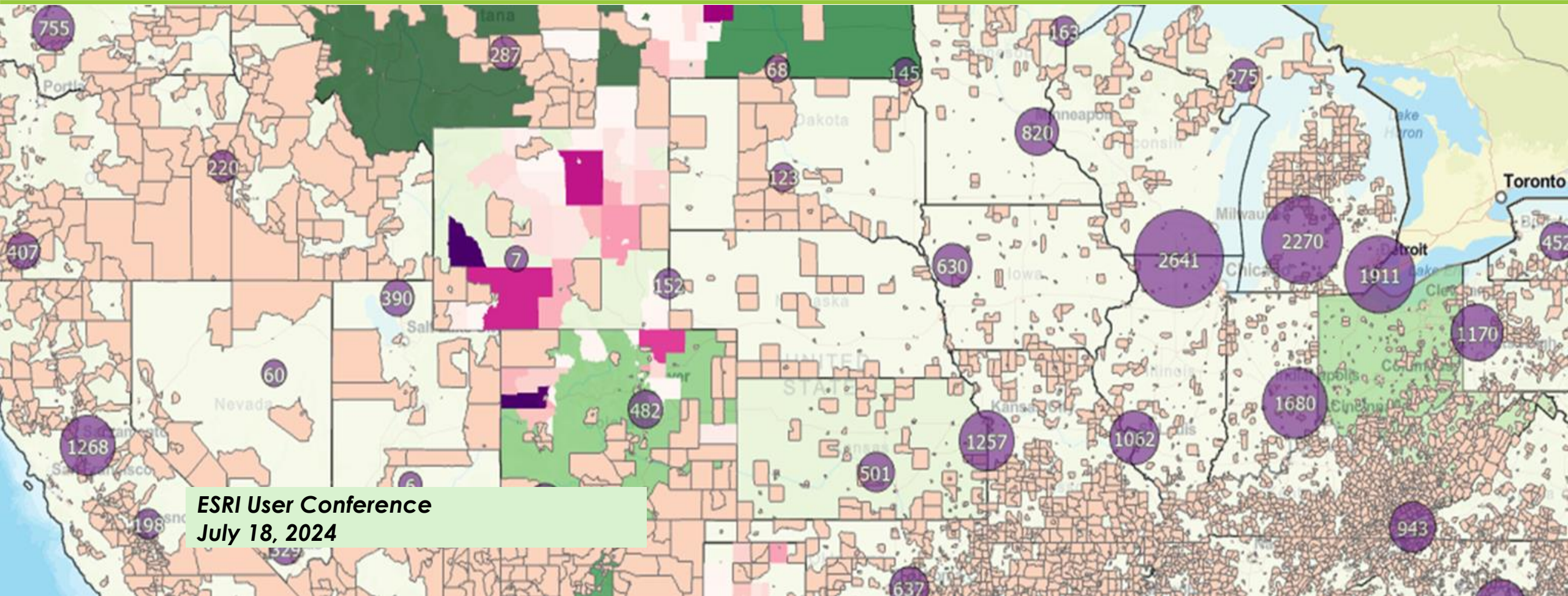


A Dashboard to Support Just Community Transitions for Carbon Capture and Storage



Maneesh Sharma

Geospatial Research Scientist/NETL Support Contractor



**ESRI User Conference
July 18, 2024**

Disclaimer



This project was funded by the United States Department of Energy, National Energy Technology Laboratory, in part, through a site support contract. Neither the United States Government nor any agency thereof, nor any of their employees, nor the support contractor, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

***Maneesh Sharma^{1,2}; John Bocan^{1,2}; Casey White^{3,4}; Caleb Malay^{1,2}; Casey Cleaveland^{3,4};
Kelly Rose³; Jennifer Bauer³***

¹National Energy Technology Laboratory, 3610 Collins Ferry Road, Morgantown, WV 26505, USA

²NETL Support Contractor, 3610 Collins Ferry Road, Morgantown, WV 26505, USA

³National Energy Technology Laboratory, 1450 Queen Avenue SW, Albany, OR 97321, USA

⁴NETL Support Contractor, 1450 Queen Avenue SW, Albany, OR 97321, USA

Environmental Justice (EJ) and Social Justice (SJ) for Carbon Capture and Storage (CCS) Systems

Challenge: Lack of information and insight available to better understand the viability of a CCS project's implementation based off existing EJ and SJ challenges, as well as overall community attitudes toward CCS

40% of the overall benefits of certain federal investments—including investments in **clean energy** and **energy efficiency**; clean transit; affordable and sustainable housing; training and workforce development; the remediation and reduction of legacy pollution; and the development of clean water infrastructure—must flow to **disadvantaged communities** (**Justice40 Initiative (EO 14008, Section 223)**)

Value:

- Provide decision and policy makers EJ-SJ insights on CCS feasibility
- Benefit techno-economic, environmental, and social analyses driving commercial, regulatory, and research supporting the CCS economy

Objective:

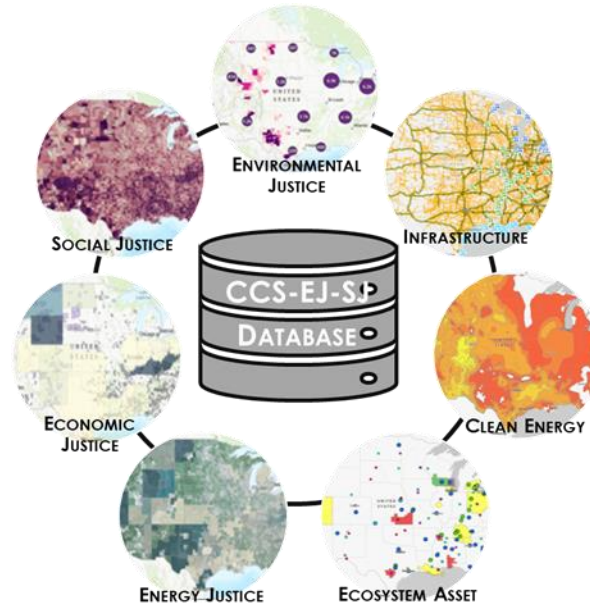
- Identify EJ-SJ factors and resources for supporting assessments and calculating metrics
- Build a nationwide EJ-SJ database to support CCS implementation planning
- Develop an intuitive, interactive dashboard to provide data-driven insights into EJ-SJ opportunities for CCS activities

Ultimate Product:

