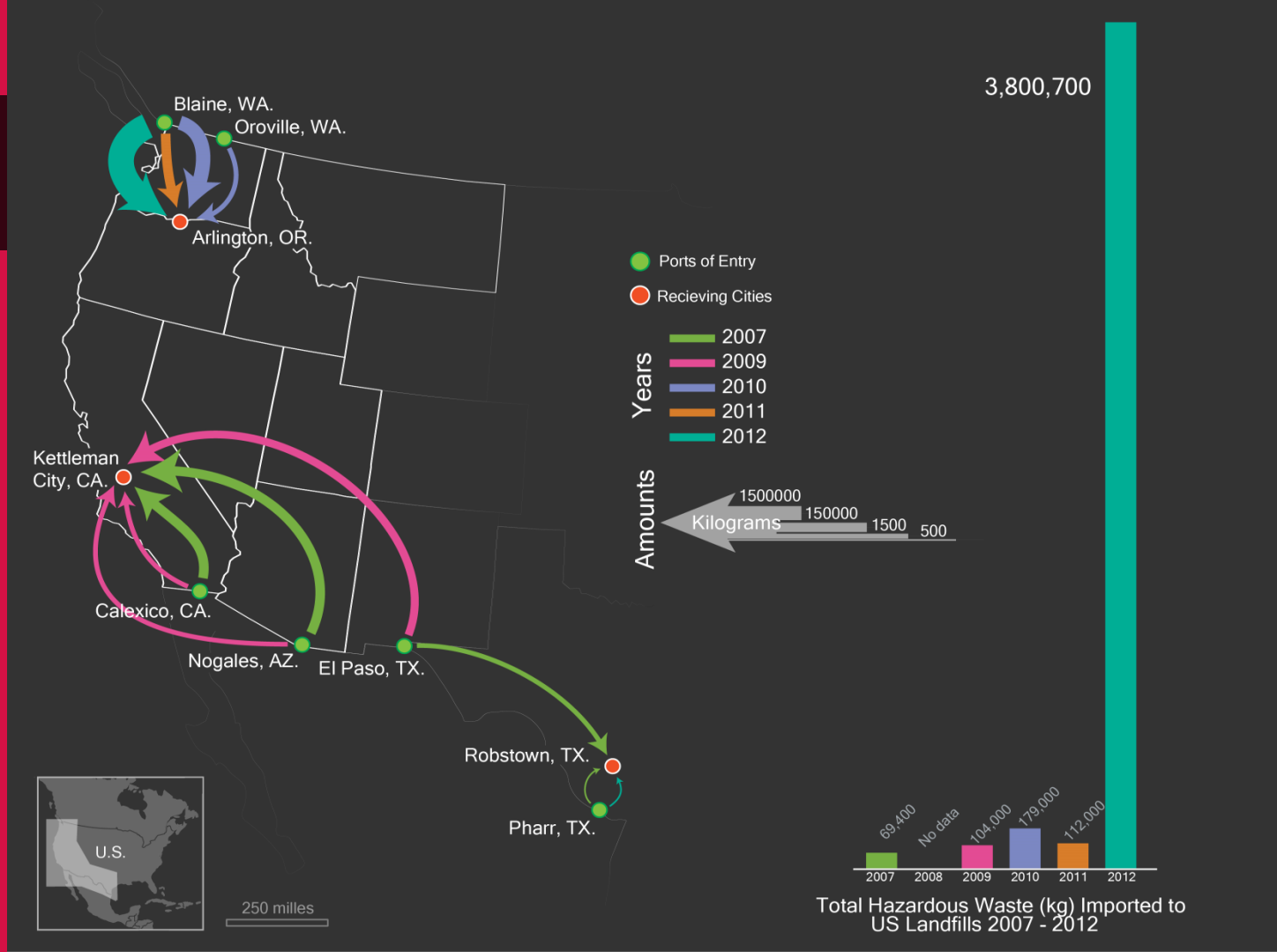
Solid Lead from Canada to the United States from 2007-2009

The Health Effects of Lead
There are many serious health problems caused by the accumulation of lead in a body. For children, lead can lead to slowed growth, lower IQ, behavior problems, hearing problems, hyperactivity, and anemia. For pregnant women, lead in the body can reduce growth of the fetus and lead to premature birth.

