YOU CAN'T FIX WHAT YOU CAN'T SEE

DISCUSSING THE ROLE OF EARTH OBSERVATION IN MONITORING CLIMATE CHANGE

The case of Climate TRACE

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WHO I AM


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EXPERIENCE

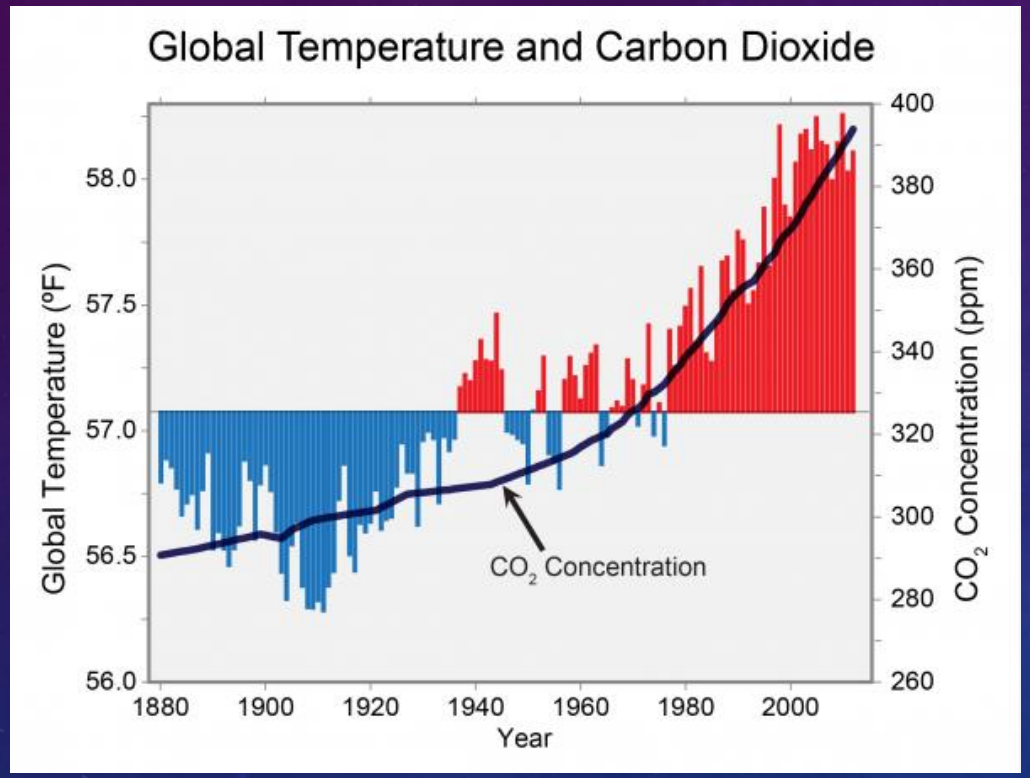
- Sep. 2021. **Freelance Data Analyst**
- Sep. 2020. **Data Science Instructor**. Datahack School
- Aug. 2020. **Research coordinator**. Institute for the Internet & Just Society.
- Aug. 2020 – Mar. 2021. **Data Analyst**. Trecone Solutions.
- 2018 – 2019. **Legal Researcher**. Maastricht METRO Institute for Transnational Legal Research.
- 2018 – 2019. **Assistant Coordinator**. Maastricht Centre for Citizenship, Migration and Development

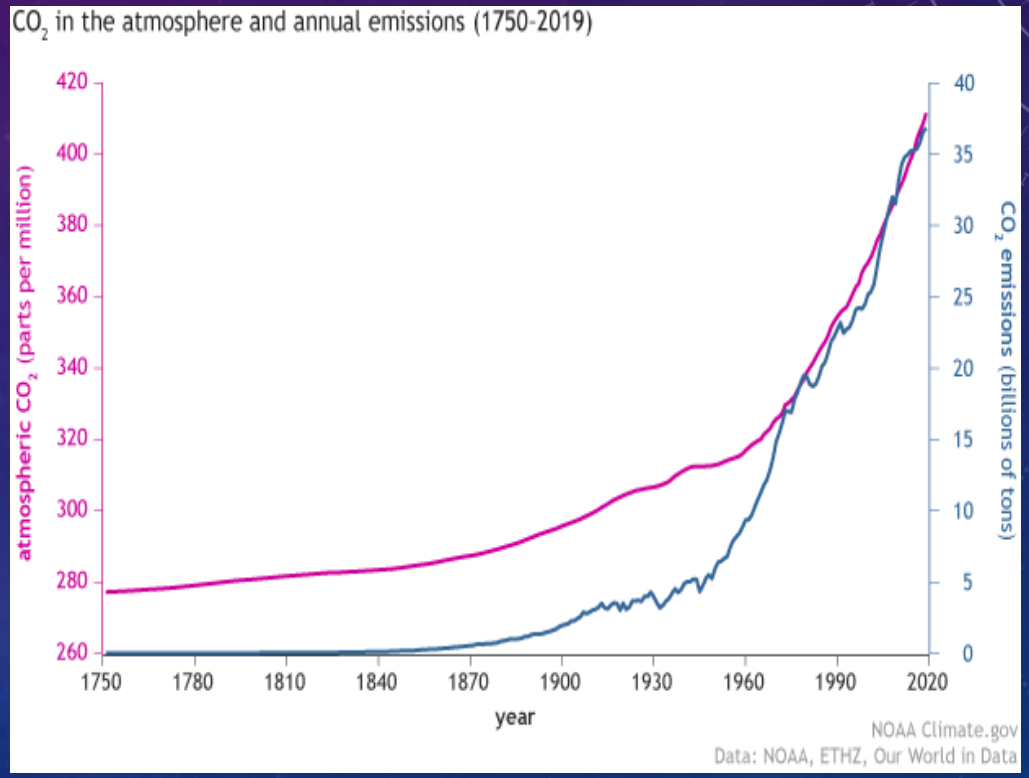
EDUCATION

- 2018 – 2019. **Master LLM European Law School**. Maastricht University
- 2011 – 2017. **Dual Bachelor in Law and Political Science**. Carlos III University

