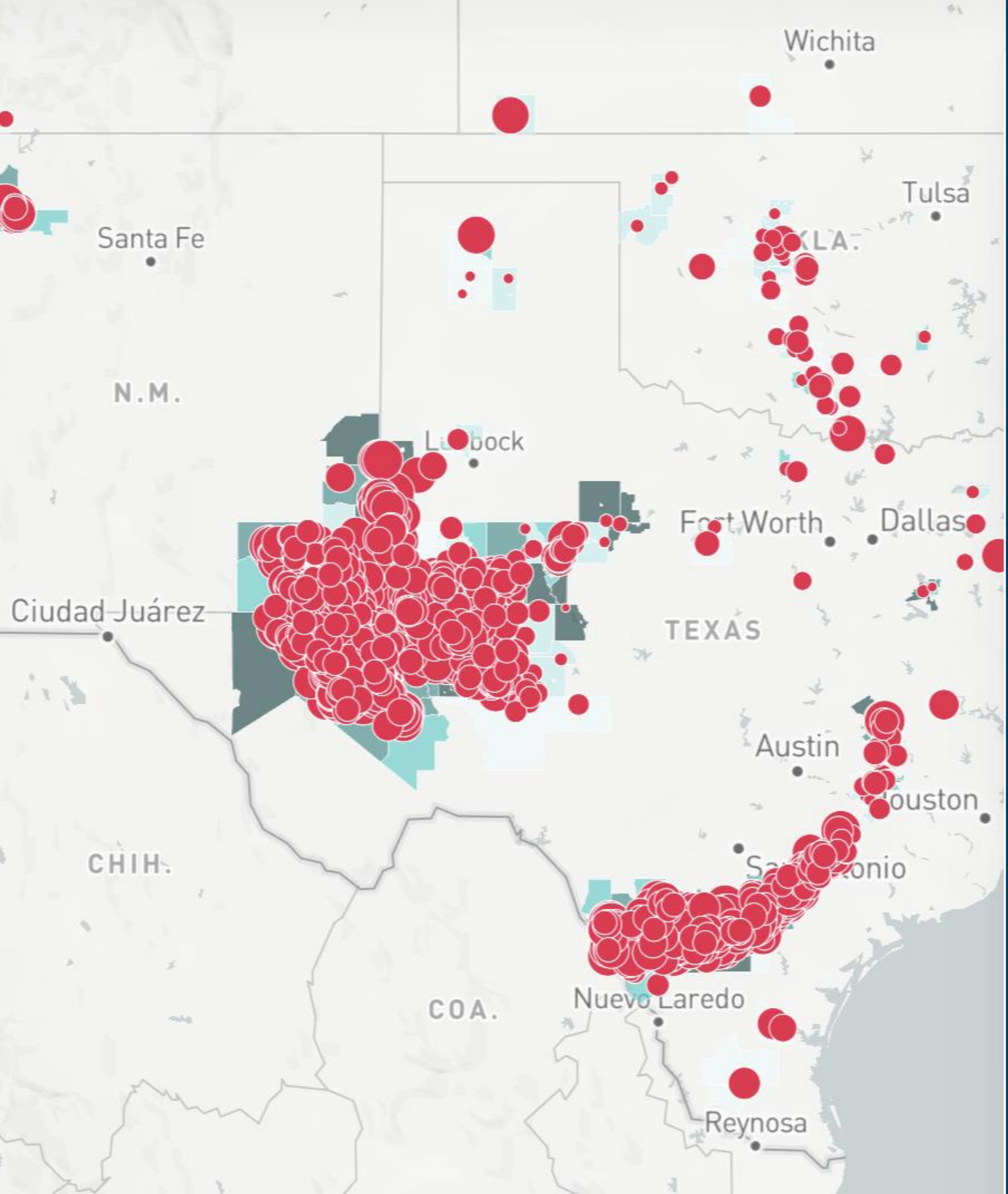
Analyzing Environmental Justice Risks from Flares

Climate Intelligence Program (CIP)

