PermianMAP: A Data Platform to Track Methane Emissions From Oil and Gas Drilling in the Permian Basin

STONE ENVIRONMENTAL
100% EMPLOYEE-OWNED

Services / Expertise
Geospatial and Data Solutions
Web Application Development, Maintenance
Integration and Application Programming

Technology
ArcGIS Online and Dashboards
ArcGIS Hub
ArcGIS REST API
Python automation
AWS S3, AWS Lambda

Market
NGO/Nonprofit

Project Location
Permian Basin, Texas and New Mexico

Date Completed
2019–2021

Project Owner
Environmental Defense Fund
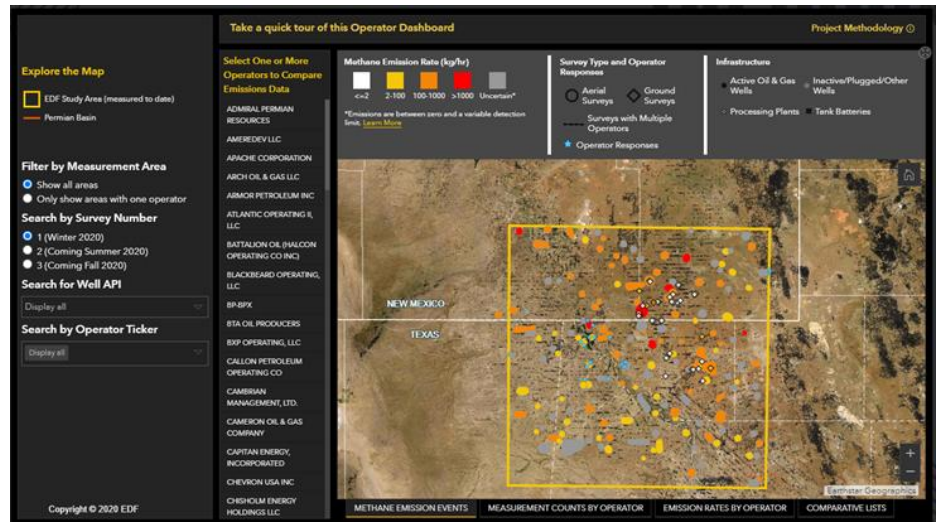
Project ID#
19-119

Project Manager
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Project Team
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Link to PermianMAP
https://permianmap.org/

esri Partner Network
Silver

Stone developed the Operator Performance dashboard as part of a larger data platform highlighting the scale of methane emissions in the Permian Basin.

STONE worked with the Environmental Defense Fund (EDF), a nonprofit advocacy group, to develop an interactive online data platform to highlight the immense volume of climate-warming methane emitted in the Permian Basin, one of the world's largest oil and gas fields in Texas and New Mexico. Our team ingested, processed, and integrated data from a diverse set of scientific partners and state and federal sources to create a compelling visual story emphasizing the scale of the methane problem. The EDF's initial requirements included:

- Secure storage for raw data
- A system for data cleaning and aggregation in multiple formats
- A system that allowed for ongoing data uploads that informs operators of emission events
- The ability to display aggregated data on a public-facing website that included maps and charts
- The ability to query data for responsible operators
- Easy data downloading
- The ability of the platform to scale as new data and measurement technologies were added

Stone utilized ArcGIS Online applications, including web maps, Dashboards, StoryMaps, Survey123, and Hub, to meet the project needs. Our first task was to obtain well and operator data from New Mexico and Texas—a key dataset for determining operators responsible for the methane emissions data collected. We developed a Python script to download well data from publicly available sources and standardize operator names to create a single dataset of active wells. We further used Python to connect the well and ongoing measurement data, establishing which

operators were responsible for methane emissions, and uploaded data to ArcGIS Online. Later, the project Python scripts were developed to identify the most likely operators of infrastructure closest to methane plume measurements.

This project also features a public-facing website built using Esri's Hub tool, which allows the team to use a custom domain name and embed a classic tabbed StoryMap. The Operation Dashboard includes maps and charts highlighting the total methane emissions by operator and the number of events. Users can filter results by operator and the type of emission source. In the Operator Performance Dashboard, oil and gas company technicians and regulators can filter the map of detected methane leaks by company name and view dynamic charts of how the selected company ranks by methane emission rates. Stone has automated the identification of responsible operators with Python scripts, allowing for quick updates to the platform as new data becomes available. Technical users can download data from pop-ups and the Download Dataset tab.

The EDF established this project to alert operators of emissions as quickly as possible and encourage their response. Stone developed an automated process that emails operators with CSV files of identified emission sources. Operators can directly respond to these alerts through the public platform with links to Survey123 forms to respond to ownership corrections or actions taken. Responses are highlighted in a separate dashboard contained in a StoryMap tab and in the map, highlighting which operators had taken steps in response to emission events.

This data platform was launched in April 2020 and continues to be updated with new data collected by EDF and partners. Stone and the EDF jointly presented the PermianMAP platform at the 2022 Esri User Conference.

The completed application is available at permianmap.org.