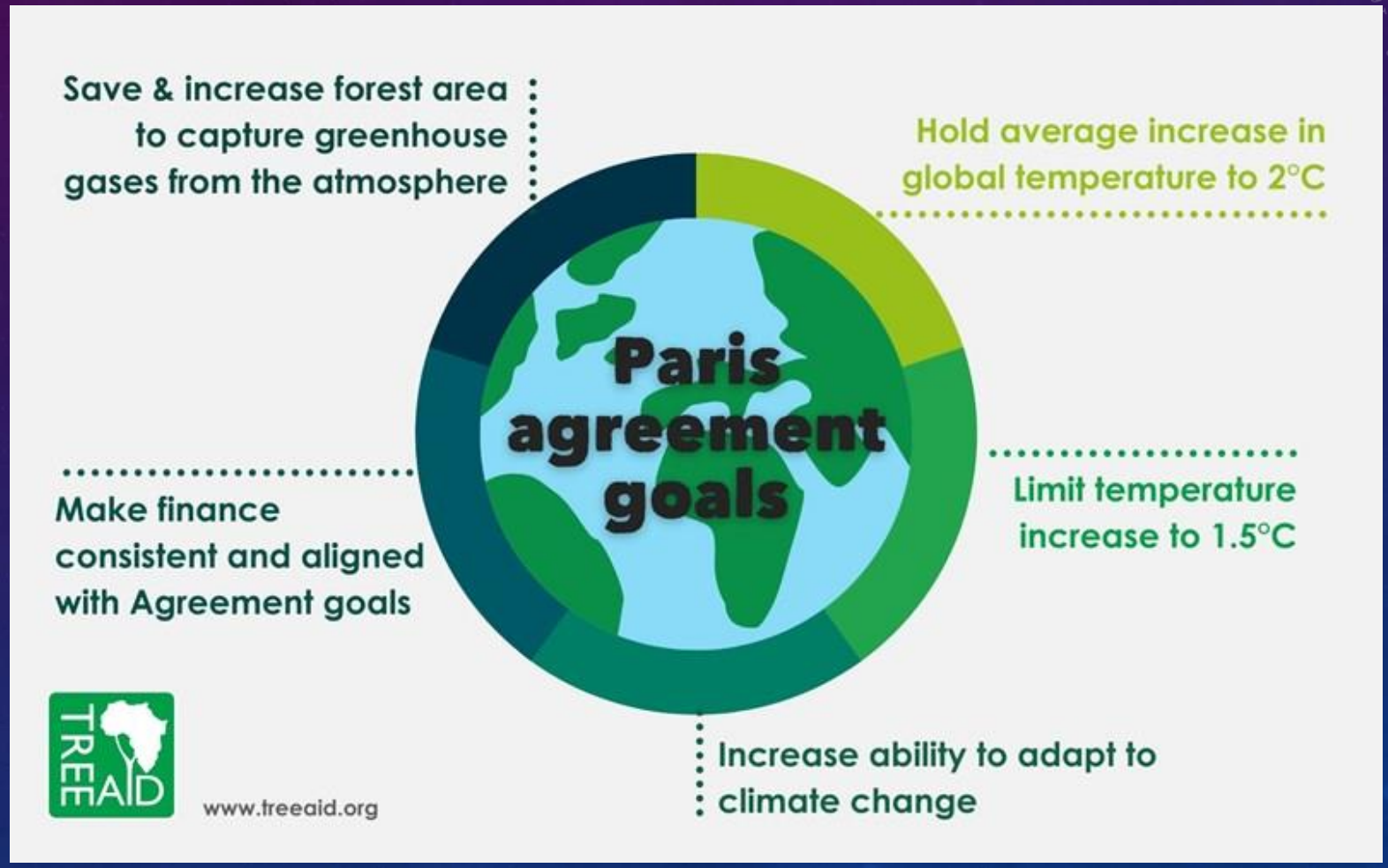
ONCE UPON A TIME… THE CLIMATE CRISIS

GLOBAL WARMING IS AT THE CORE OF THE CRISIS

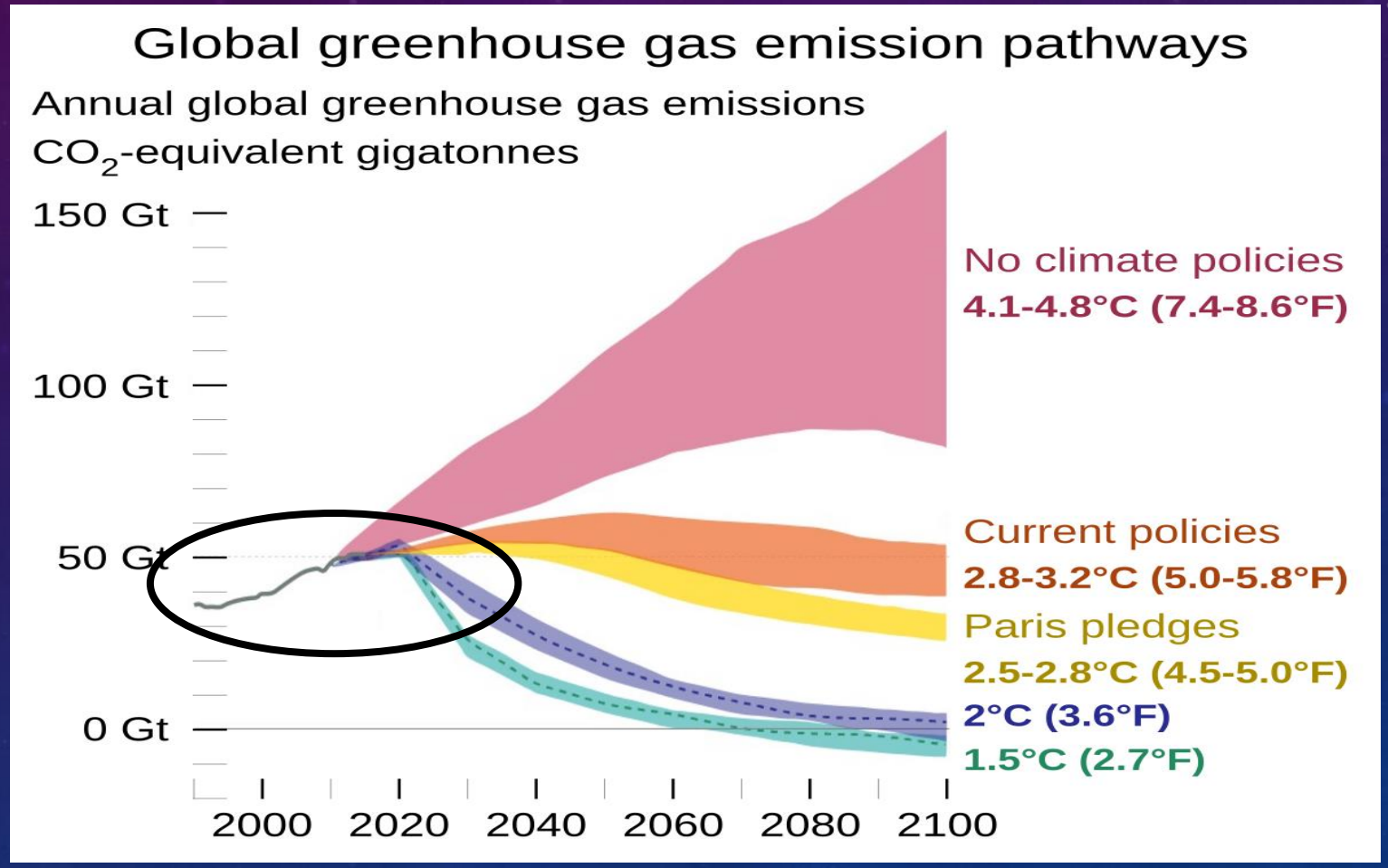




THE MISSION: REDUCE AND LIMIT CO2 LEVELS



INFORMATION IS KEY TO ADDRESS THE CLIMATE CRISIS



HOW MUCH GREENHOUSE GAS EMISSIONS ARE OUT THERE?

MONITORING GHG EMISSIONS

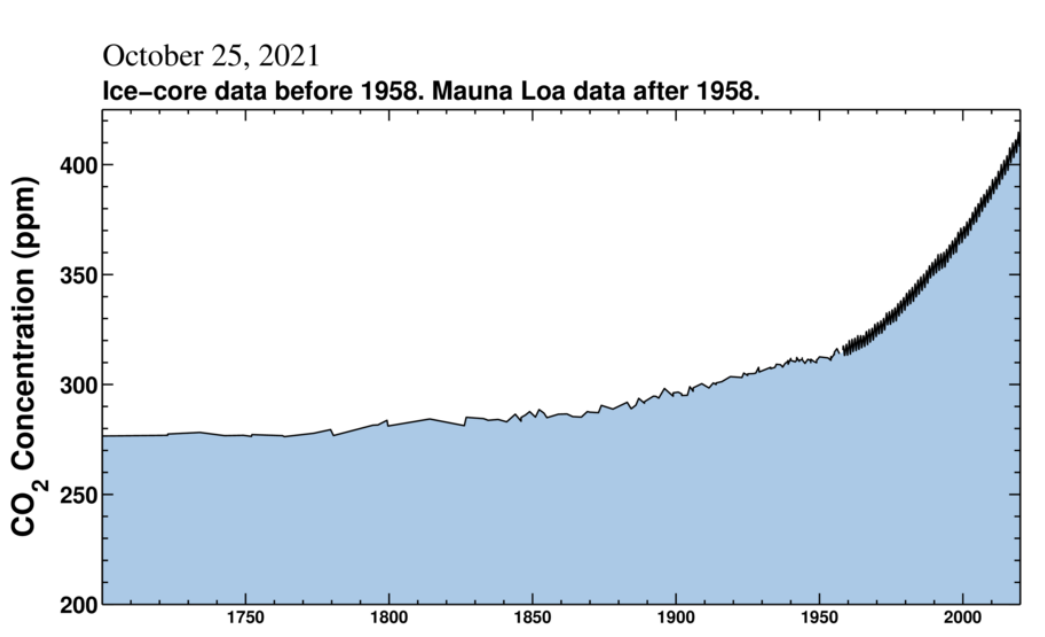
Tracking GHG emissions is a complex task:

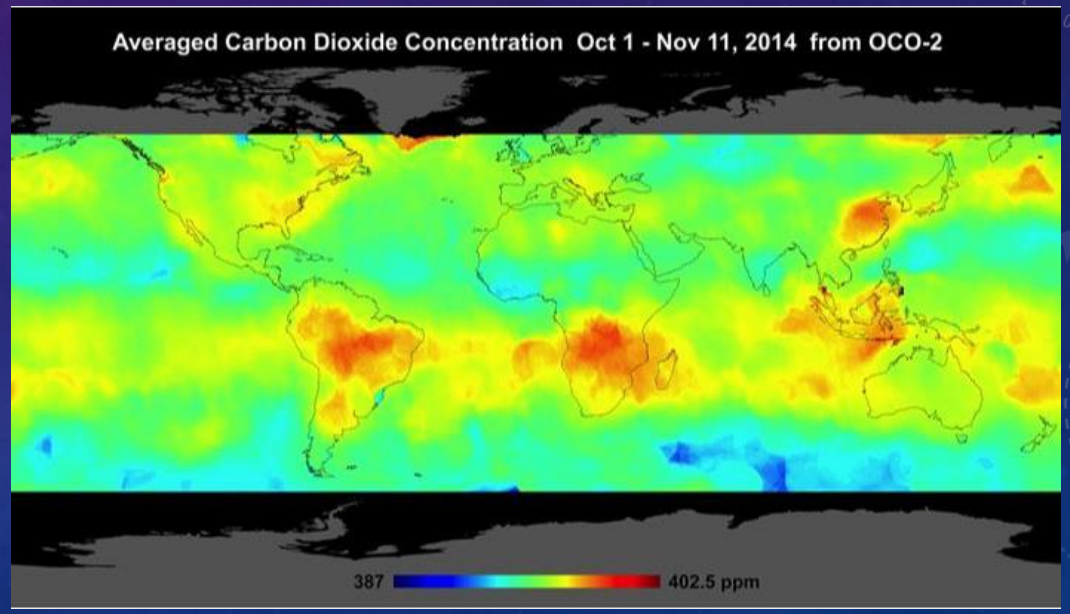
- Diversity of emission sources
- Different monitoring methodologies
- Fragmented regulation
- Fragmented inventories (national, subnational, industry-specific, company-specific, NGO…)
- Lack of technical and financial resources (namely, the Global South)
- Lack of transparency

REMOTE SENSING GHG MONITORING

For decades, climate scientists have been able to measure Earth's total level of atmospheric GHG concentrations using different remote sensing methodologies.

