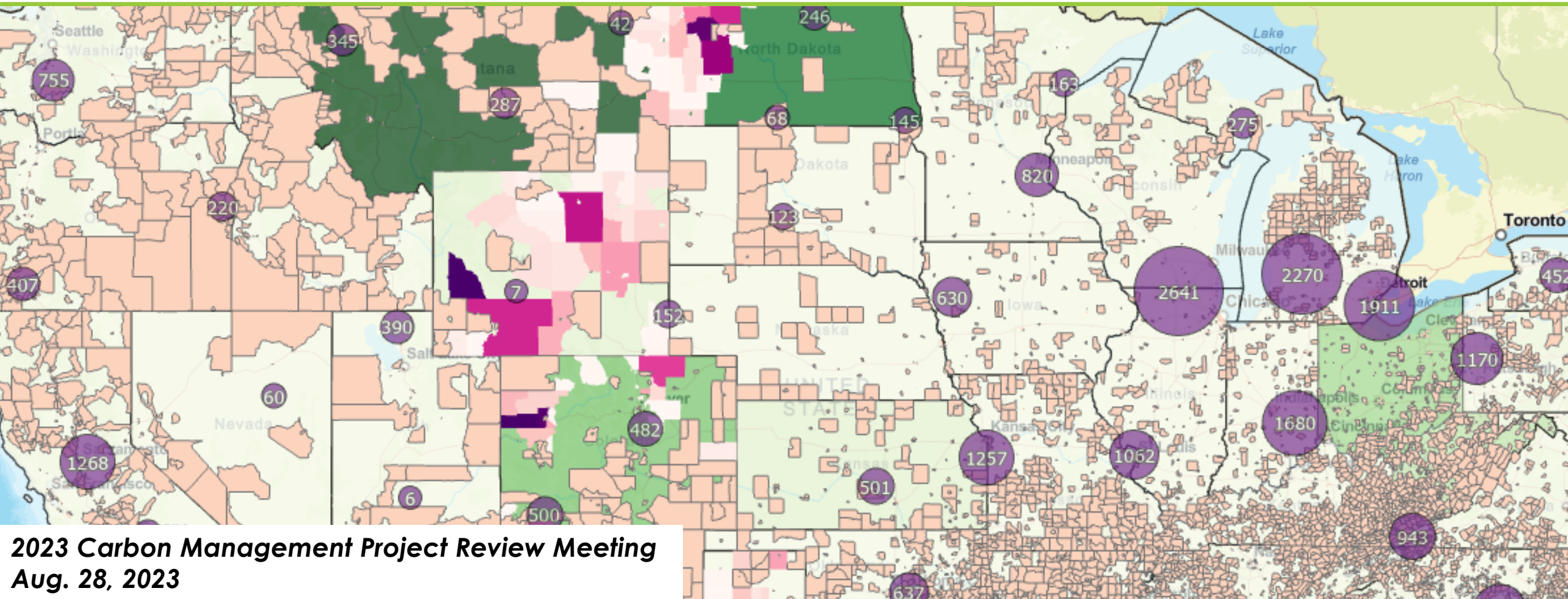


EJ/SJ Dynamic Datasets for CCS Systems and the Energy Transition Atlas Web Tool



*Maneesh Sharma – NETL, LRST
Geospatial Research Scientist*



**2023 Carbon Management Project Review Meeting
Aug. 28, 2023**

Authors and Contact Information



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***⁵Oak Ridge Institute for Science and Education, P.O. Box 117, 1450 Queen Avenue SW, Albany,
OR 97321, USA***

Disclaimer

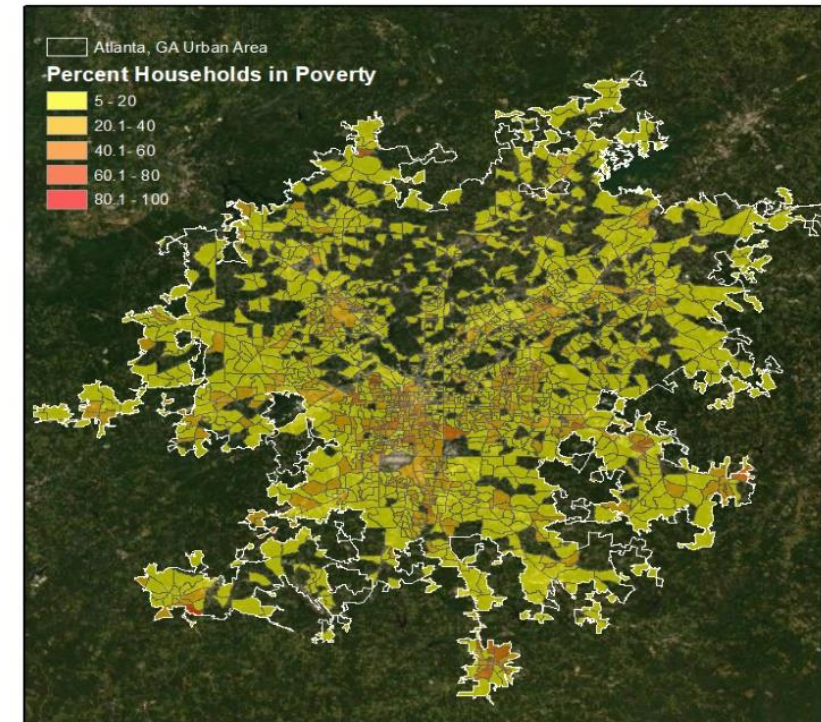


This project was funded by the United States Department of Energy, National Energy Technology Laboratory, in part, through a site support contract. Neither the United States Government nor any agency thereof, nor any of their employees, nor the support contractor, nor any of their employees, makes any 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.

High Demand for EJ/SJ Data & Information

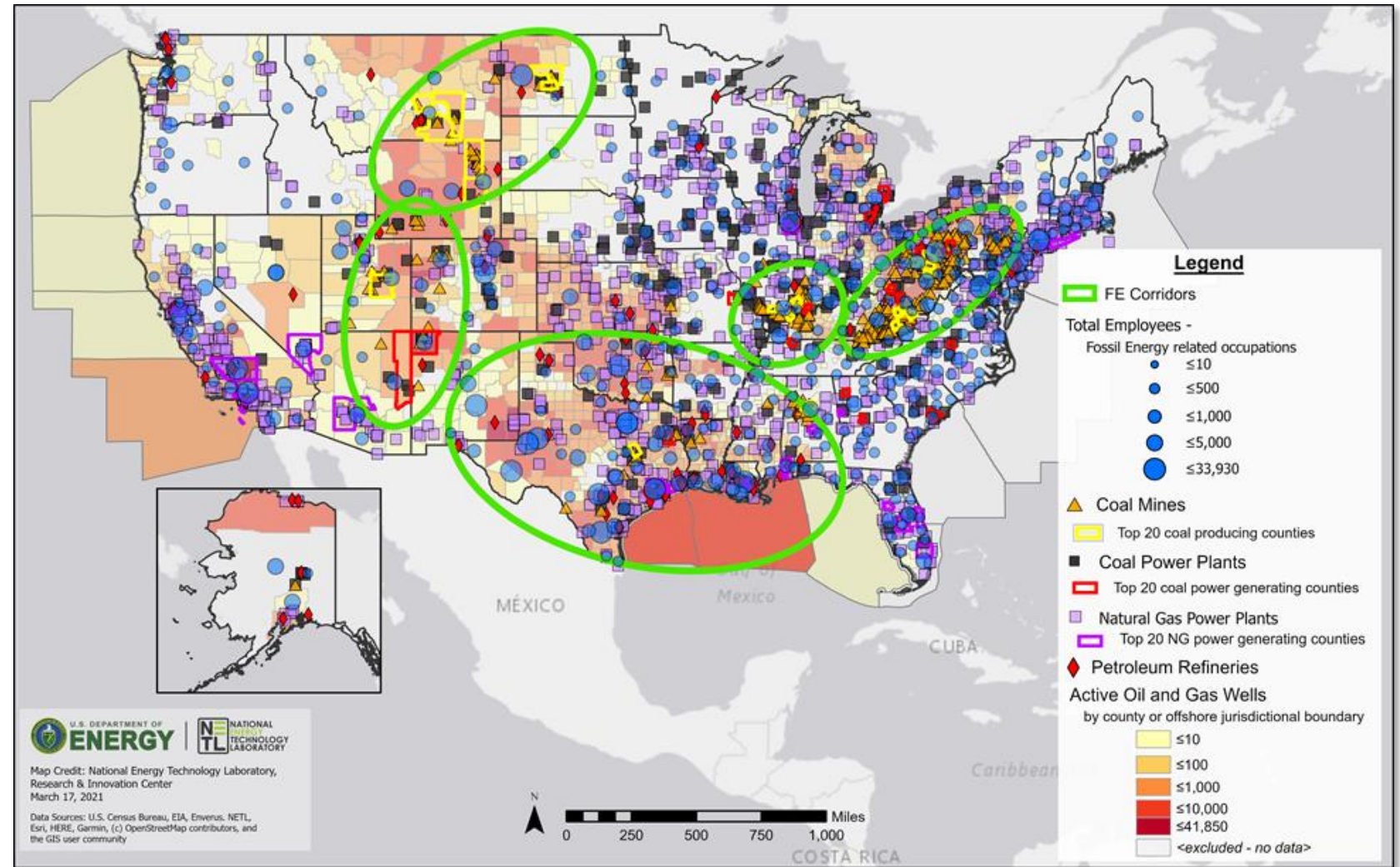
- There are unprecedented opportunities for energy R&D at this time
- However, this growth, coupled with initiatives like Justice40, all rely on common baseline information that can help stakeholders understand and assess key energy, environmental, and social burdens in relation to their activities and broader needs

