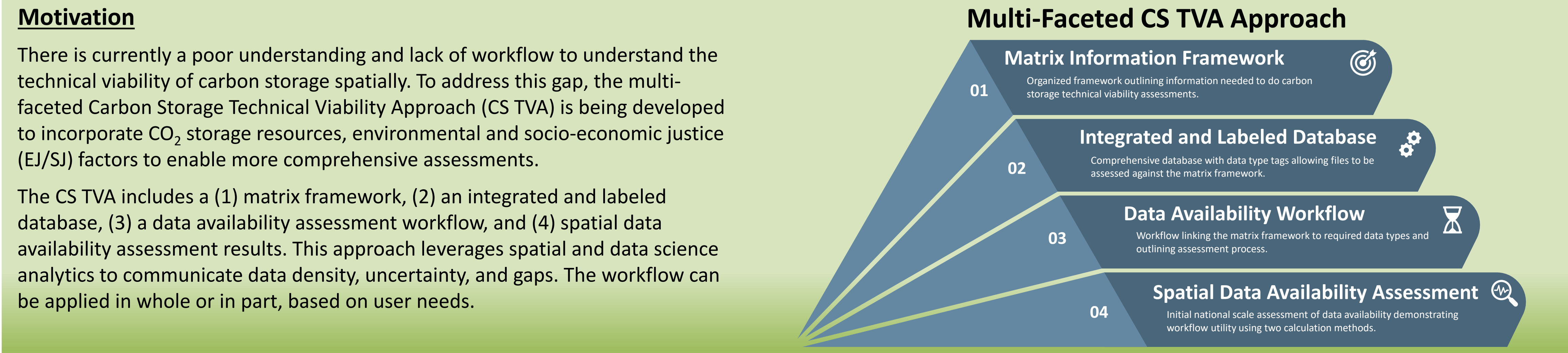


Carbon Storage Technical Viability Approach (CS TVA): An Integrated Approach for Feasibility and Data Resource Assessment

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2. CS TVA Database & Story Map

The CS TVA Database was developed to support the implementation of the CS TVA Matrix and Approach. The datasets were tagged with data type labels and tied to components outlined in the CS TVA Matrix. Users will benefit from being able to run analysis on a systematically labeled and consistently compiled database.



Julia Mulhern, Jacob Shay, Neyda Cordero Rodriguez, Gabriel Creason, Mackenzie Mark-Moser, Araceli Lara, Kelly Rose, Carbon Storage Technical Viability Approach (CS TVA) Database, 6/11/2024, <https://edx.netl.doe.gov/dataset/edx4ccs-carbon-storage-technical-viability-approach-database>, DOI: 10.181141/1984655