But it **IS NOT FEASIBLE** to **map emissions to specific sources….**





CLIMATE TRACE

Climate TRACE (Tracking Real-time Atmospheric Carbon Emissions) is a global coalition…

created to make meaningful climate action faster and easier…

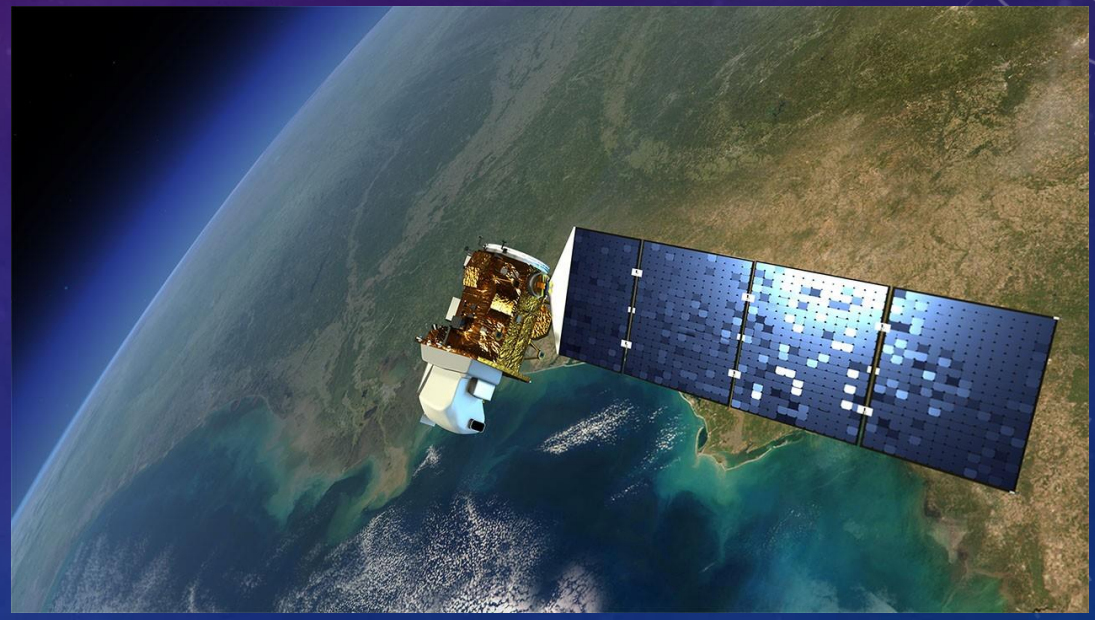
by independently tracking greenhouse gas (GHG) emissions…

harnessing satellite imagery and other forms of remote sensing, AI, and data science.

SATELLITE IMAGERY AND AI: A NEW HOPE

Why now

- Currently, **more than 3000** active satellites, both public and commercial.
- High resolution and coverage allow **granular** and **in-real-time monitoring.**
- AI and machine learning power **image processing.**
- **Open Space Data**: Increasing availability of Earth Observation (EO) Data
- **Cloud computing** makes satellite data more accessible, thereby expanding the EO market



HOW IT WORKS

Satellite Imagery Collection

- Space Agencies data
- Commercial satellites data
- Visible / non visible spectrum

Complement with other data sources

- Ground-and-sea-based sensors
- Government sources
- corporate disclosure forms
- maritime vessel locations

Train ML algorithms

- +59 trillion bytes of data
- 300 satellites
- 11,100 sensors
- ML spot indicators of human-caused GHG