- CCS-EJ-SJ database available for download on NETL's Energy Data Exchange (EDX) DisCO₂ver
- Interactive dashboard designed to support intuitive interaction with CCS-EJ-SJ data to support CCS project efficiency and improve understanding of EJ and SJ factors and how the factors may support or impact commercial, regulatory, and research applications

EJ and SJ for CCS Systems

- CCS-EJ-SJ database showing data organization within major themes
- Available as file geodatabase from EDX

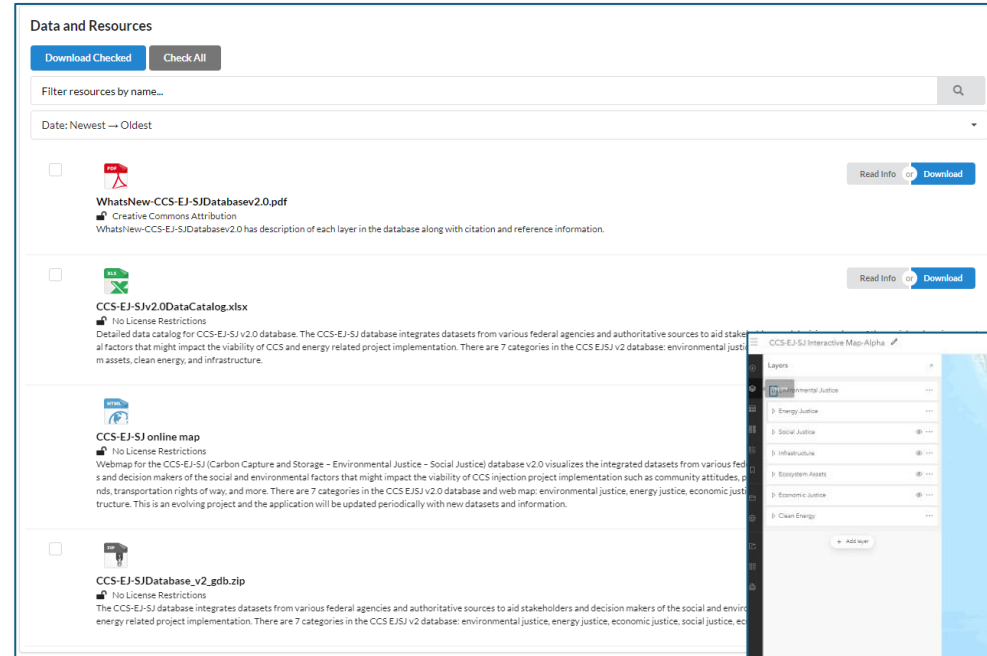


Data Aggregated from Various Authoritative Sources

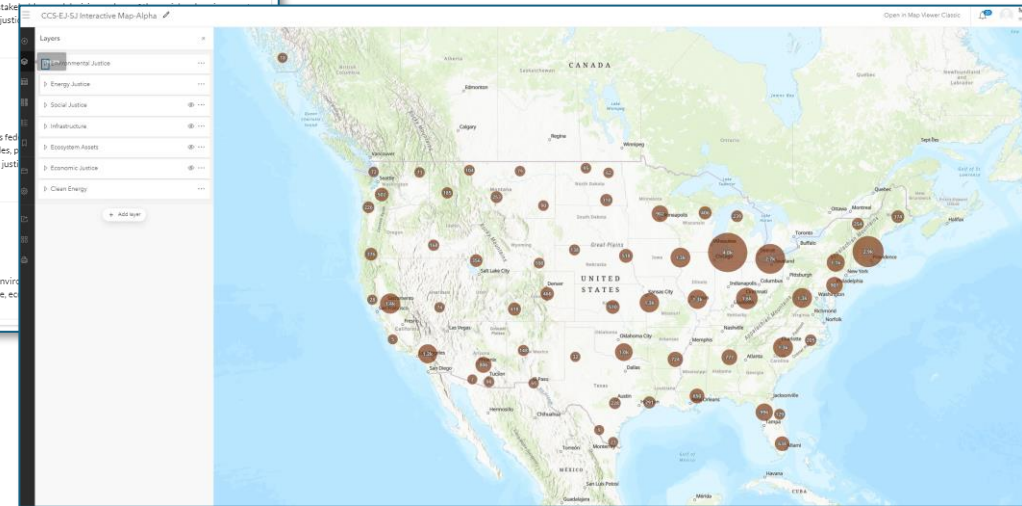
Category	Datasets	Sources
Environmental Justice	28	ACS, CDC, EPA, FEMA, NLCD, U.S. Census
Social Justice	38	ACS, CDC, CEQ, EPA, HIFLD, HUD, NASA, U.S. Census
Energy Justice	27	ACS, DOE, EIA, Enverus, EPA, GCCSI, IBRD, NOAA, U.S. Census
Economic Justice	11	ACS, BEA, IWG, NETL, U.S. Census
Clean Energy	9	EIA, HIFLD, NAICS, NREL, ORNL
Ecosystem Assets	12	AMCC, EDA, EPA, DOE, MFG USA, NIST, NSF
Infrastructure	18	EIA, BTS, CEC, FAA, FCC, FRA, HIFLD, MSI, MSHA, NETL, U.S. Census, USDOT, USGS
	148 datasets	

EJ and SJ for CCS Systems

- CCS-EJ-SJ information hosted on EDX
- EDX site includes
 - What's New
 - Data Catalog
 - Database
 - Interactive Online Map



Types of EJ-SJ information and metrics
available in version 2 of the CCS-EJ-SJ
Database (Sharma et al., 2024;
<https://edx.netl.doe.gov/dataset/ccs-ej-sj-database>)