Gillian Cooper,
Claire Trainor

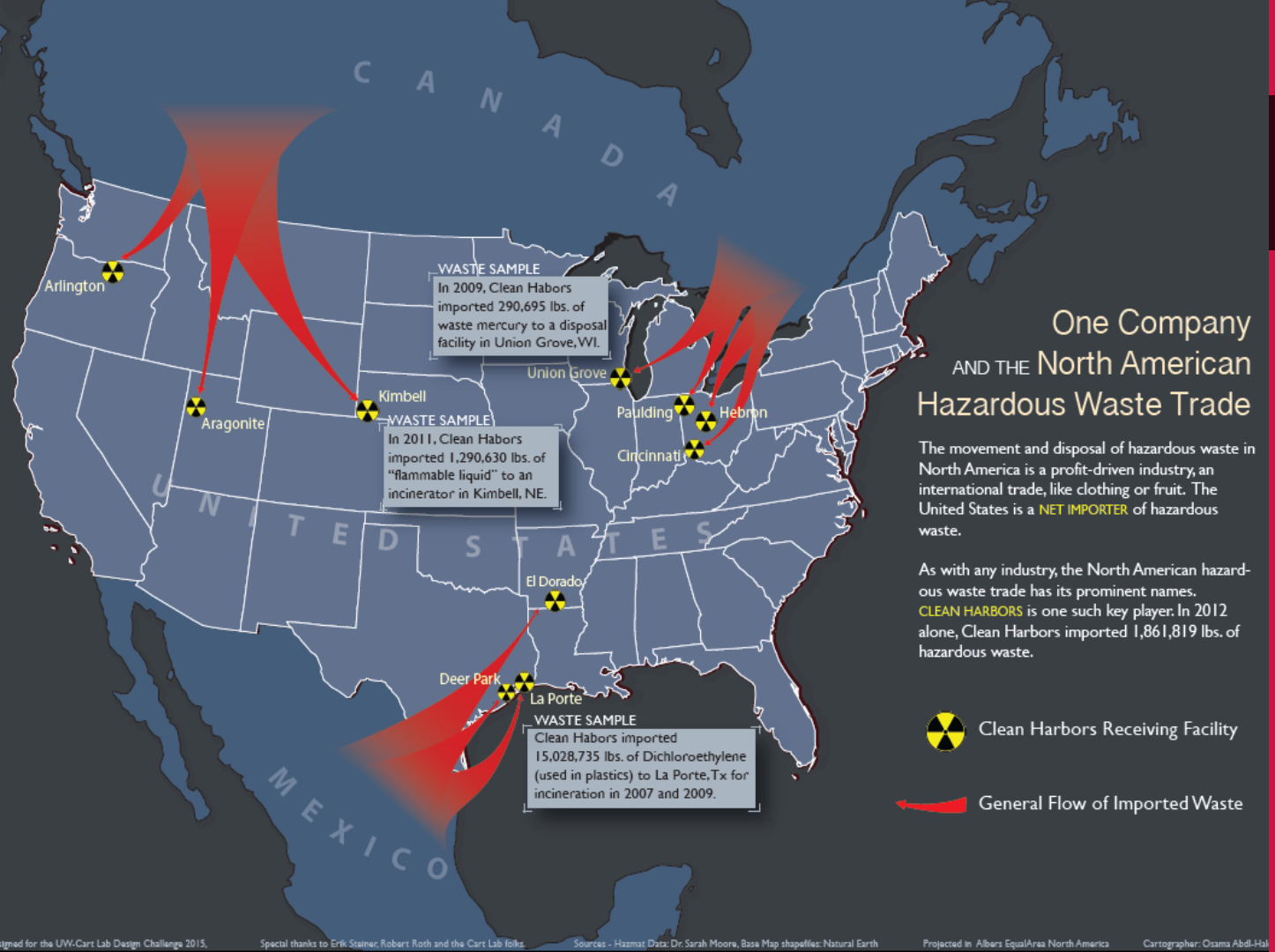
flows

specific sites



Constanza Bravo, Michelle Hu

political economy
transnational?