Webinar April 24, 2024



Agenda

- **Welcome, Introductions -** 5 minutes
- **Team Presentation -** 25 minutes
- **Webtool Demo -** 5 minutes
- **Panelist Q&A -** 30 minutes
- **Audience Questions -** 20 minutes
- **Closing and Thank You -** 5 minutes

Speakers

Deborah Gordon
RMI Sr Principal

Rose Wang
RMI Manager

Sasha Bylsma
RMI Sr Associate

Dr. Jill Johnston
USC Associate Professor of Population and Public Health Sciences

Kayla Lucero-Matteucci
New Mexico Just Transition Advisor

The Flaring EJ Tool

A new RMI webtool to assess the negative environmental impact of oil & gas flares on nearby communities

Flaring

The practice of emitting and burning off unwanted gas

excess

contaminated

unproductive

unprofitable

An estimated 140 billion cubic meters of gas valued at $16 billion went up in smoke globally in 2022

The wasted gas could have met the combined domestic gas demands of Japan and Italy

Source: World Bank 2023 Global Gas Flaring Tracker Report

Characteristics of Flaring in the US

Tied to shale O&G growth

From 2010 to 2020, flaring increased at twice the rate of associated gas production growth.

A wasteful climate threat

On public and tribal lands alone in 2019, 4.6 billion cubic meters of gas was wasted through flaring, equivalent to the demand of 2.2 million homes.

Ambiguously regulated

Flare permitting, reporting, and operating regulations differ across states and federal lands, creating a patchwork of policies difficult to enforce.

A hidden health hazard

A growing body of literature points to adverse health effects in communities frontline to flaring, with disproportionate equity impacts.

Source: https://www.iea.org/commentaries/putting-gas-flaring-in-the-spotlight, https://www.edf.org/media/new-study-quantifies-natural-gas-wasted-us-public-and-tribal-lands

Flaring Health Risks

- **According to a 2024 study published in GeoHealth, pollution from oil and gas venting and flaring results in substantial health impacts annually:**
  - $7.4 billion in health damages
  - More than 700 premature deaths
  - 73,000 asthma exacerbations among children

- **Main health hazards:**
  - Black carbon ⟶ Fine particulate matter ($PM_{2.5}$)
  - Nitrogen oxides (NO_x) ⟶ Ground-level Ozone (O_3)

Source: https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2023GH000938

EJ Approach to Flare Impact

Environmental Hazard **X** Vulnerability **=** Risk

Flaring as an environmental hazard

- Select indicators and create a calculation for quantifying the hazard level of flares

Demographic data as a measure of vulnerability

- Select indicators and create a calculation for quantifying the vulnerability of population groups

A tool to screen for environmental justice communities

- Create a combined index to identify and quantify disproportionately high flaring burdens

Choosing Indicators

EJ Screen socio-economic vulnerability indicators

1. % people of color
2. % households low income
3. % limited English speaking household
4. % less than high school education
5. % age <5, % age >64
6. % Unemployed

Demographic Index: Average of 1-2

Supplemental Index: Average of 2-6, Life expectancy

RMI vulnerability index: Weighted Average of 1-6 (priority weight for 1 & 2)

EJ Screen environmental indicators

1. PM 2.5
2. Ozone

…

13. Wastewater

Flare impact indicators

- Flared gas volume
- Detection frequency
- Flare density

EJ Screen Index: Index * Environmental indicator percentile

RMI EJ Index: Vulnerability Index * Flare index

Methodology Continued

Layer Variables

Aggregated ↓

Layer Scores

Normalized ↓

Flare Layer

Derived through VIIRS VNF.
Filtered to exclude non-O&G, non-upstream.

Block Group Layer

Derived through EPA's EJ Screen.
Filtered by 5km proximity to flares.

Additional study area of block groups impacted by wells as a control group.

Flare Scores

Flare impact is derived from individual **flared gas volume** and **detection frequency.**

Flare vulnerability is derived from an **area-weighted vulnerability of the block groups within 5km of the flare.**

Block Group Scores

Block group vulnerability is derived from the **priority-weighted average of socio-economic data.**

Block group flare impact is derived from **the cumulative gas flared, the average detection frequency, and the flare density within 5km.**

Methodology Continued

Layer Variables

Aggregated ↓

Layer Scores

Normalized ↓

Flare, Vulnerability Indices

Combined ↓

Environmental Justice Index

Flare Layer

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Flare Scores

Flare impact is derived from individual **flared gas volume** and **detection frequency**.