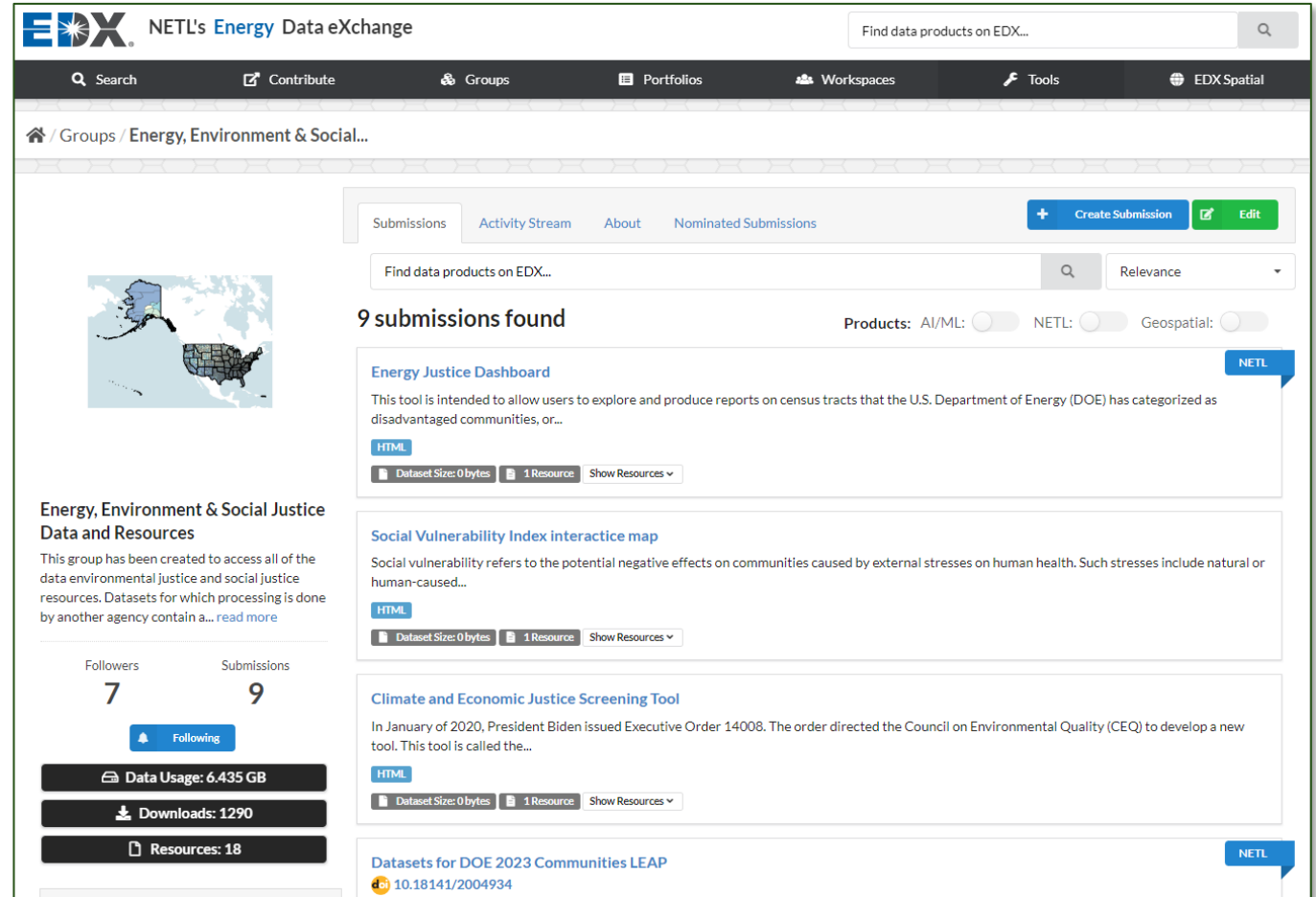
Interactive Online Map

EDX-Energy Data Exchange



A web-hosted, virtual library and laboratory that supports the public and the NETL community

Central location for EJ-SJ related information [Energy, Environment & Social Justice Data and Resources - Groups - EDX \(doe.gov\)](#)



EDX NETL's Energy Data eXchange

Find data products on EDX...

Search Contribute Groups Portfolios Workspaces Tools EDX Spatial

Home / Groups / Energy, Environment & Social...

Submissions Activity Stream About Nominated Submissions + Create Submission Edit

Find data products on EDX... Relevance

9 submissions found Products: AI/ML: NETL: Geospatial:

Energy Justice Dashboard NETL
This tool is intended to allow users to explore and produce reports on census tracts that the U.S. Department of Energy (DOE) has categorized as disadvantaged communities, or...

HTML
Dataset Size: 0 bytes 1 Resource Show Resources

Social Vulnerability Index interactive map
Social vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused...

HTML
Dataset Size: 0 bytes 1 Resource Show Resources

Climate and Economic Justice Screening Tool
In January of 2020, President Biden issued Executive Order 14008. The order directed the Council on Environmental Quality (CEQ) to develop a new tool. This tool is called the...

HTML
Dataset Size: 0 bytes 1 Resource Show Resources

Datasets for DOE 2023 Communities LEAP NETL
10.18141/2004934

Energy, Environment & Social Justice Data and Resources
This group has been created to access all of the data environmental justice and social justice resources. Datasets for which processing is done by another agency contain a... [read more](#)

Followers 7 Submissions 9
Following

Data Usage: 6.435 GB
Downloads: 1290
Resources: 18

Community Attitude Toward CCS

Purpose

This analysis aims to capture sentiment toward topics in CCS using text data extracted from news articles, community forums, and social platforms.

1. Spatial Patterns

- How does sentiment toward CCS vary by geography, and what regional differences can be identified?

2. Word Association

- What topics, terms, and phrases are primary drivers of sentiment scores, and how do they influence public perception?

3. Public Concerns and Support

- What are the main concerns and areas of support among communities regarding CCS projects?

4. Media Influence

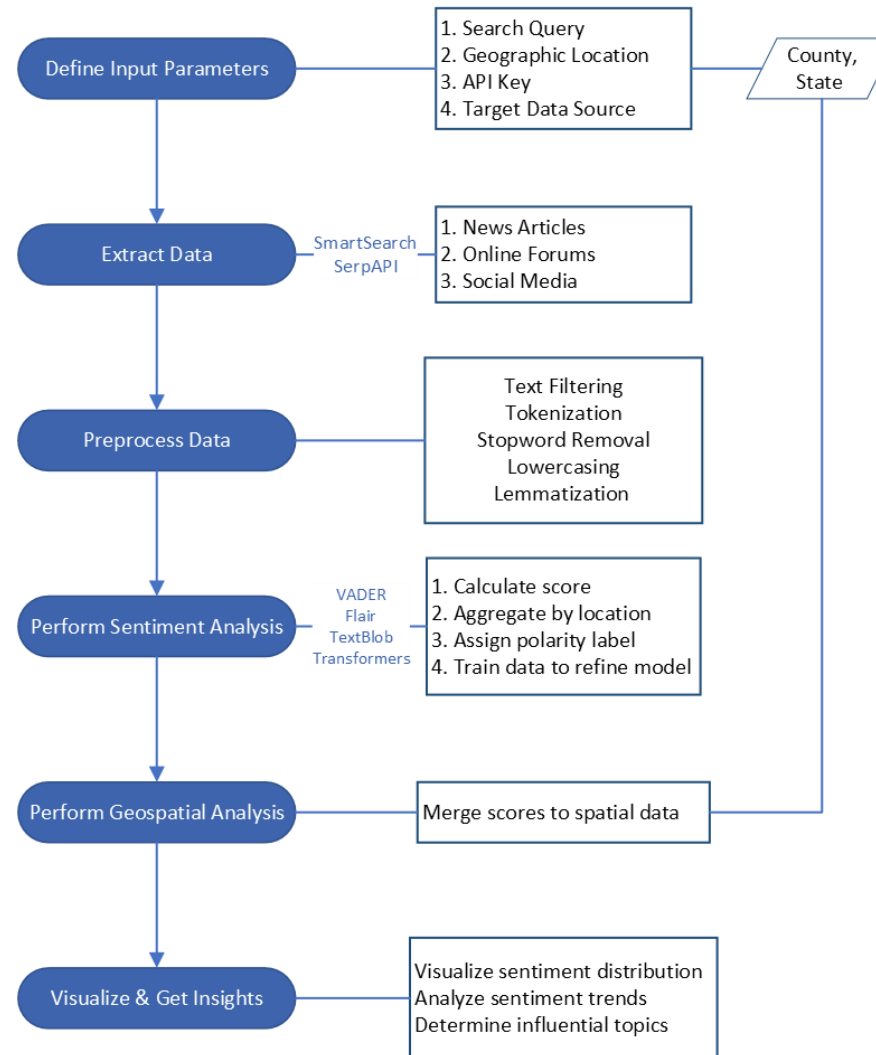
- How does media coverage affect sentiment and public discourse on CCS?