Osama Abdl-Haleem

How one line on a map explains 9% of the U.S.–Mexico hazardous waste trade

By Evan Applegate & Eric Nost

1

Let's talk about

CleanHarbors ENVIRONMENTAL SERVICES ,

a company that appears in 1/3 of the rows in the "waste importer" dataset. Its ubiquity isn't so surprising: they had **$1 billion** in waste disposal revenues last year, and according to them most of the hazardous waste incinerated in North America goes through one of their facilities.

Most of the waste they import is leftovers from the manufacture of **vinyl chloride**, the stuff you need to make PVC pipes.

Further digging revealed that Clean Harbors imports a lot of this vinyl chloride waste: 11,089 tons from 2007-2012, which adds up to **9% of all hazardous waste imported into the U.S.** that's measured in pounds or kilograms. Where does it all come from?

Clean Harbors Deer Park
La Porte, Texas

3

That one plant is the Deer Park facility in La Porte, Texas. But why's the waste coming to Texas? What's the economic sense of moving waste **800 miles** just to burn it?

U.S.

MEXICO

4

The map holds the answer: **both the Deer Park facility and the Pajaritos complex are adjacent to ports on the Gulf of Mexico, and it's a straight shot between them.**

We don't have manifests but public shipping data from IHS maritime confirms ▶ that chemical tankers make regular runs between the two ports, taking on cargo in Mexico and unloading it in Texas.

Pajaritos Petrochemical Complex
Coatzacoalcos, Veracruz, Mexico

2

All the vinyl chloride waste imported by Clean Harbors comes from a single location in Mexico. And it all ends up at one Clean Harbors plant.

5

It's a simple route, and also a cheap one: moving cargo by ship is far less costly than moving it by rail or road. Add a free trade agreement that smooths international waste transit and the picture becomes clear: **low transport costs plus NAFTA equals a booming trade in hazardous waste between Mexico and the U.S.**

political economy
specific sites

Evan Applegate & Eric Nost

critical quantification

storytelling

Chelsea Nestel

critical quantification
can stories tell themselves?

interviews one year later

"the story is in fact being spun"

"if you go dig around for the numbers that support what you think, you'll probably find them"

directed storytelling

"if I couldn't find the answer from the dataset, I looked for other data"

"it was useful to think in terms of cases rather than exploration"

"it is okay to be subjective and creative, I don't think that subjectivity is always bad"

"as a designer you have to be able to adapt and be able to understand what's in the data"

undirected storyseeking

"whether those stories were appropriate to the data or to the task at hand was up in the air"

"having a big dataset was just inducement to dig out its spurious correlations"

critical quantification
uncertainty

Incompleteness	
missing or underreported shipments	7
missing geocoded coordinates	1
missing units	1
Inconsistency	
inconsistent units	8
inconsistent waste codes/names	5
Inaccuracy	
geocoding errors	3
misspelling	1
Imprecision	
geocoding imprecision	1
aggregation resolution	1
rounding	1
Lineage	
handwriting / transcription issues	3

interviews one year later

critical quantification
collaboration

Dylan Moriarty

#takehomes

CARTOGRAPHY LAB
University of Wisconsin–Madison

- A Design Challenge is a **LOT** of work for everyone, but checks every box on campus while helping us think outside them.
- Big data are **meaningless** but specific stories in them are **powerful**; together, they can reveal their limitations and confront traditional narratives.
- Just as data cannot speak for themselves, **stories cannot tell themselves**. Be creative, critical, and reflexive when seeking and telling.
- Collaboration is essential to learning and understanding. **Everyone** has something to contribute.
- A Design Challenge **starts conversation**, it cannot end one.

The Design Challenge

interviewing critical geographic pedagogy, visual storytelling, and big data visualization in a day-long mapping workshop!

Thx!

Read about the project!

- Nost et al. (2017) HazMatMapper: An online and interactive geographic visualization tool for exploring transnational flows of hazardous waste and environmental justice. *The Journal of Maps*.
- Moore et al. (2017) Undisciplining environmental justice research with visual storytelling. *Geoforum*.
- Project page: www.geography.wisc.edu/hazardouswaste/

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Thanks to our sponsors!

- Andrew W. Mellon Foundation
- National Science Foundation Award #1539712
- The Wisconsin Alumni Research Foundation

Thanks to all participants!

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