X

Flare vulnerability is derived from an **area-weighted vulnerability of the block groups within 5km of the flare.**

↓

Quantifies and ranks the disproportionate impact a flare poses to nearby block groups.

Block Group Scores

Block group vulnerability is derived from the **priority-weighted average of socio-economic data.**

X

Block group flare impact is derived from **the cumulative gas flared, the average detection frequency, and the flare density within 5km.**

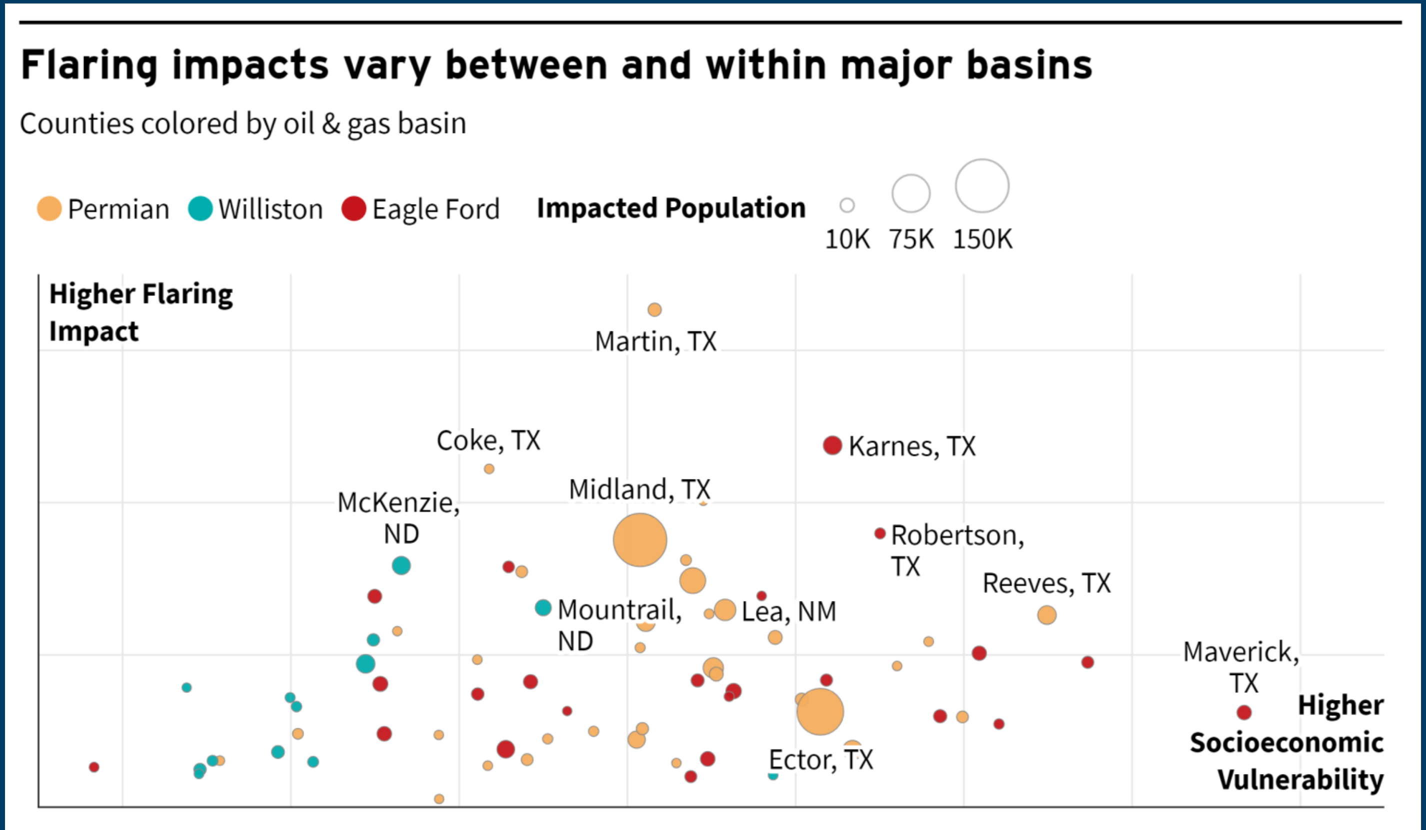
↓

Quantifies and ranks the disproportionate impact of cumulative flaring on a block group.