5. Future Trends

- What emerging trends can be identified in public sentiment towards CCS?

Community Attitude Toward CCS

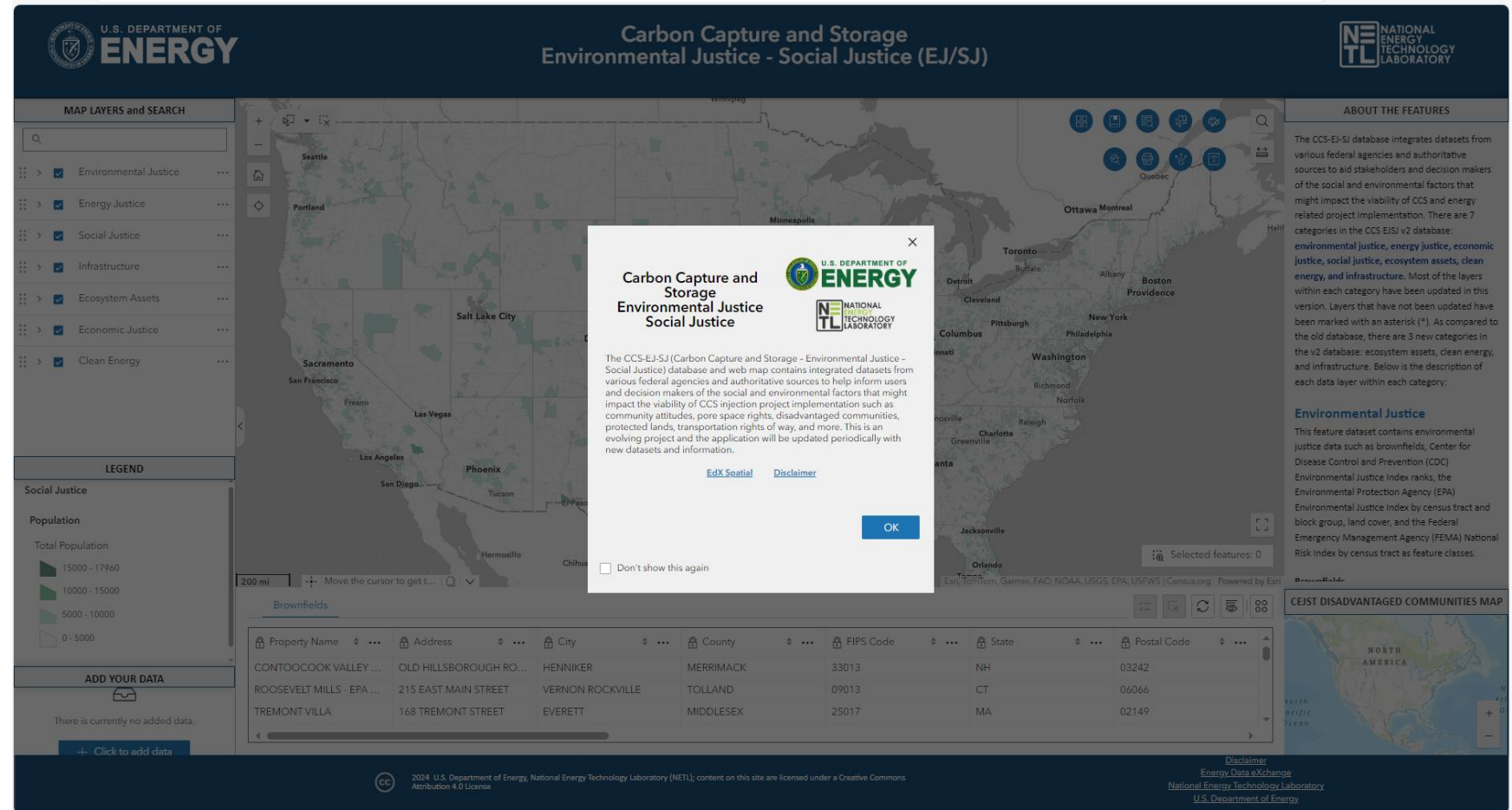
Workflow



CCS-EJ-SJ Interactive Web Application

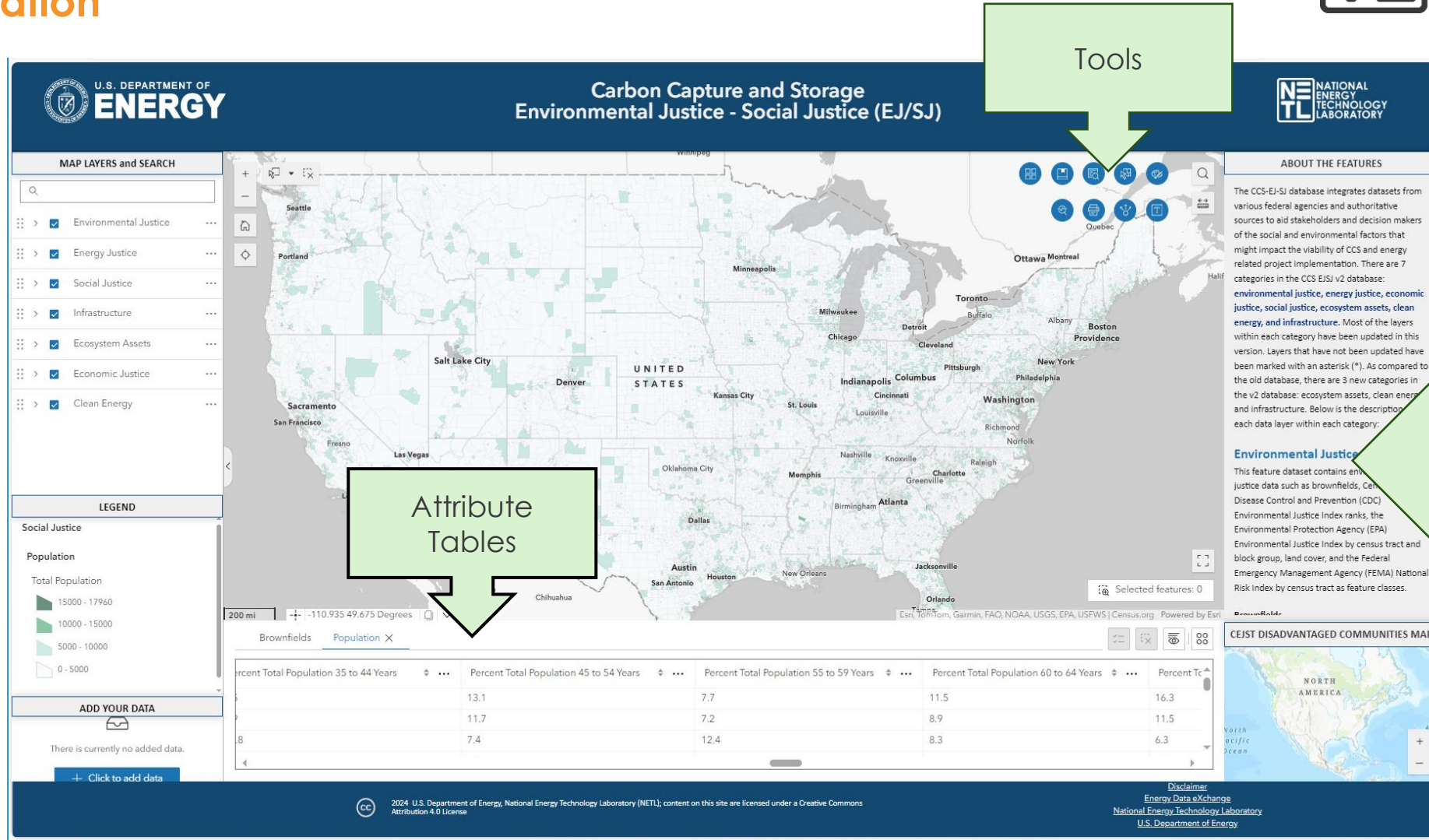
Welcome/Informational Screen

- CCS-EJ-SJ web application is being built using the developer's version of ESRI's Experience Builder