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 of Data to Support EJ/SJ

- Requires a wide range of data and information, often at multiple spatial and temporal resolutions, to address needs (what do you want to explore? what questions do you want to evaluate?)
- Role and use of these data require authoritative resources, as well as targeted presentation/communication to ensure explainability and usability

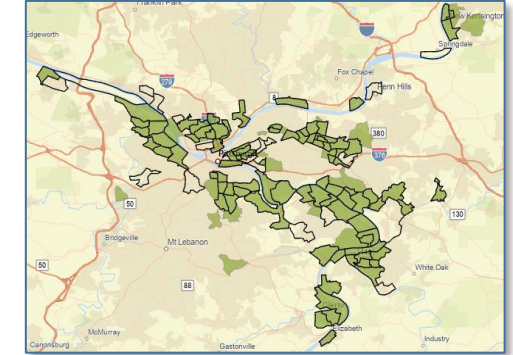


EJ/SJ Data & Information

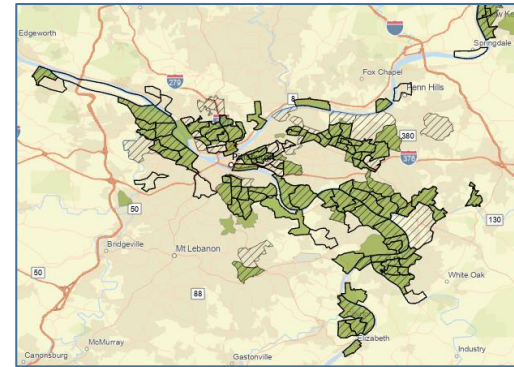
- Authoritative but disparate data sources
 - Governmental Sources
 - White House
 - DOE
 - EPA
 - CDC
 - States
 - Require time consuming acquisition



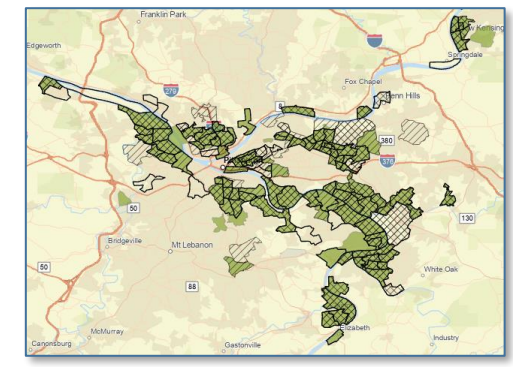
White House



DOE



EPA



CDC

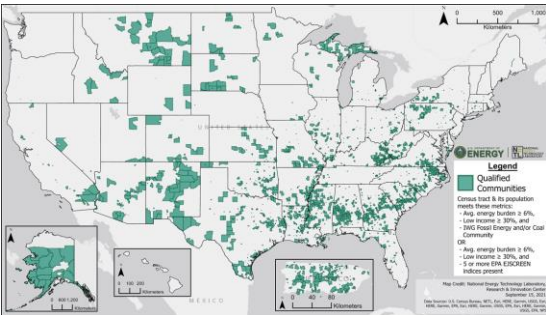
EJ/SJ Database for CCS and Applications

Lack of information limits our understanding of EJ/SJ factors that might impact CCS viability

Solution:

- Identify **EJ/SJ factors** and **resources**
- Build a **nationwide EJ/SJ database** to support CCS implementation planning
- **Apply AI/ML** to evaluate **community attitudes** concerning local CCS projects

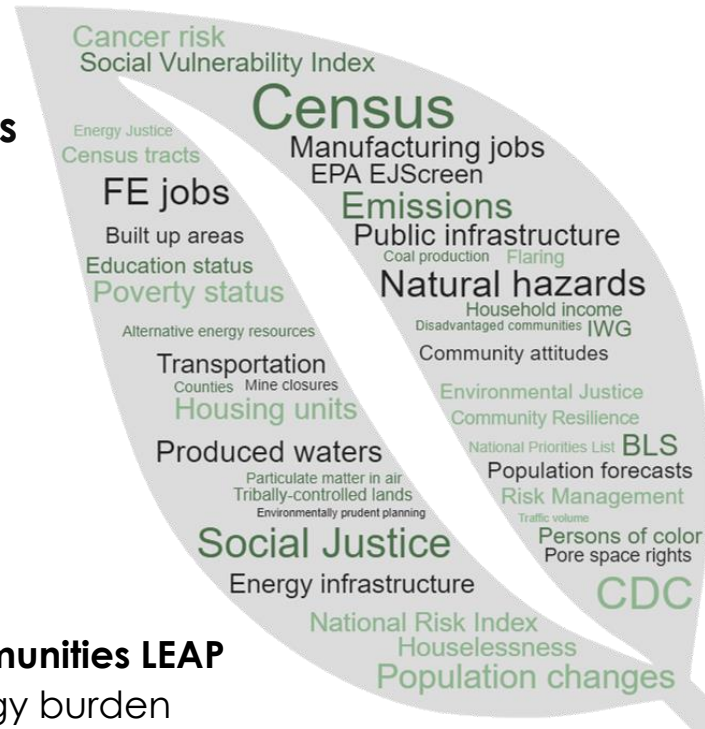
EJ/SJ Examples:



DOE's Communities LEAP

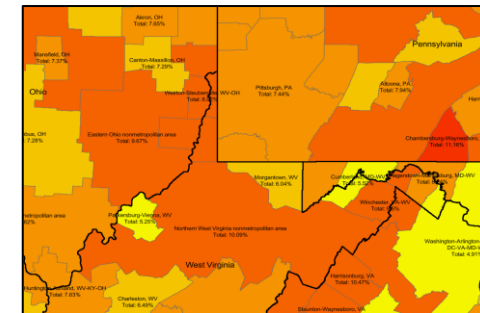
- High energy burden
- Low-income population
- Historic dependence on fossil energy (FE) economy
- High exposure to environmental hazards

Bauer et al. 2021. **Datasets for DOE 2021 Communities LEAP Pilot**, <https://edx.netl.doe.gov/dataset/datasets-for-doe-2021-communities-leap-pilot>, DOI: 10.18141/1820030



Value Delivered:

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



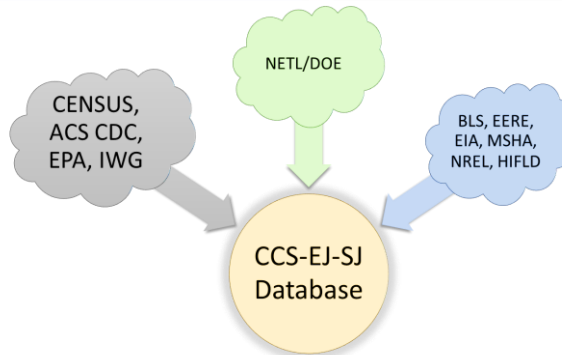
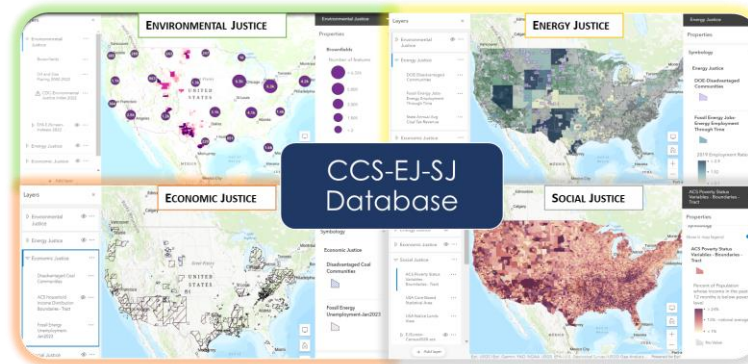
Fossil Energy Jobs

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

EJ/SJ Database for CCS

CCS-EJ-SJ Database

- EJ/SJ factors and resources
- Nationwide EJ/SJ Database to support CCS implementation planning
- Published CCS-EJ-SJ Database on EDX® (Sharma et al., 2023)
- Online mapping tool enables quick access and visualization
- Leverages web services ensuring data are up-to-date



EJSJ for CCS Viewer
Creative Commons Attribution
Webmap for the CCS-EJ-SJ (Carbon Capture and Storage - Environmental Justice - Social Justice) database to visualize the integrated datasets from various federal agencies and authoritative sources that might impact the decision makers of the social and environmental factors that might impact the implementation of CCS such as community attitudes, pore space rights, disadvantaged communities, and more. This is an evolving project and the application will be updated as more information is available.



View Info Open Link

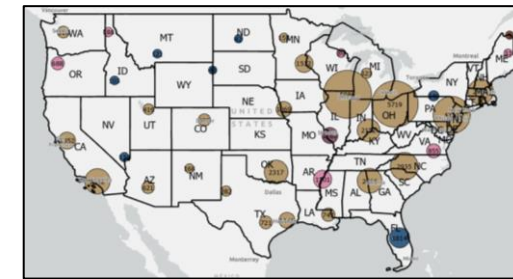
ccs-ej-sj-database.gdb.zip
License Not Specified

View Info Download

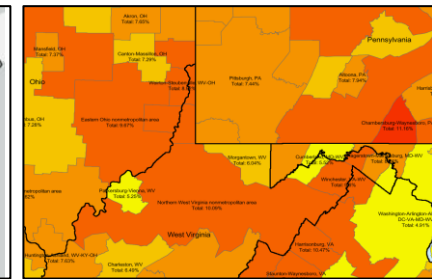
Sharma et al. 2023. CCS-EJ-SJ Database, <https://edx.netl.doe.gov/dataset/ccs-ej-sj-database>, DOI: 10.18141/1964057

Impact:

- Provides **decision and policy makers** – EJ/SJ insights on CCS feasibility
- Benefits **techno-economic, environmental, and social analyses** driving **commercial, regulatory, and research** supporting the CCS economy



Manufacturing Sources

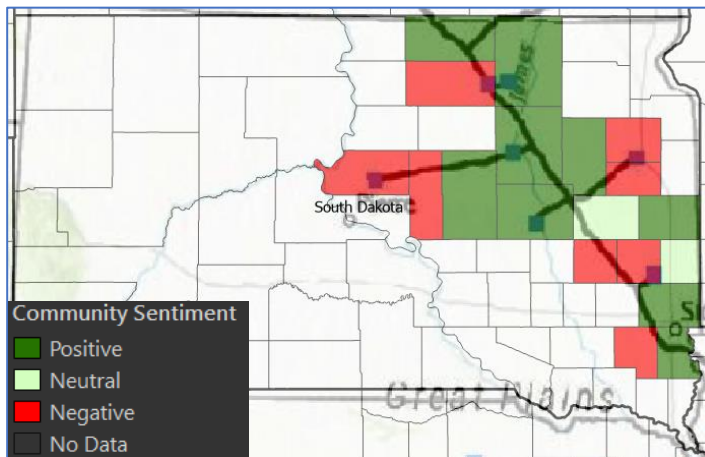


FE Jobs

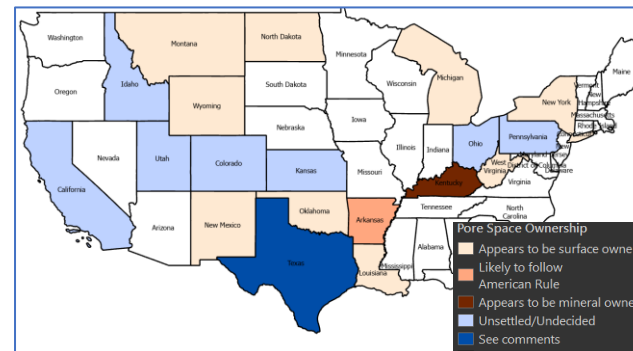
EJ/SJ Database for CCS

CCS-EJ-SJ Database-Ongoing Tasks

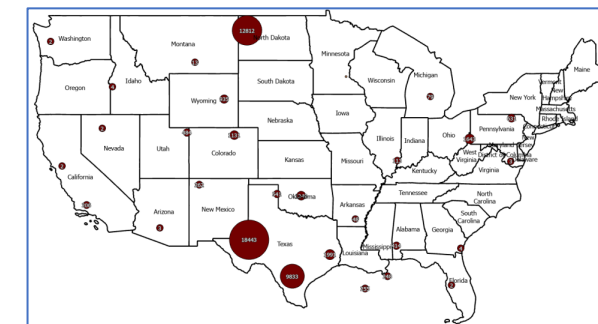
- Characterize **community sentiment** towards CCS
 - Apply **machine learning, online, search tool** to identify **community attitudes towards CCS**