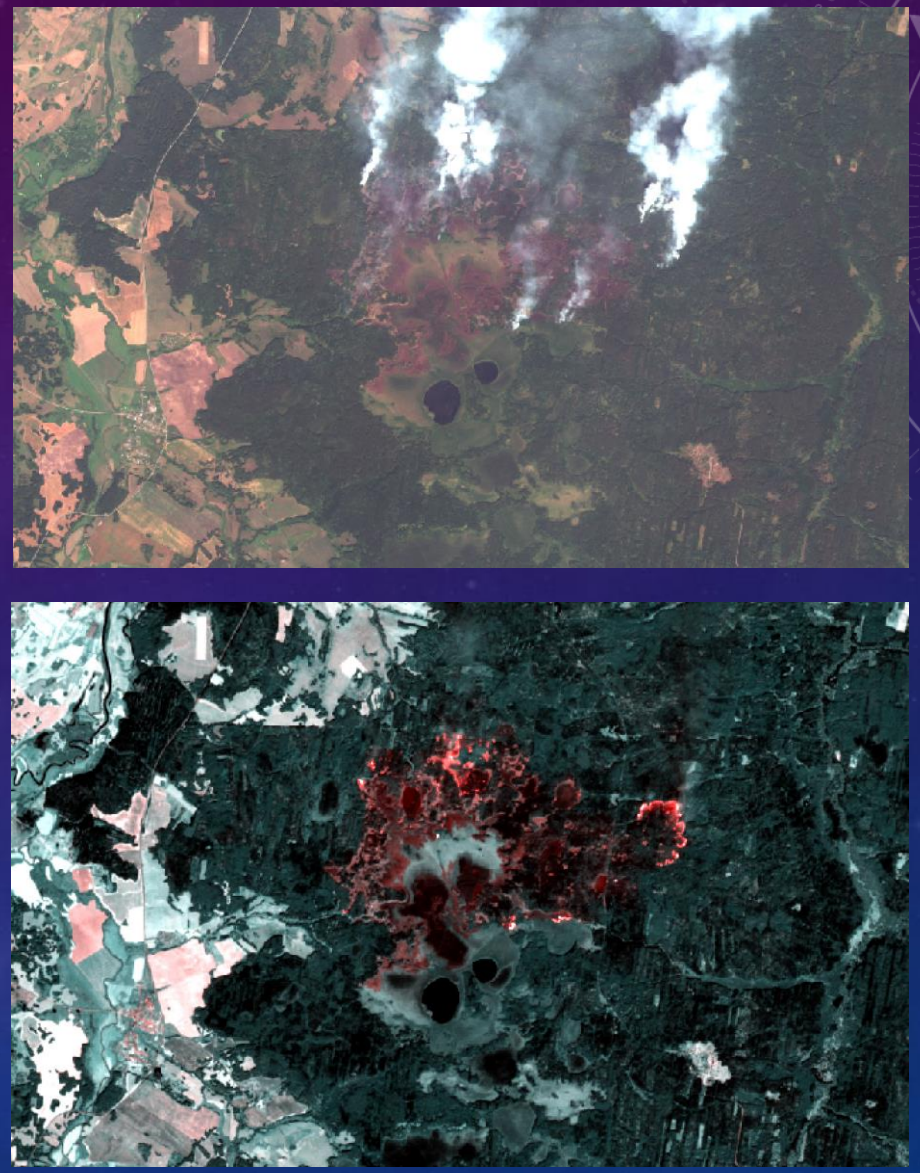
Release of GHG emissions inventory

- GHG emissions inventory made available to the public
- Future updates with more granular data (asset-specific, near-real-time monitoring)
- Public API

MACHINE LEARNING IN ACTION

For each sector, Climate TRACE takes a different approach, applying existing expertise to new observations in a way that is tailored to reflect the unique aspects of individual emitting industries.

See sector-specific methodologies

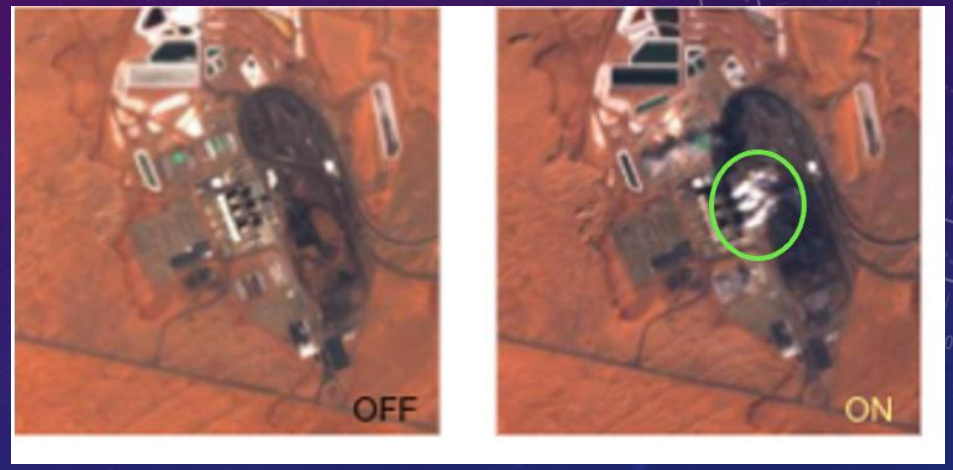


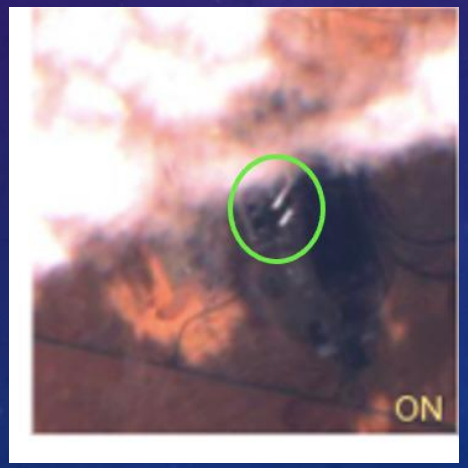
Documenting forest fire emissions in Russia during 2021
Source: Climate TRACE

MONITORING POWER PLANTS

Monitoring generation activity at individual power plants using automated plume detection in satellite imagery.

Visible plumes from Sentinel-2 optical imagery indicate whether a coal-fired power plant is generating at a given time.