- Goal is to provide the stakeholder a central place for authoritative data
- Users/stakeholders can interact with data and print a custom report



CCS-EJ-SJ Interactive Web Application

Main Application

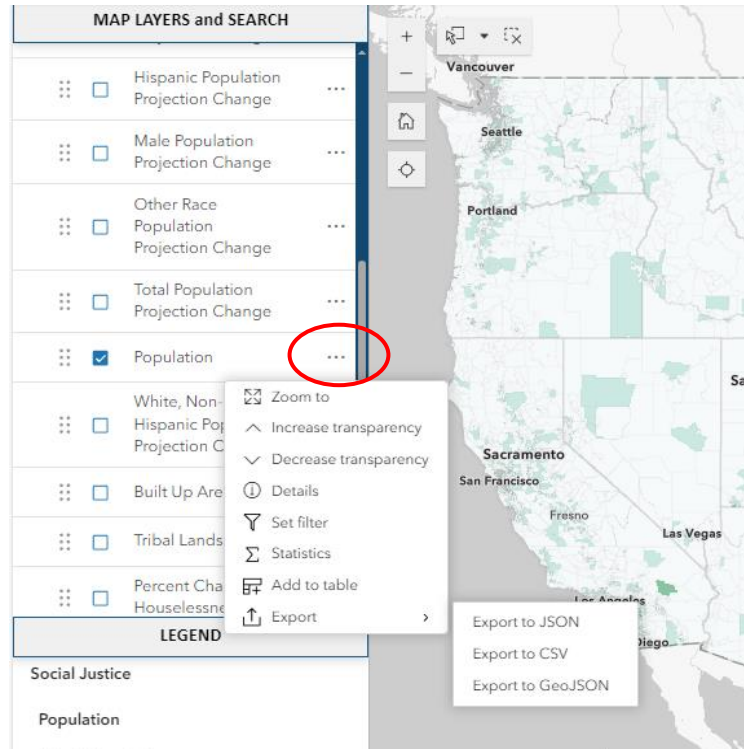


CCS-EJ-SJ Interactive Web Application

Layers: Associated Tools

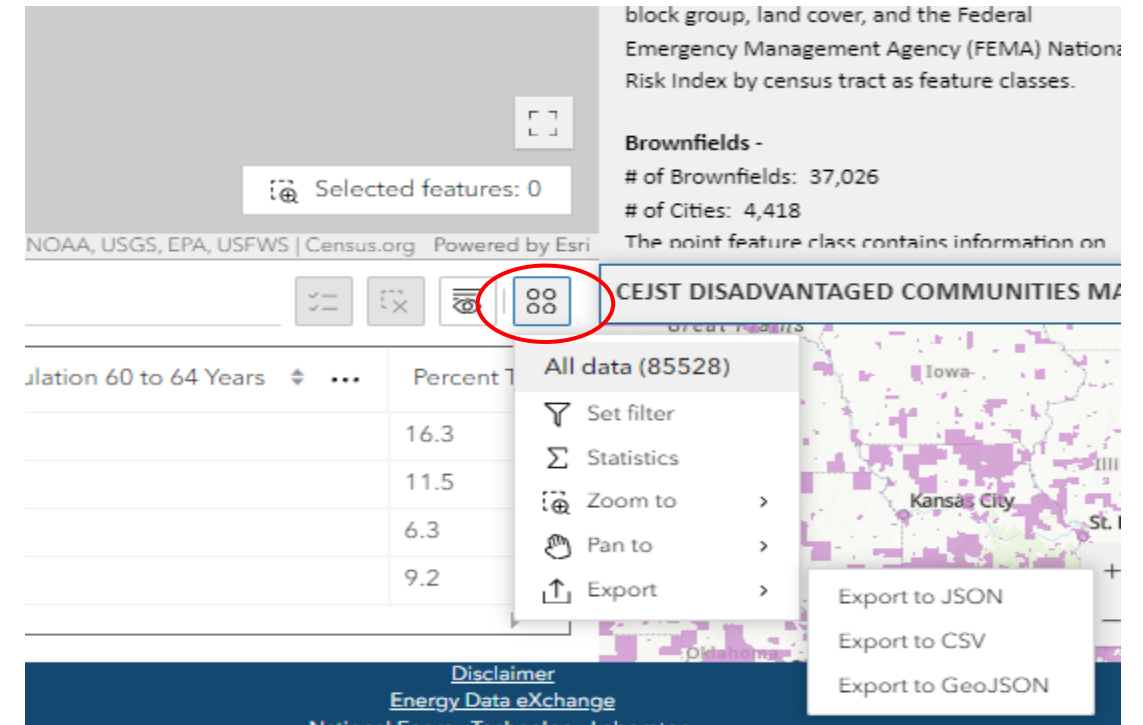
Get from Map Layers:

Click on the icon (circled) to access tools via Map Layers: Zooming, Transparency, Layer Details, Filter Data, Generate Statistics, View Attribute Data in Attribute Table, Export Data (as JSON, CSV, GeoJSON; geospatial files planned for Ver. 2)



Get from Attribute Table:

Click on the icon (circled) to access tools via the Attribute Table: Filter Data, Generate Statistics, Zooming, Pan to Data in the Map, Export Data (as JSON, CSV, GeoJSON; geospatial files (upcoming)



CCS-EJ-SJ Interactive Web Application

Grouped Layers: Environmental and Energy Justice

Expanded

Expanded

MAP LAYERS and SEARCH

Environmental Justice

Brownfields

CDC Environmental Justice Index Ranks

EPA Environmental Justice Screen Blockgroup

EPA Environmental Justice Screen Tracts

National Risk Index

Land Cover

Environmental Justice

Energy Justice

Social Justice

Infrastructure

Ecosystem Assets

Economic Justice

Clean Energy

Energy Justice

Pore Space Rights

Oil and Gas Flaring In Production

USA Oil and Gas Flaring






USA Oil and Gas Flaring Tracts





DOE Disadvantaged Communities

Coal Production by State

Tools: The Toolbar

More tools are planned for Version 2.

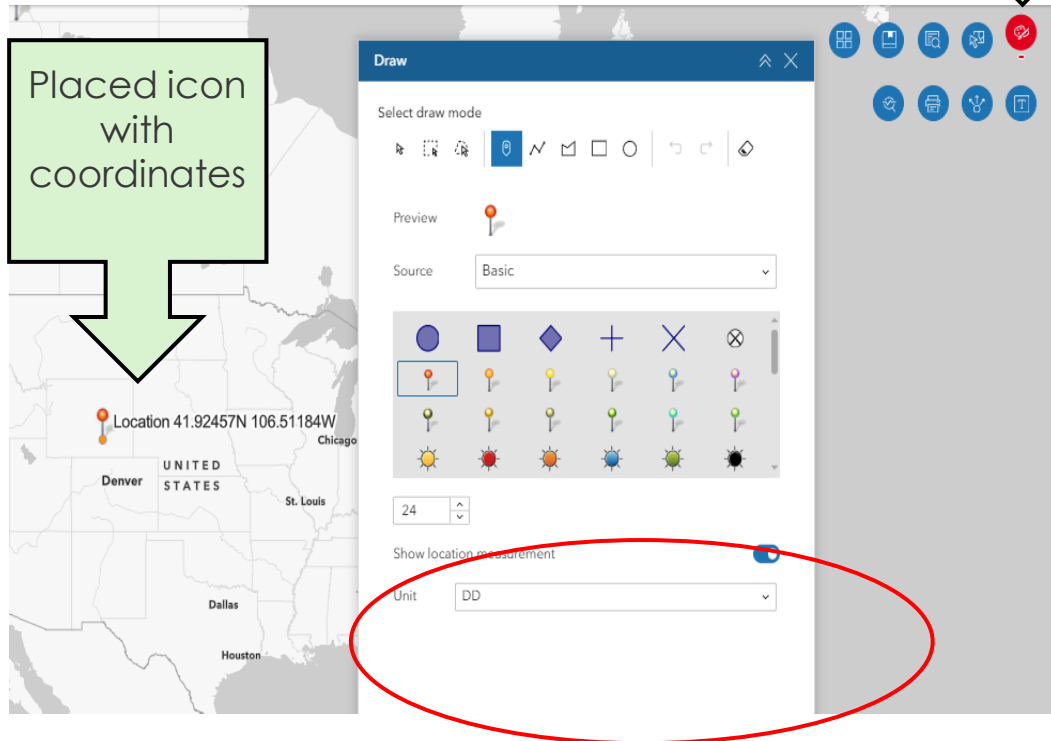
-  Choose your own base (background) map.
-  Bookmark your areas of interest and return to them (in a viewing session).
-  Query layers (in development).
-  Spatially select layers (in development).
-  Draw and Measure Tool. Place a point, draw lines, draw polygons. Turn on measure to get a point location, length of a line, square miles within a polygon

-  Analysis Tool. (Further development. This tool will be incorporated into other tools.)
-  Standard Print Tool. In version 2, this will be replaced with a customized print and report tool.
-  Sharing Tool. Share the map via social media or email.
-  Informational Tool. General information on the map application itself. This tool is in development.