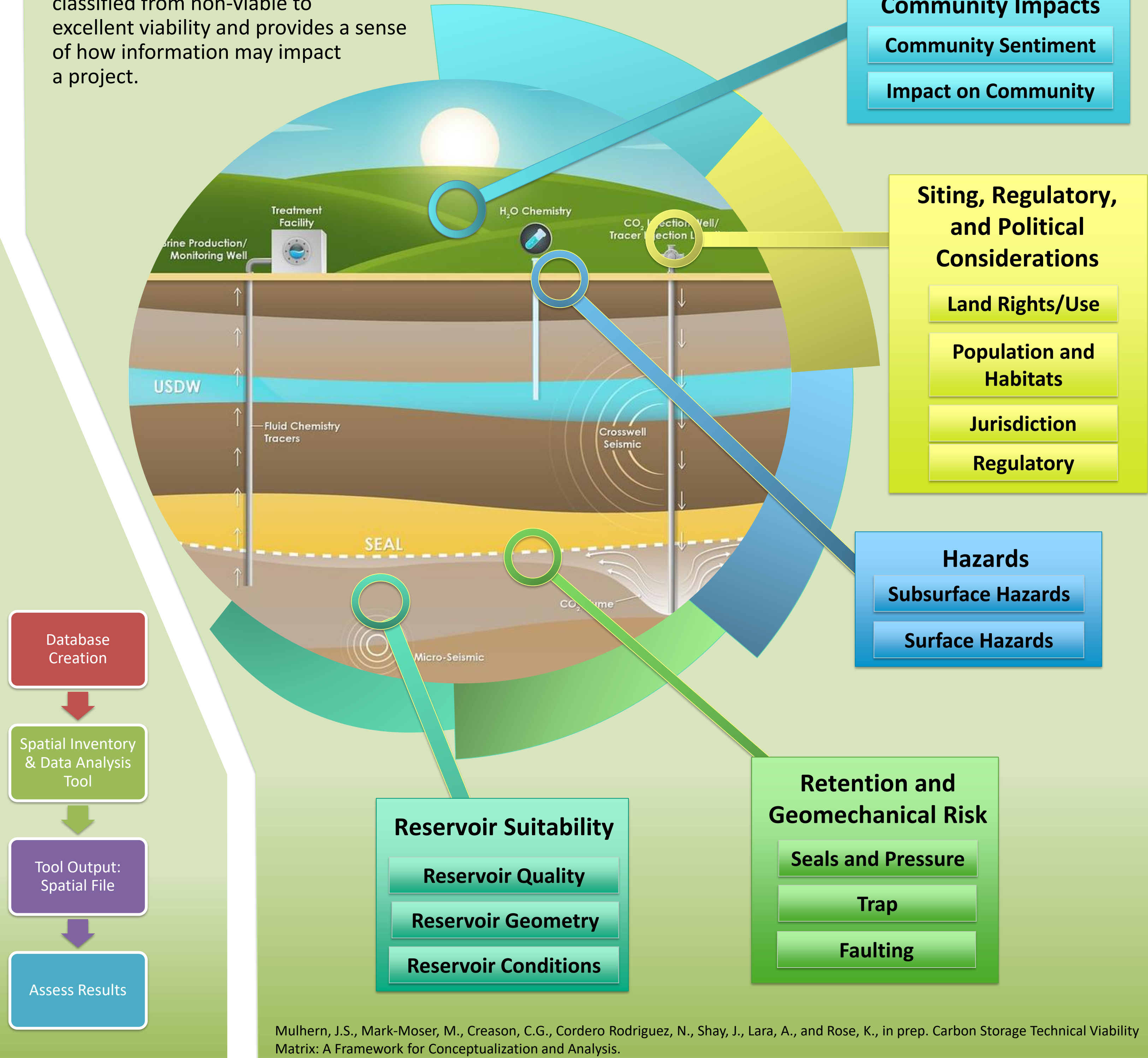
3. CS TVA Data Availability Assessment Workflow:

The CS TVA Workflow has four main phases outlined below:

- 1. Database Creation**
 - a) Gather data and generate data catalog
 - b) Tag data required
 - c) Map components to data required
 - d) Apply weighting to data required
 - e) Database validation
- 2. Spatial Inventory and Data Analysis Tool**
 - a) Generate empty grids
 - b) Run binary and weighed methods
- 3. Tool Output: Raster Files**
 - a) Binary presence or absence of data
 - b) Count of data types available for each grid cell
 - c) Weighted results per component
 - d) Total count of data types per component
- 4. Assess Results**
 - a) Create spatial maps
 - b) Interpret and assess results

1. CS TVA Matrix

The CS TVA Matrix is a criteria framework which documents the information needed for a holistic technical viability assessment using five categories, fourteen sub-categories, and forty-six components. This integrated framework was designed to aid in ensuring that integrated and comprehensive thinking is being leveraged during the early stages of assessments to help users gather the information and data types needed for effective assessments. Each of the forty-six components are classified from non-viable to excellent viability and provides a sense of how information may impact a project.



Mulhern, J.S., Mark-Moser, M., Creason, C.G., Cordero Rodriguez, N., Shay, J., Lara, A., and Rose, K., in prep. Carbon Storage Technical Viability Matrix: A Framework for Conceptualization and Analysis.

4. CS TVA: Spatial Inventory, Data Analysis, and Raster Outputs

The CS TVA database and workflow were leveraged to assess data availability spatially at a national scale using two methods: Binary Indexing and Weighted Assessment.

Binary Index Method

Binary descriptions which facilitate the ability to quickly query results, allow for spatial-join mathematical function based on location, improve storage and memory usage, and are scalable for larger data catalogs.