Community Sentiment in Proposed CO₂ Pipeline Route



Pore Space Rights



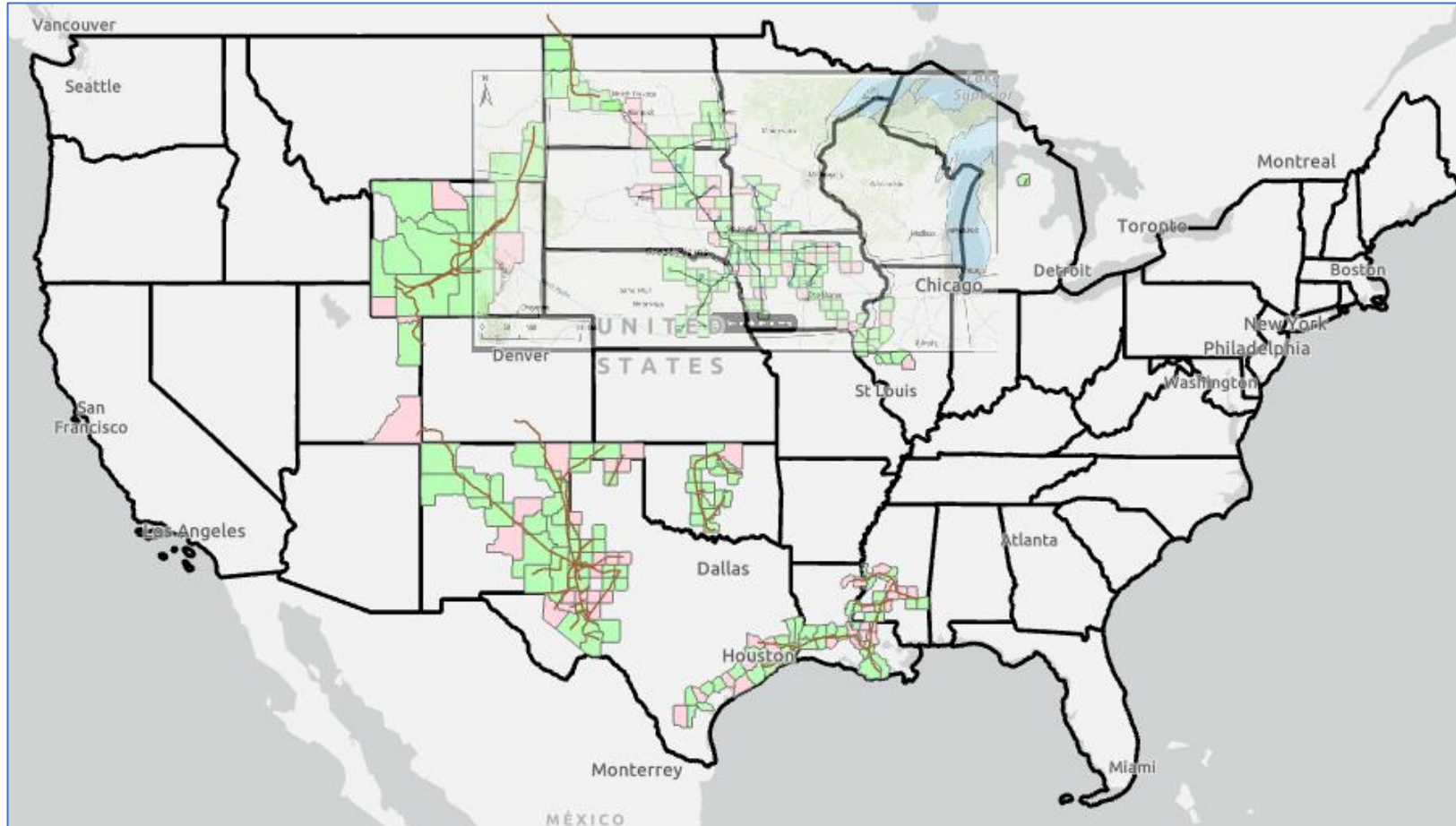
Flare Locations

- **Expand** CCS-EJ-SJ database

Category	Datasets	Sources
Environmental Justice	18	NETL, IWG, EPA, CDC, BLS, U.S. Census, ACS, USDOT
Social Justice	38	NETL, IWG, EPA, CDC, BLS, U.S. Census, ACS, USDOT
Energy Justice	27	NETL, DOE, EERE, EIA, U.S. Census, MSHA, NREL, HIFLD
Economic Justice	11	NETL, IWG, EPA, CDC, BLS, U.S. Census, ACS

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

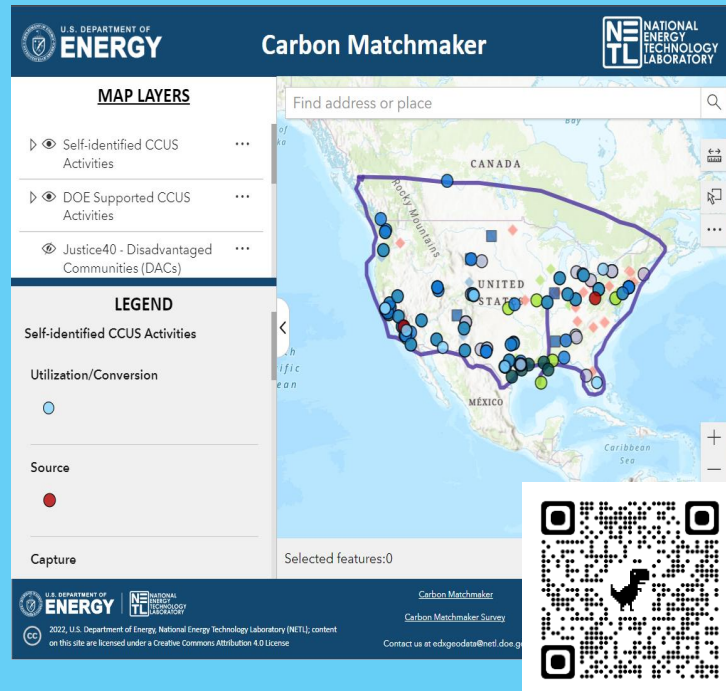
Community Sentiment Analysis



- Community Sentiment Analysis for U.S. in relation to CCS activities
- NETL's AI/ML enabled SmartSearch tool is being used to extract data from web to perform Community Sentiment Analysis at county scale

NETL's Supported, On-Going EJ/SJ Efforts

Carbon MatchMaker



U.S. DEPARTMENT OF ENERGY
Carbon MatchMaker
NETL NATIONAL ENERGY TECHNOLOGY LABORATORY

MAP LAYERS

- Self-identified CCUS Activities
- DOE Supported CCUS Activities
- Justice40 - Disadvantaged Communities (DACs)

LEGEND

Self-identified CCUS Activities

Utilization/Conversion

Source

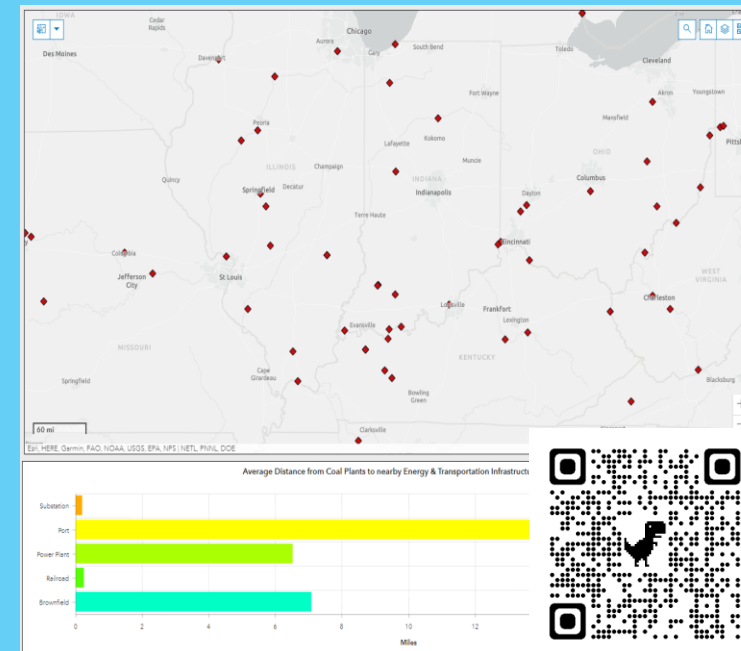
Capture

Find address or place

Selected features: 0

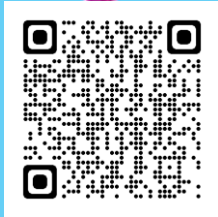
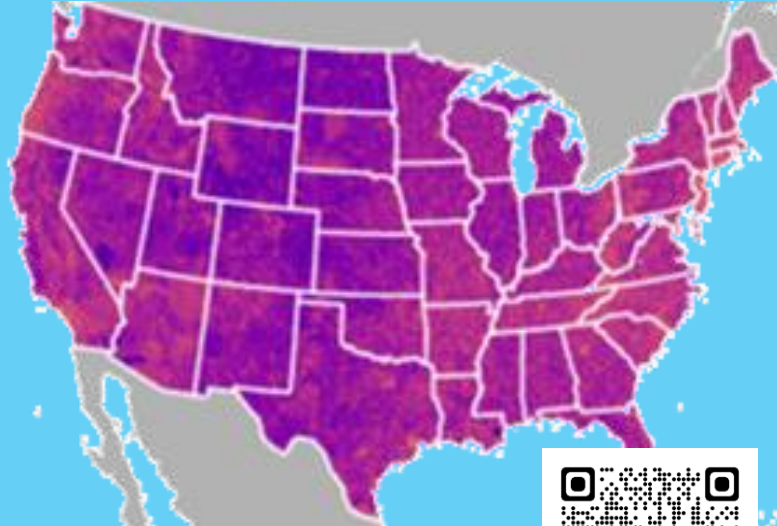
Carbon MatchMaker
Carbon MatchMaker Survey
Contact us at edignodara@netl.doe.gov