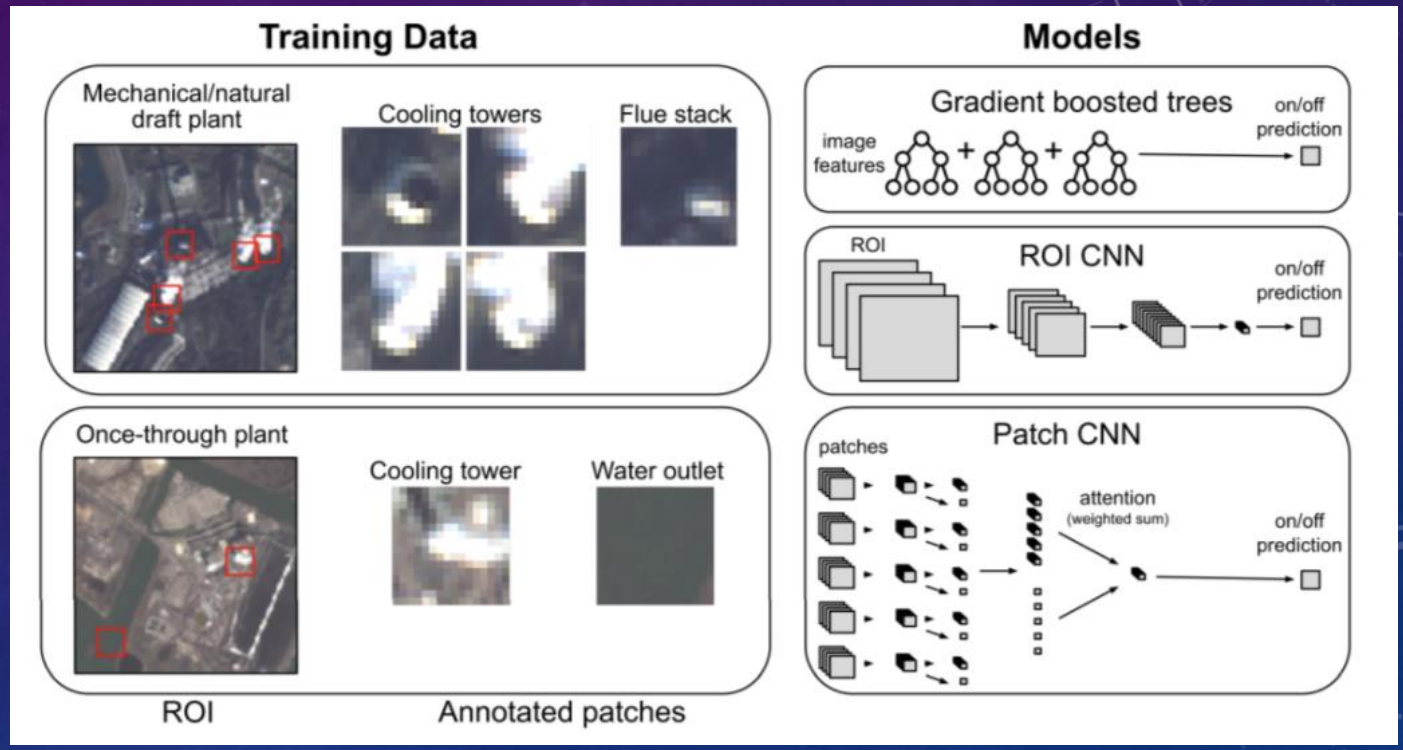


Source: Climate TRACE

MONITORING POWER PLANTS

Trained machine learning models to determine:

- Operational status of an individual plant from satellite imagery
- Emissions produced by individual plant