Binary Indexing: FID 1

1	0	0	1
0	1	1	1
0	0	1	1
0	0	1	1
0	1	1	0
1	1	1	0

Binary Indexing: FID 2

1	1	0	0
0	1	1	0
0	0	1	1
0	0	1	0
0	0	1	0
0	1	1	0

Data Availability: CID 1

100%	50%	0%	50%
0%	100%	100%	50%
0%	0%	100%	100%
0%	0%	100%	50%
0%	50%	100%	0%
50%	100%	100%	0%

Weighted Assessment Method

Assigning numerical weighting in a dataset resolves the potential for skewed, or disproportionate datasets. Data importance is established throughout the dataset with weighting and values were manually assigned based on expert opinion to each component.

Weighted Indexing: FID 1

.25	.08	.08	.25
.08	.50	.50	.25
.08	.08	.75	.75
.08	.08	.75	.75
.08	.08	.75	.75
.25	.50	.50	.08

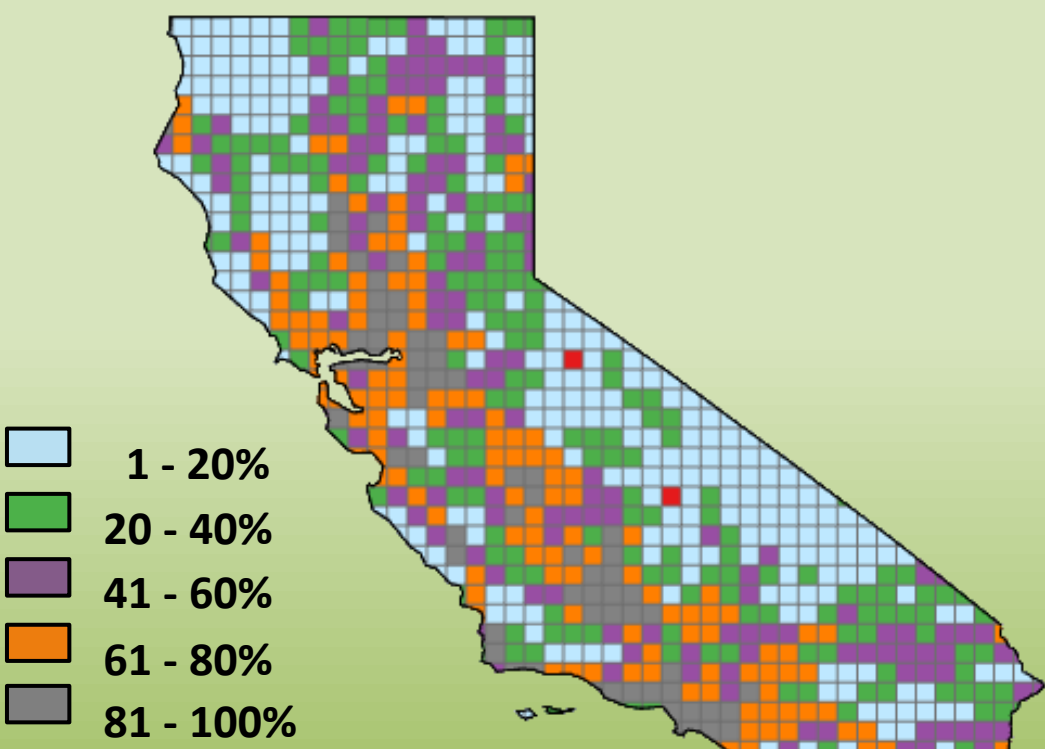
Weighted Indexing: FID 2

.25	.25	.08	.25
.08	.50	.50	.08
.08	.08	.75	.75
.08	.08	.75	.50
.08	.08	.50	.08
.25	.50	.50	.08