Coal Power Plant Redevelopment Tool

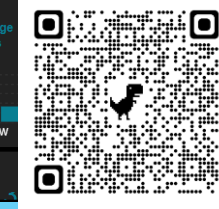
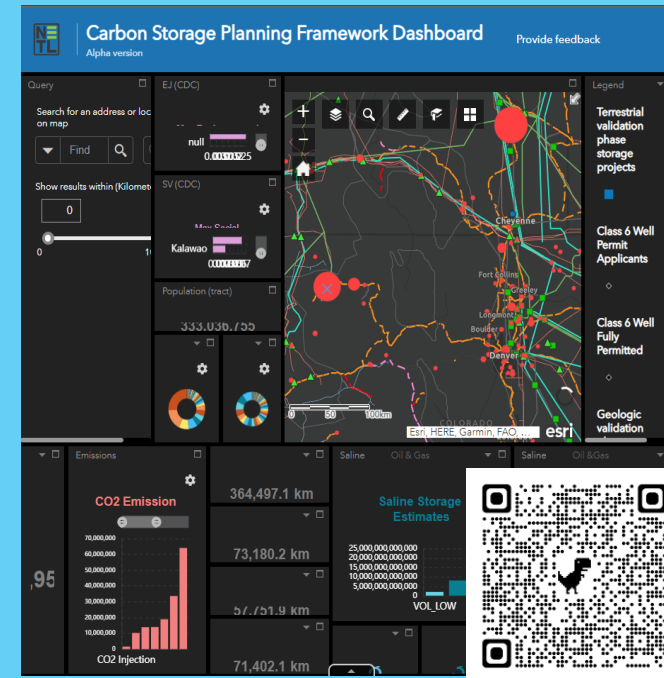


NETL's Supported, On-Going EJ/SJ Efforts

Pipeline Routing Tool



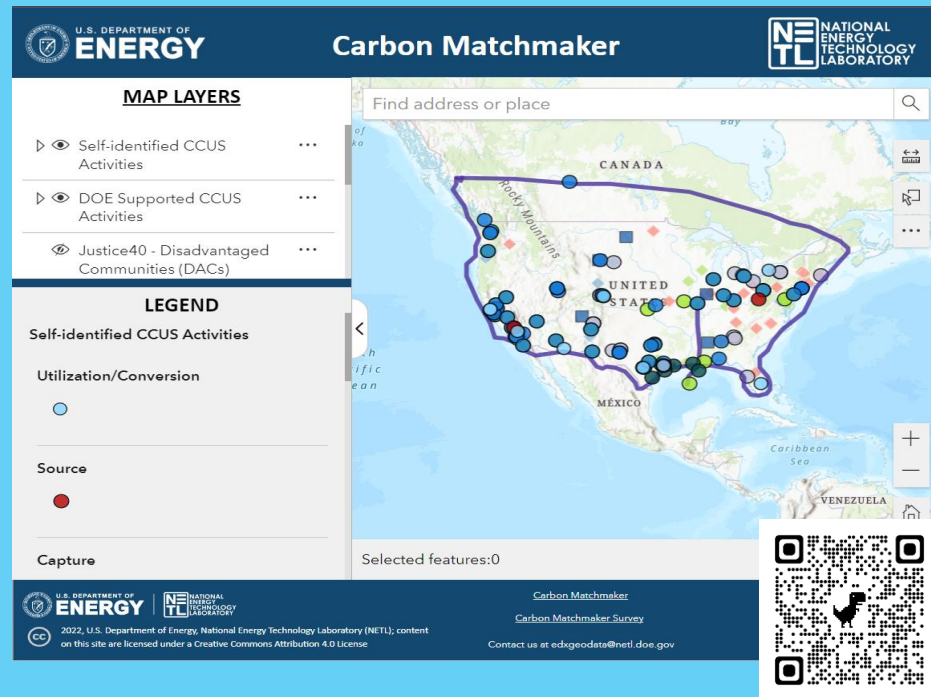
Carbon Storage Planning Framework Dashboard



Leveraging Common Data for Diverse Applications

Carbon Matchmaker | Department of Energy

To facilitate Carbon management hubs



- Increases awareness and facilitates development of regional carbon management hubs, including alongside hydrogen hub development where relevant.
- Provides community, industry, and technology development stakeholders domestically and internationally with carbon dioxide supply and demand maps for current and planned projects.
- Highlights past and currently funded DOE carbon management projects in a geospatial map.

Points of Contact:

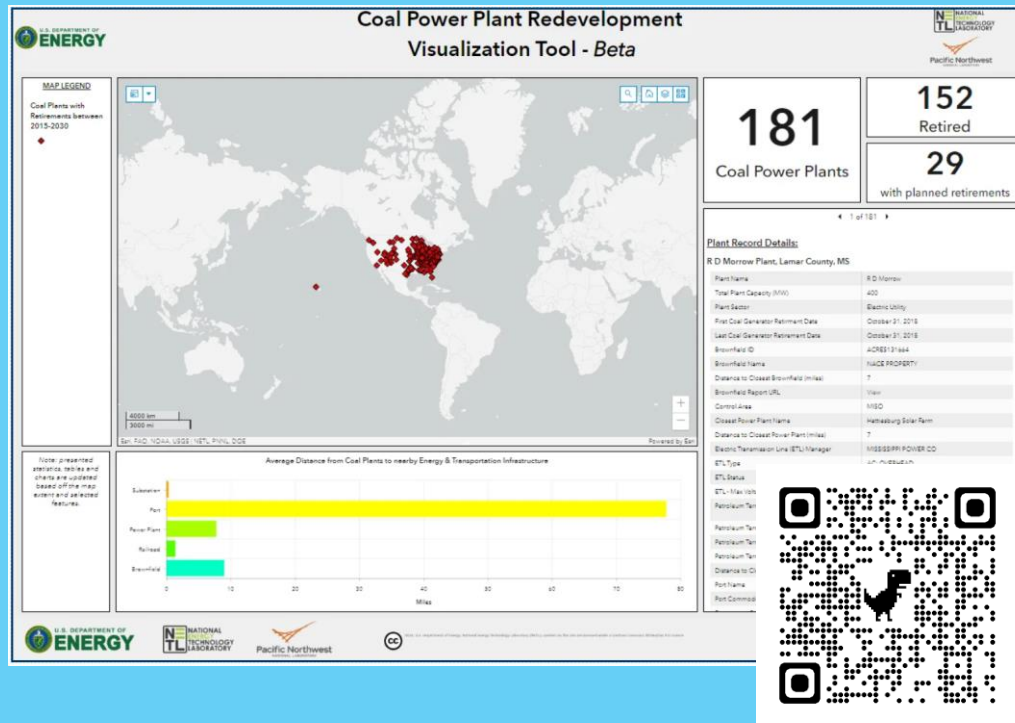
- **Jennifer Bauer**, Jennifer.Bauer@netl.doe.gov
- **Kevin Dooley**, Kevin.Dooley@hq.doe.gov