Flare impacts are skewed in many ways

- 10% of US upstream flares comprise 47% of annual flared volume
- 3 US O&G basins comprise over 90% of annual flared volume
- Of the areas with the highest flaring hazard, block groups in these basins on average experience 1 flare every:

9 miles Permian	10 miles Eagle Ford	18 miles Williston



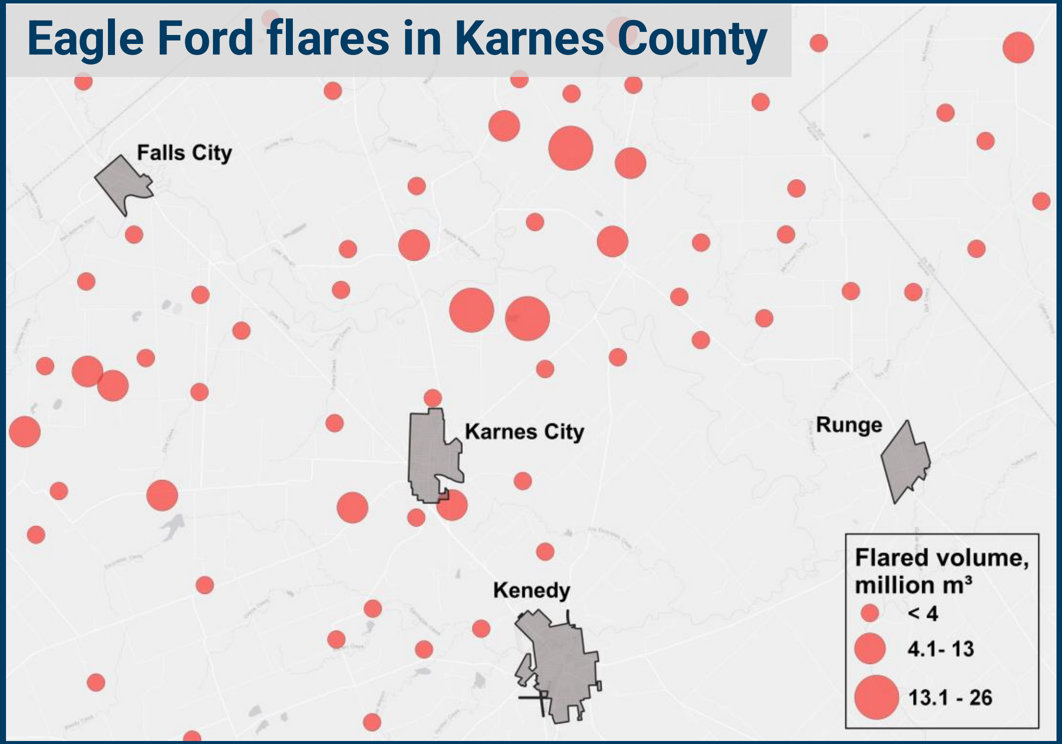
Block group vulnerability by population subset

National average	0.22
Block groups near wells	0.24
Block groups with highest flaring impact	**0.28**