CCS-EJ-SJ Interactive Web Application

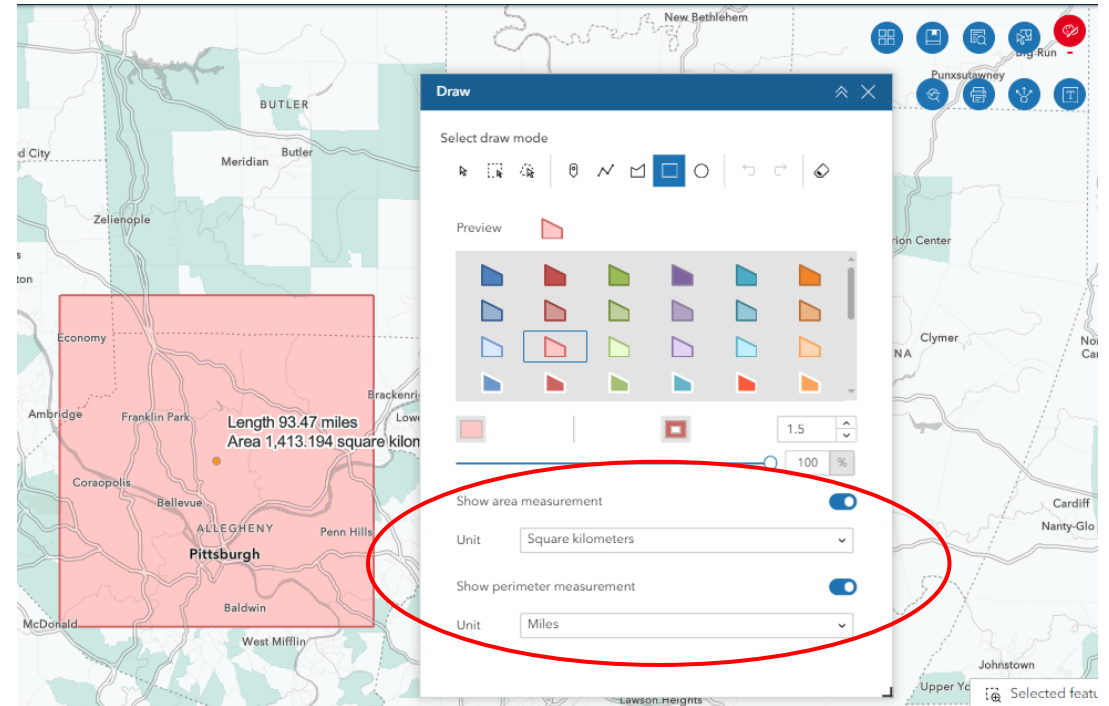
Tool Example: The Draw and Measure Tool

The Draw and Measure Tool for a point with "Show location measurement" turned on.



Active
Tool

The Draw and Measure Tool for a polygon with "Show location measurement" turned on for both area measurement and perimeter measurement.



CCS-EJ-SJ Interactive Web Application

Tool Example: The Add Data Tool

Example of using an exterior web service (REST). Below, an "All Mining" layer is added from the West Virginia Geological and Economic Survey. https://atlas.wvgs.wvnet.edu/arcgis/rest/services/Coal_Web_Mercator/All_Mining_WM/FeatureServer

You can also add your own:
Shapefiles, CSV, KML, GeoJSON, GPX.

LEGEND

Social Justice

Population

Total Population

- 15000 - 17960
- 10000 - 15000
- 5000 - 10000
- 0 - 5000

ADD YOUR DATA

There is currently no added data.

ADD data

Search **URL** File

Type

ArcGIS Server Web Serv...

URL

https://atlas.wvgs.wvnet.edu/arcgis/rest/services/Coal_Web_Mercator/All_Mining_WM/FeatureServer

Add

Sample URL

https://services.arcgis.com/P3ePLMYs2RVChkIj/arcgis/rest/services/World_Cities/FeatureServer/0

LEGEND

All_Mining_WM

Underground Mining Labels

Underground Mining

Surface Mining

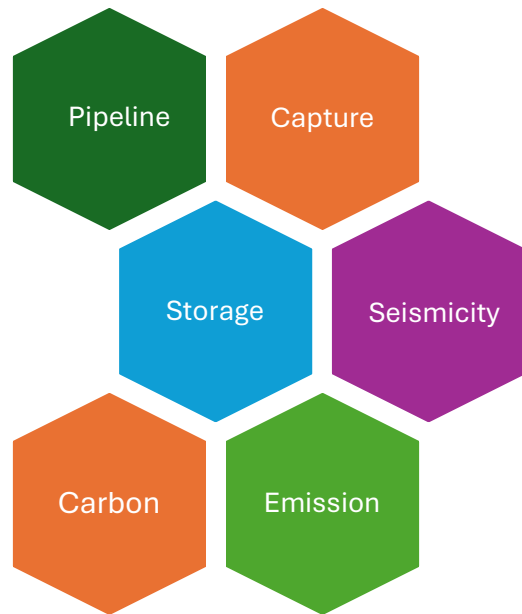
ADD YOUR DATA

Property Name **Address** **City** **County** **FIPS Code**

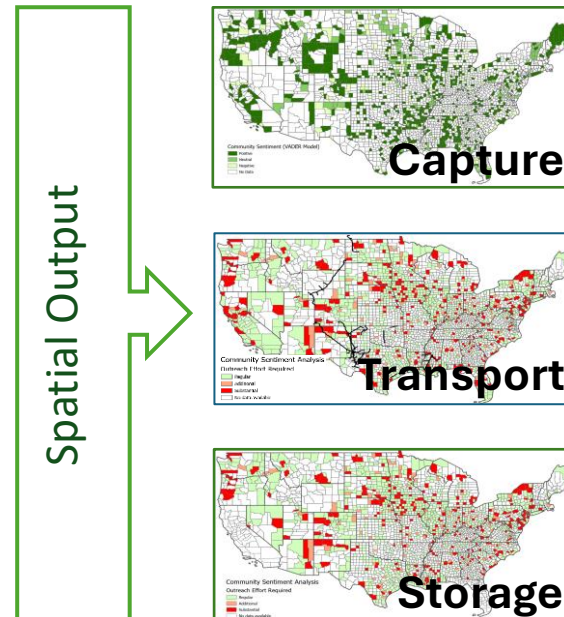
CONTOOCOOK VALLEY ...	OLD HILLSBOROUGH RO...	HENNIKER	MERRIMACK	33013
ROOSEVELT MILLS - EPA ...	215 EAST MAIN STREET	VERNON ROCKVILLE	TOLLAND	09013
TREMONT VILLA	168 TREMONT STREET	EVERETT	MIDDLESEX	25017
ALDEN CORRUGATED	1 CHURCH STREET	NEW BEDFORD	BRISTOL	25005