Fuzzy Sum Values: CID 1

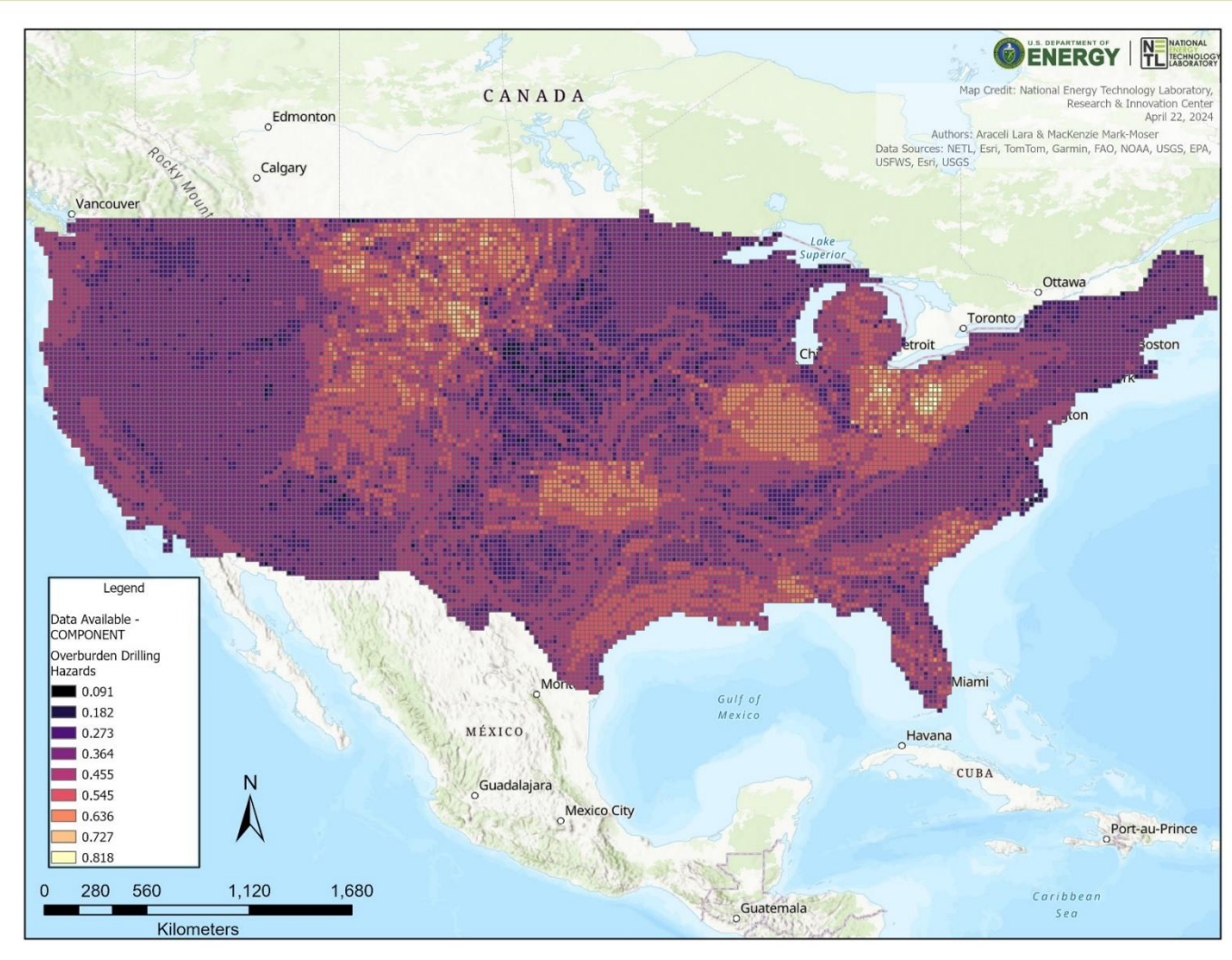
.44	.31	.15	.44
.15	.75	.75	.31
.15	.15	.94	.94
.15	.15	.94	.88
.15	.54	.75	.15
.44	.75	.75	.15

fuzzySumValue = 1 - ((1 - arg1)*(1 - arg2)*(1 - argn))



Future Work

- Results assessment and workflow refinement** – Results will be assessed to improve workflow and refine weighted associations applied to each component.
- Advanced auto tagging** – Leveraging natural language processing to auto generate data tags that align to the CS TVA Matrix ensures that there is consistent, standardized language surrounding carbon storage terminology.
- Additional data discovery** – Image extraction tool will be incorporated into the workflow to aid in data discovery.
- Continued database expansion** – Additional datasets will be included in the integrated database.
- Matrix publication** – CS TVA Matrix will be published to enable users to leverage the framework.



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