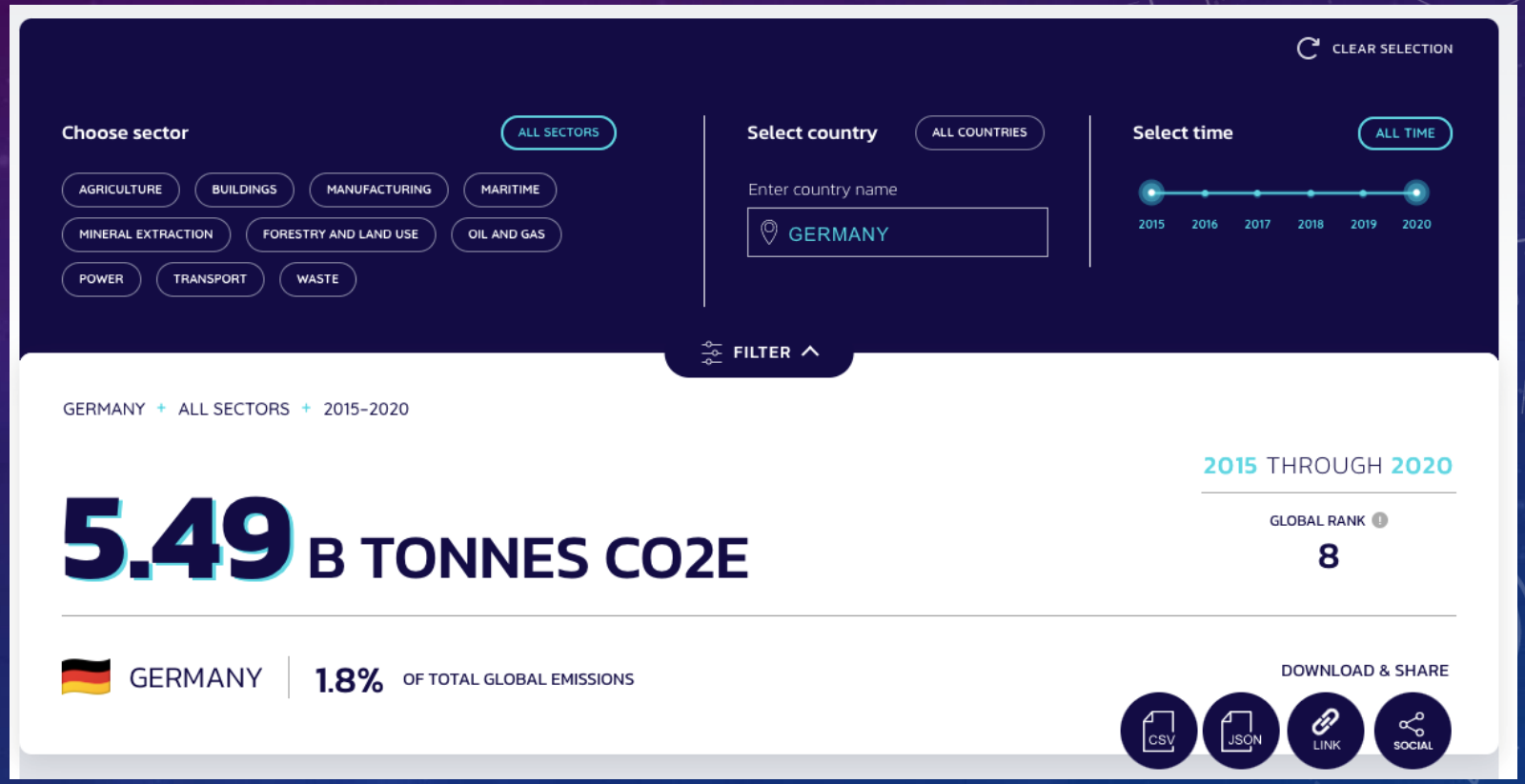


Source: WattTime

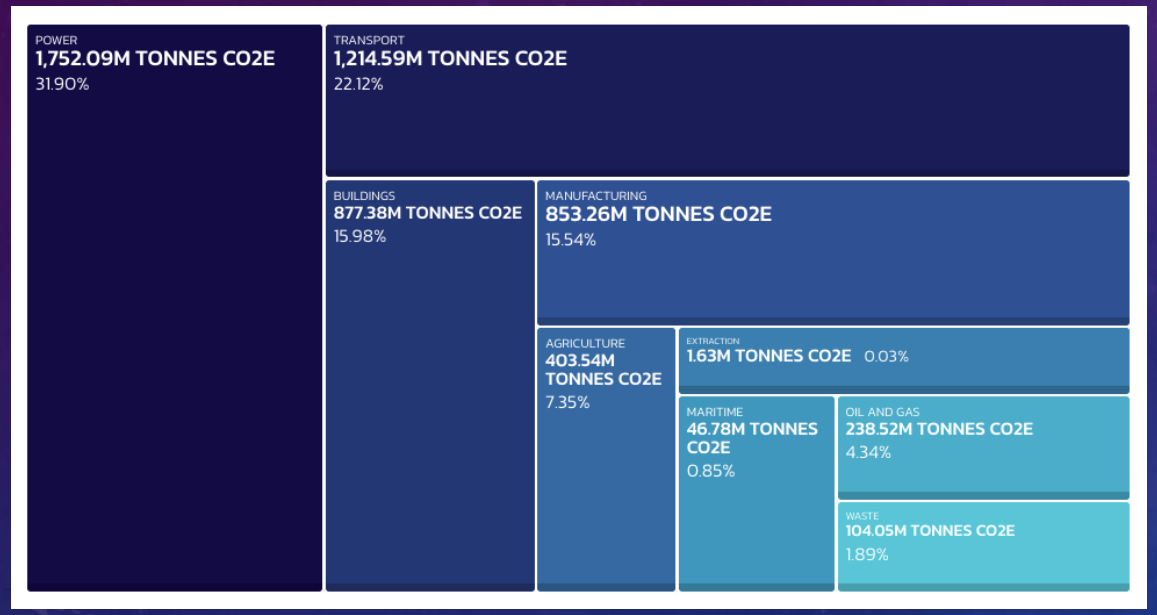
CLIMATE TRACE EMISSIONS INVENTORY

- Released in September 2021
- First emissions inventory of its kind
- Country annual estimates
- 2015-2020 period
- 10 sectors and 38 subsectors