CCS-EJ-SJ Coming Updates

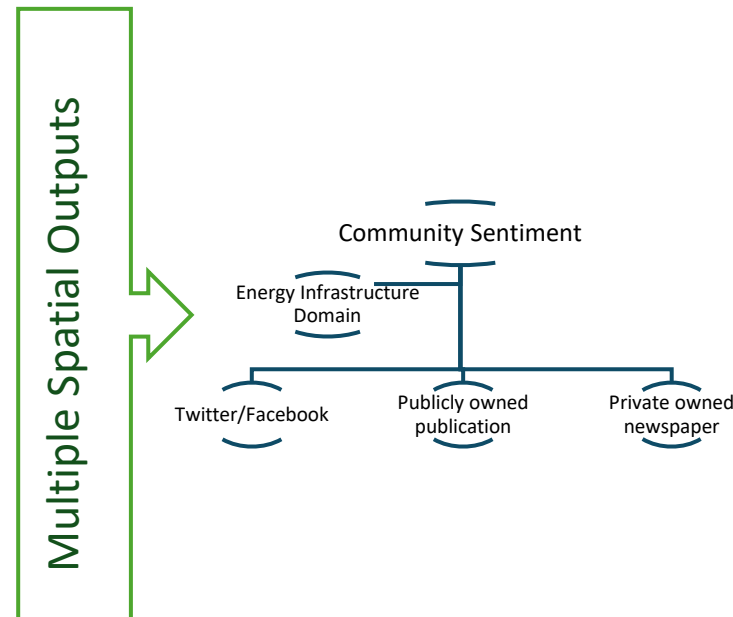
Community Sentiment on Energy Infrastructure



Energy infrastructure domain.

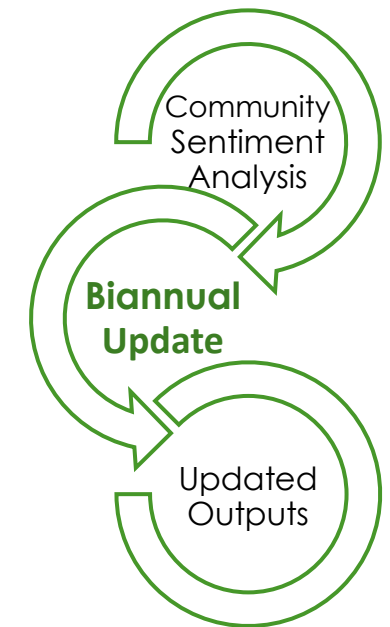


Sentiment analysis spatial outputs by domain.



Optional: Detailed Analysis of sentiment analysis output.

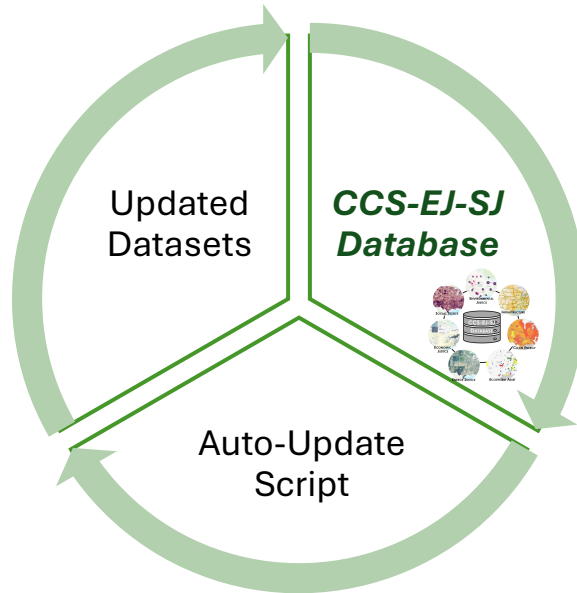
Update Frequency



Sentiment analysis update.

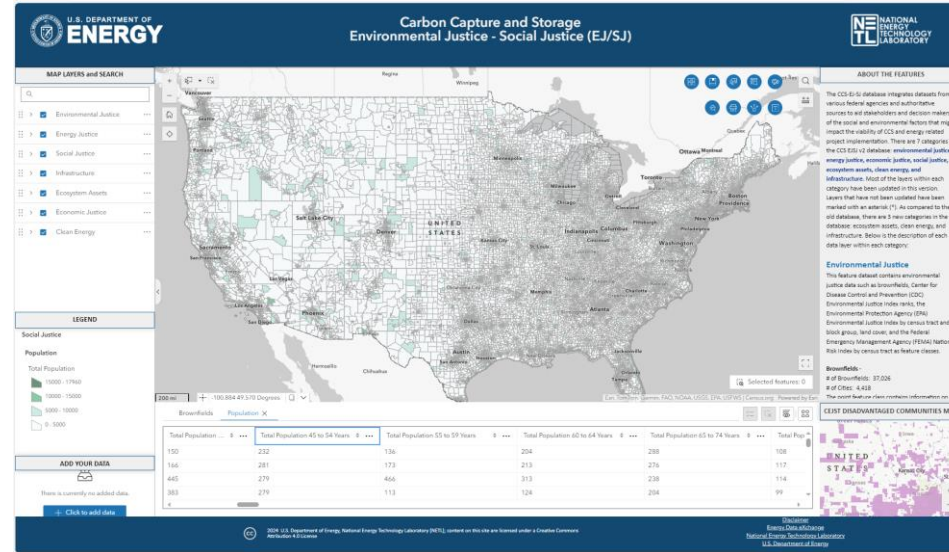
CCS-EJ-SJ Coming Updates

Script- Auto Update Database



Auto-Update Script
for various data sources.

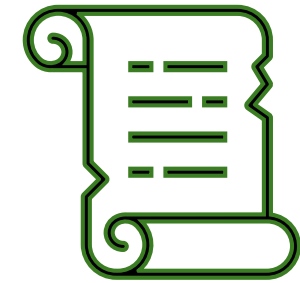
Web Application



Create Dashboard - Advanced functionality;
including support for advanced data queries
and output of stylized reports.

<https://edx.netl.doe.gov/dataset/ccs-ej-sj-database>

Manuscript



Draft manuscript-
community sentiment
analysis models, model
outputs and results.



Integrate data and dashboard
into EDX DisCO₂ver Platform for
user access.

Acknowledgments



This work was performed in support of the U.S. Department of Energy's (DOE) Fossil Energy and Carbon Management's Geo-Analysis and Monitoring Team and was developed jointly through the U.S. DOE Office of Fossil Energy and Carbon Management's EDX4CCS Field Work Proposal Project, in part, from the Bipartisan Infrastructure Law.

This research was supported in part by an appointment to the U.S. Department of Energy (DOE) Postgraduate Research Program at the National Energy Technology Laboratory (NETL) administered by the Oak Ridge Institute for Science and Education (ORISE).

NETL RESOURCES

VISIT US AT: www.NETL.DOE.gov



@NETL_DOE



@NETL_DOE



@NationalEnergyTechnologyLaboratory

CONTACT:

Maneesh Sharma

Maneesh.Sharma@netl.doe.gov

Jennifer Bauer

Jennifer.Bauer@netl.doe.gov