Tool released on July 13, 2022, statistics updated 4/19/2023

Leveraging Common Data for Diverse Applications

Coal Power Plant Redevelopment Tool - Energy Communities

Coal Power Plant Redevelopment Tool

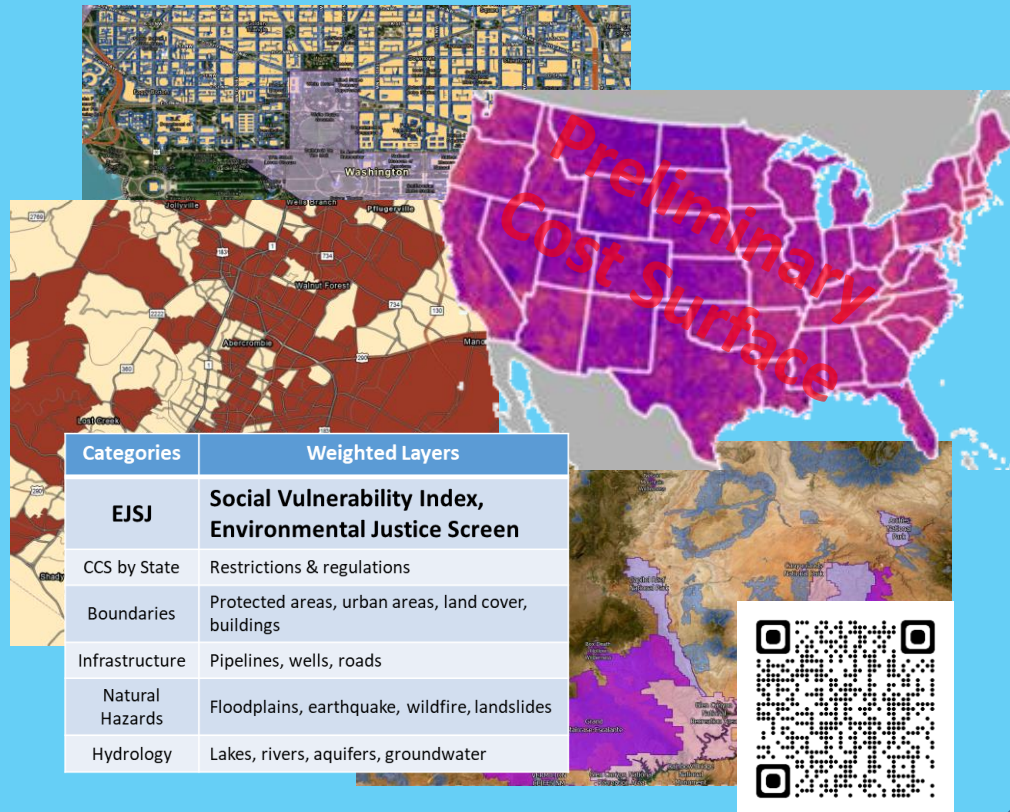


- Information for state/local officials, project developers, and power plant owners to identify and pursue opportunities for plant redevelopment and community reinvestment.
- The Tool identifies coal power plants that have been closed or set-to-retire, alongside key infrastructure characteristics that are relevant for potential redevelopment opportunities.

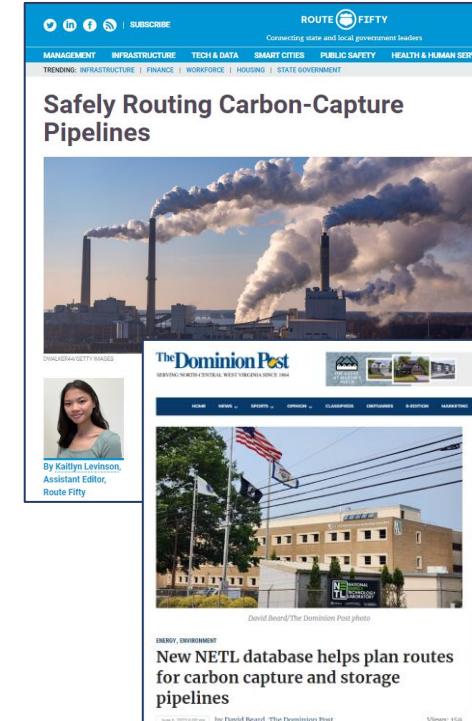
Leveraging Common Data for Diverse Applications

CO₂ Pipeline Routing EJ/SJ Smart Tool & Database

A data-driven, geospatial resource supporting safe & smart route planning



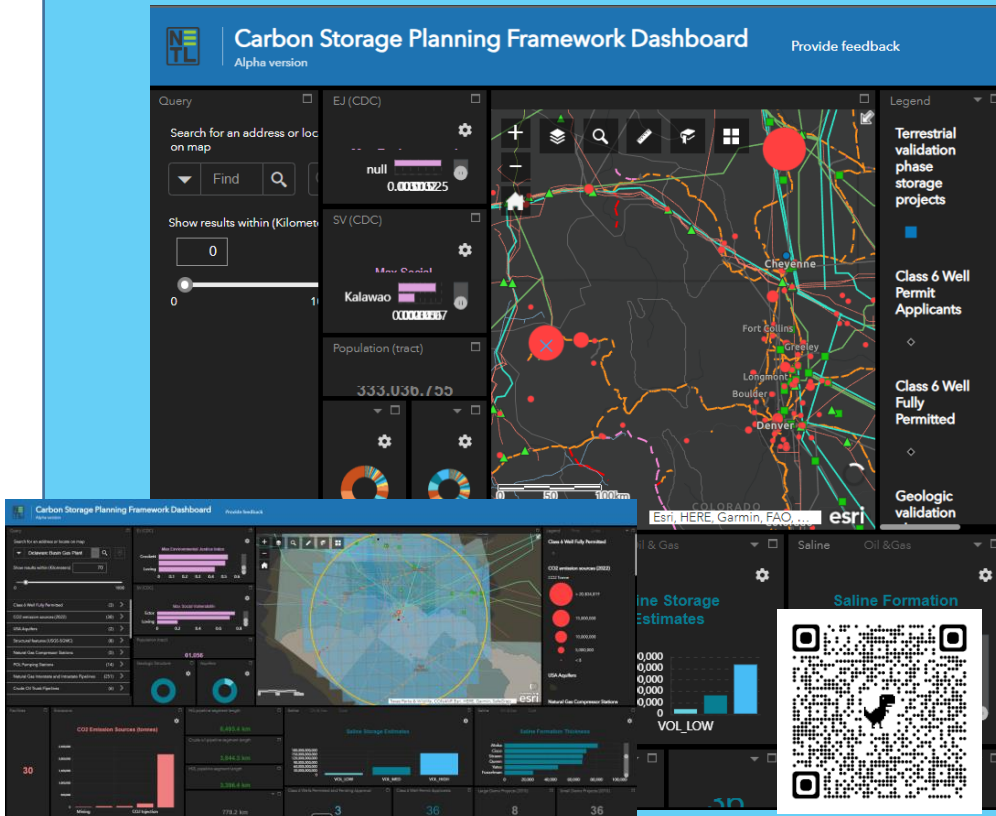
- An **interactive smart tool** to assist in **planning routes for CO₂ transport** across the country
 - Integrates complex EJ/SJ variables from **CCS-EJ-SJ** database, which can affect the **success, safety,** and **cost** of new infrastructure development
 - Integrating CCS-EJ-SJ data into **Routing Database** (Schooley et al., 2023)
 - **90+ GB** of spatial data
 - **40+** weighted layers
 - **195+ downloads** (June 29, 2023)
- Points of Contact:**
- **Lucy Romeo**, Lucy.Romeo@netl.doe.gov
 - **Jennifer Bauer**, Jennifer.Bauer@netl.doe.gov



Leveraging Common Data for Diverse Applications

Carbon Storage Planning Framework Dashboard

Carbon Storage Planning Framework Dashboard



- Dashboard provides easy access to explore, query, and evaluate multiple data layers to support and accelerate carbon storage resource and feasibility assessments and planning efforts.
- Users can evaluate assessment in relation to EJ/SJ related datasets.