Case Study: Eagle Ford, Texas

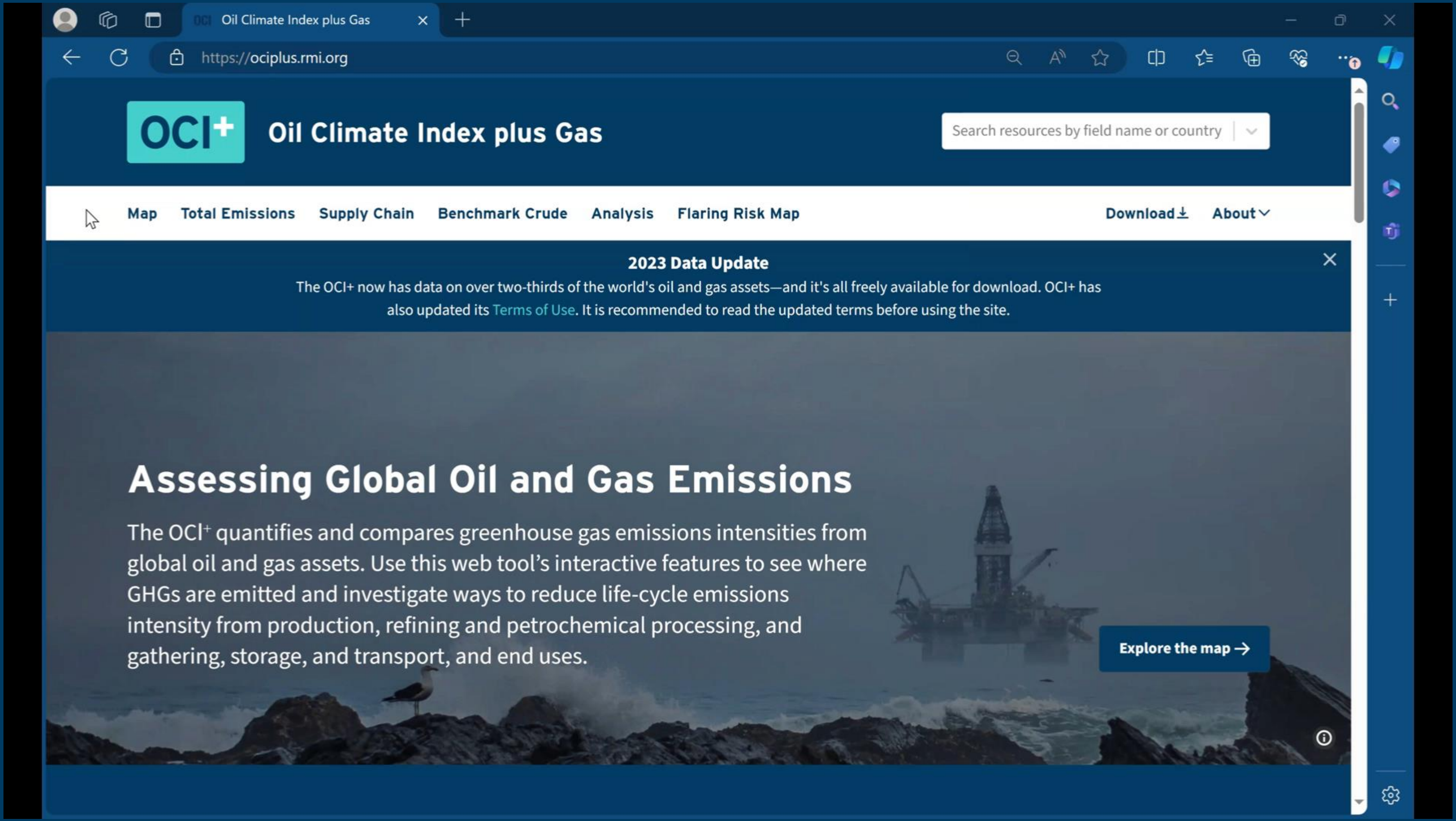
High flaring meets high socio-economic vulnerability – in close proximity

- **Block groups in the Eagle Ford rank poorly for both adverse flare impacts and vulnerability indicators**
- **Oil productivity has led to drilling closer to denser residential areas**
  - 14 wells / mi²
  - 1 flare / 5 mi²
- **Disparities exist within the basin:**



Indicator	Lower Flare Impact (n=82)	Highest Flare Impact (29)
Communities of Color	46%	**51%**
Low Income Communities	29%	**41%**

Flaring Risk Map — Demo Video



Panel Discussion

With our guests:

Jill Johnston
USC Associate Professor of Population and Public Health Sciences

Kayla Lucero-Matteucci
New Mexico Just Transition Advisor

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