Points of Contact:

- Devin Justman, Devin.Justman@netl.doe.gov
- Jennifer Bauer, Jennifer.Bauer@netl.doe.gov

Projects Using EJ/SJ Data

Growth of EJ/SJ opportunities

U.S. DEPARTMENT OF ENERGY | Office of Policy
Coal Power Plant Redevelopment Visualization Tool - Beta

181 Coal Power Plants

OP – Mapping disadvantage and energy communities, and opportunities

Executive Office of the President - Council on Environmental Quality

Requests to support new energy activities through maps of CCS facilities, resources & tribes

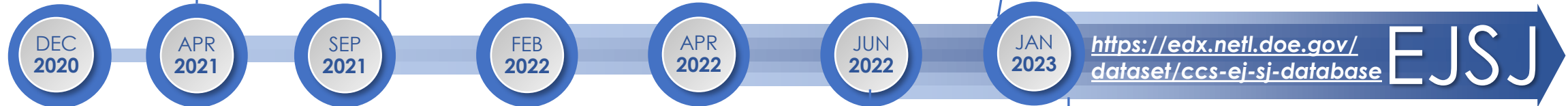
EDX Energy Data exchange

BIL **EDX4CCS** – Developing a single resource for EJ/SJ data relevant to CCS decision & policy makers

NETL's actionable, geo-data science and spatial R&D garnered the EJ/SJ opportunities that continues to grow

EJ/SJ SINCE
2020

PROJECTS
7



Interagency Working Group on Coal & Power Plant Communities & Economic Revitalization

IWG – Mapping coal communities to provide decision & policy support

MESC – Mapping communities for manufacturing eligibility opportunities across the U.S.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

EERE – Addressing data needs to evaluate clean energy transition prioritization

U.S. DEPARTMENT OF ENERGY | Fossil Energy and Carbon Management

FECM – Carbon Matchmaker

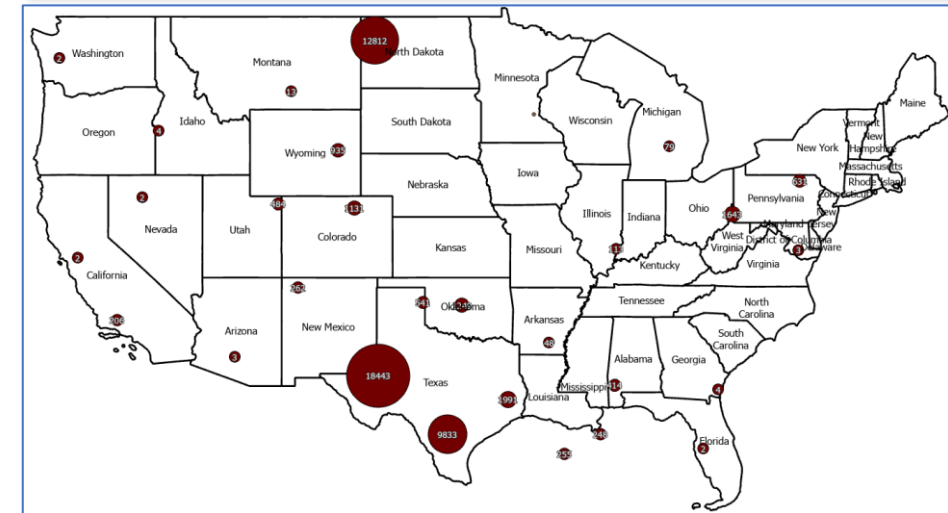
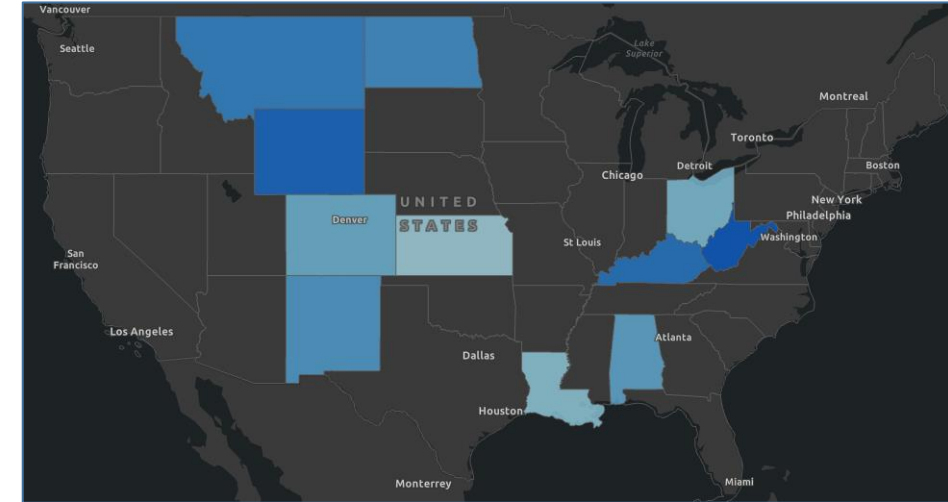
PUBS | FACTSHEET
MAPS
2 | 16+

DATA & WEB TOOLS
10

VISITS | DOWNLOADS
>100k | >1k

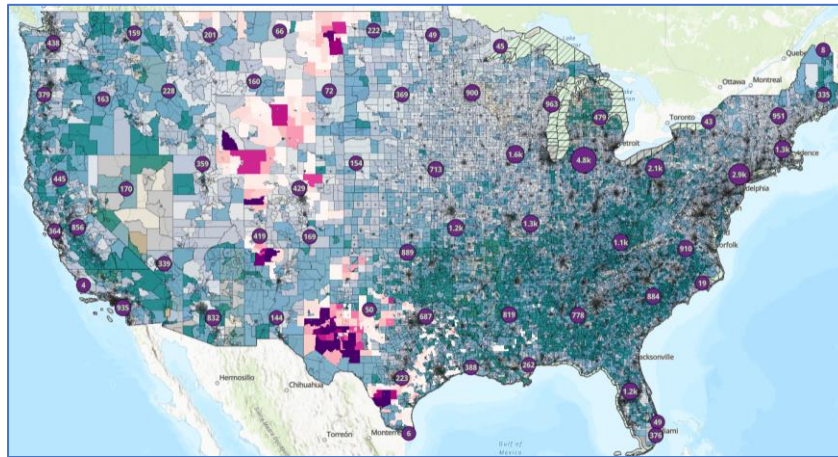
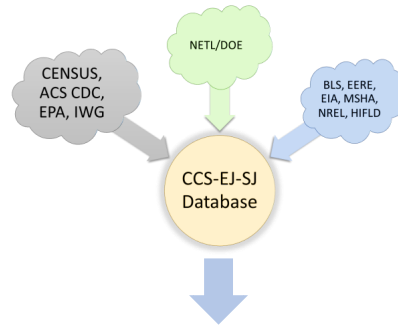
Under Development: EJ/SJ Dashboard and Atlas

- Integrate data on communities & energy transitions
 - Begin analytics with data, at a census tract/county scale:
 - Community sentiment analysis
 - Add relevant data related to CCS
 - Pull in additional community metrics, including:
 - Tax revenue from fossil energy/coal
 - Urban vs. rural
 - Poverty level
 - Average travel times to/from work
 - Percent of county households considered technology limited (based off broadband internet access)
 - Average level of education
 - And more to come...
- Introduce criteria and weights where needed to present critical information to stakeholders



Ongoing and Future Work

- Interactive **Dashboard** development
 - Use EJ/SJ dynamic database and authoritative sources



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

- Integrate into EDX **DisCO₂ver Platform**

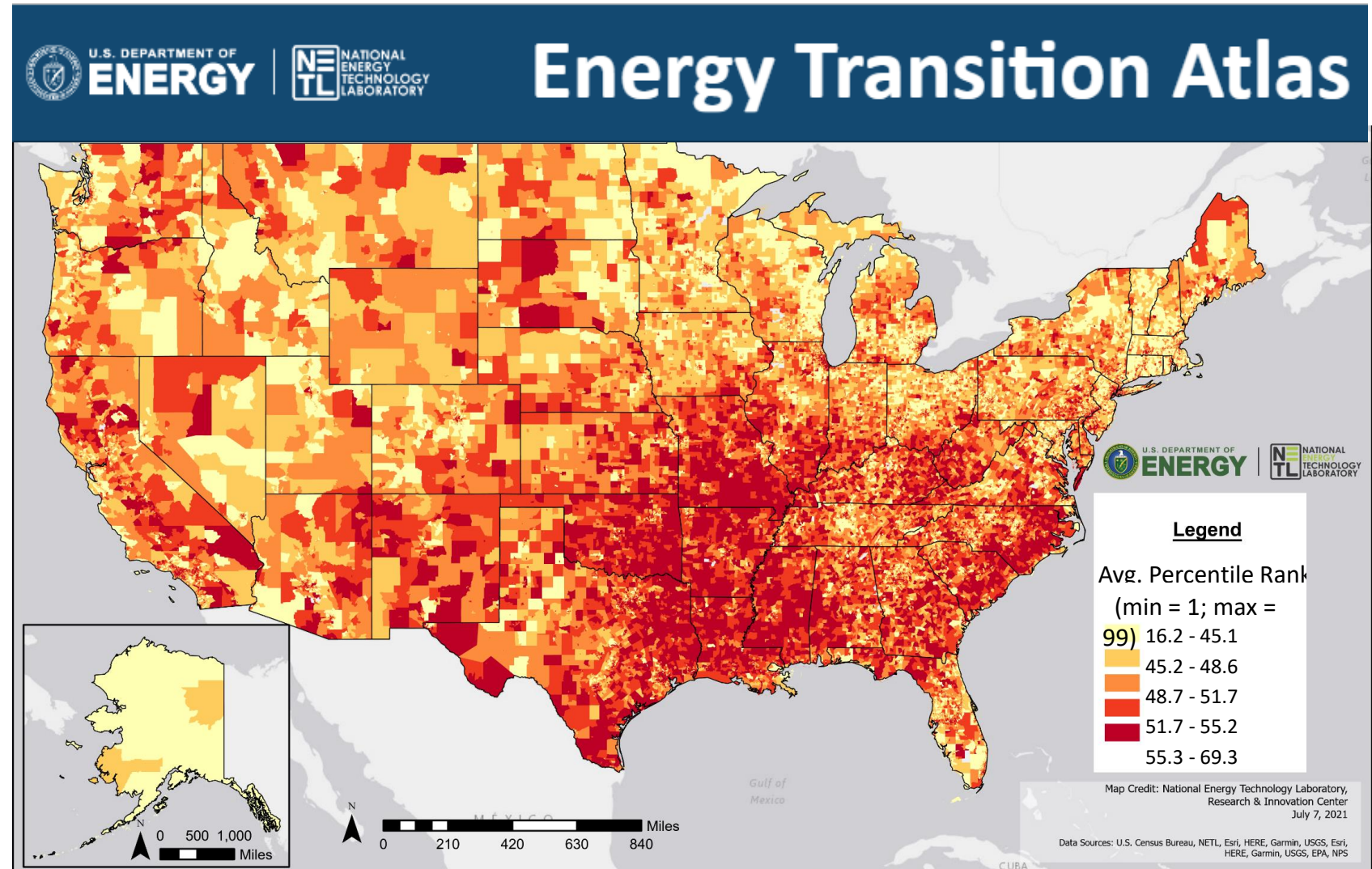


Opportunities:

- Evaluate **CCS feasibility** by evaluating EJ/SJ data to CCS to project specific resource such as **source, sink, and transport data**
- Analyze relationships between **EJ/SJ factors** and **community attitudes towards CCS**
- Support upcoming tools and resources such as the coal redevelopment tool, **Energy Transition Atlas**

Getting Data Into People's Hands

- Energy Transition Atlas will provide:
 - Access to both individual and integrate data through EDX++ & EDX Spatial
 - Spotlight key insights and trends for different communities and energy transition needs
 - Allow others to build from and use data for their purposes



Tuesday - Live Tool Demos!

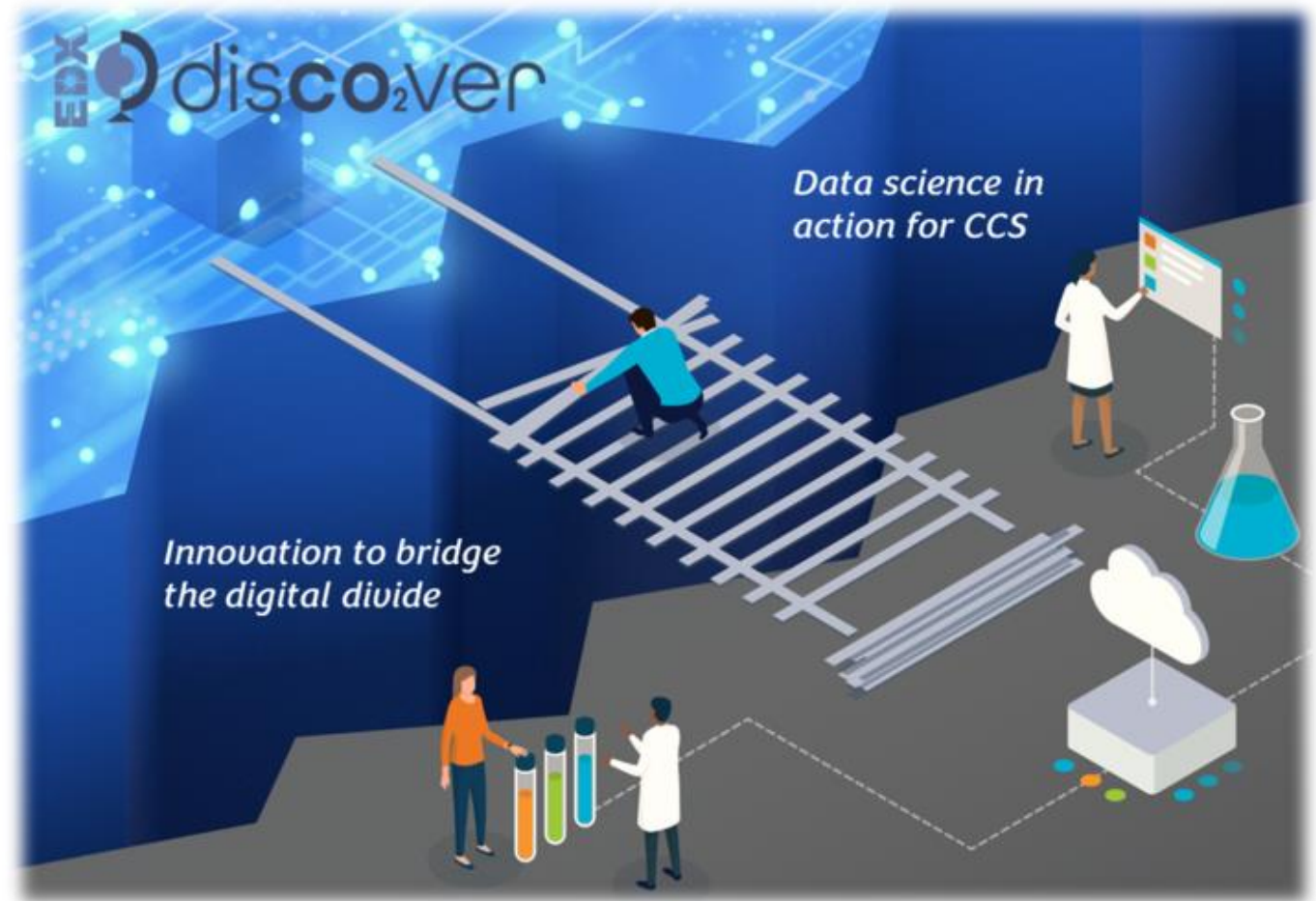
When: 5:45-7:45 p.m.

**Where: The Ballroom Foyer
and East/West Atriums**

What:

- **Environmental Justice and Social Justice** for CS Systems
- The **international offshore CS** and web-database and tool
- RokBase, Virtualizing **CS Rock Property Data** platform
- **Class VI Data Support Tool** for regulatory requirements
- **CO2 Pipeline Routing** Smart Tool
- Co2Locate - **Class II Well Reuse and Regional Evaluation Tool**
- **Carbon Storage Planning Framework Dashboard**
- **3D Data Viewer** and Preview Capability
- AllIM Model, **Assessing Infrastructure Reuse Potential** for CS
- **EDX disCO₂ver**, a one-stop tool for CO₂ digital resources

 In demo "theater room"  support team will offer **in person demos & Q&A**



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 (FWP DE-FE 1025007) 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

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ENERGY