Explore the inventory



CLIMATE TRACE EMISSIONS INVENTORY

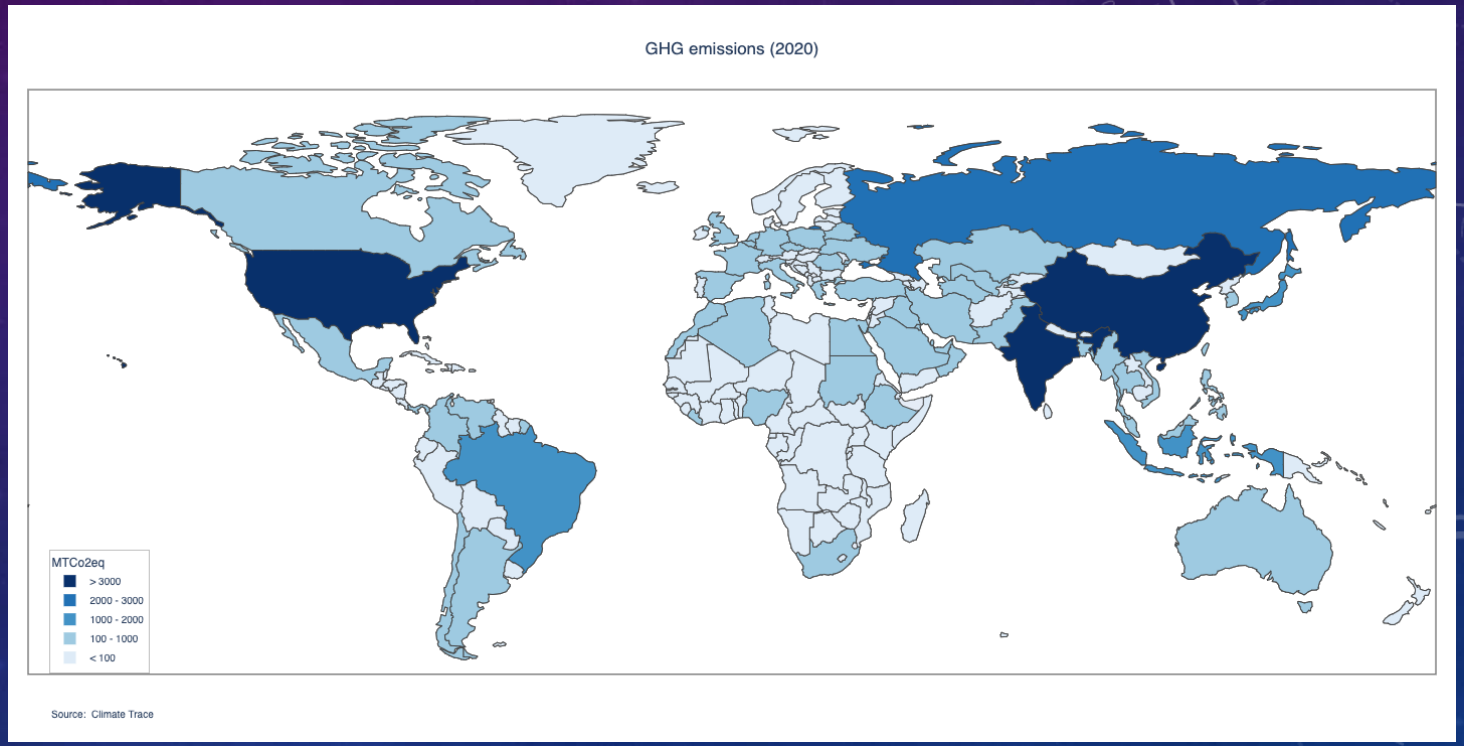


Emissions by sector from Germany

Trend emissions by sector from Germany

MY LITTLE CONTRIBUTION

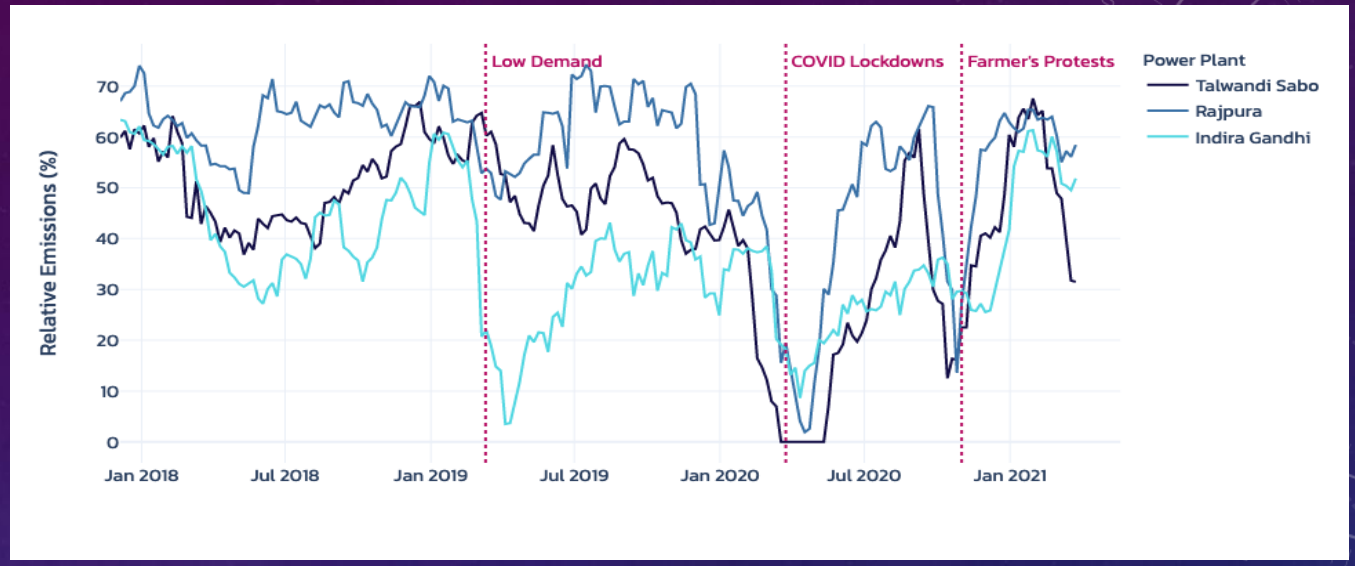
- Python made interactive world map based on Climate TRACE inventory.
- GHG emissions, GHG emissions per capita, emissions by sector.
- Article published in Towards Data Science
- Maps available on Plotly Chart Studio



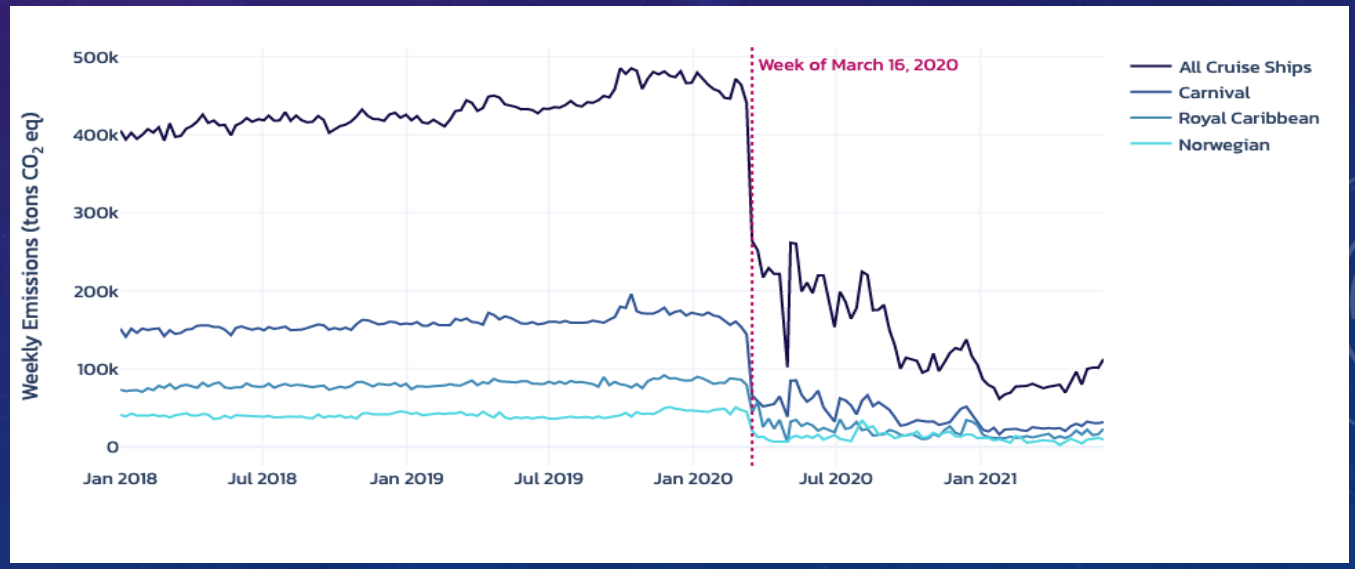
INCOMING UPDATES

New features include:

- Data recency: near-real-time data.
- Time-series data granularity
- Asset-level spatial granularity
- Asset detection



Documenting emissions fluctuate at three coal-fired power plants in India



Documenting Maritime emissions from cruise ships after COVID-related restrictions
Source: Climate TRACE

WHY IS CLIMATE TRACE DATA RELEVANT

- **Radical transparency**
  - **where** assets are located
  - **when** emissions causing activities are happening
  - **how much** emissions result from those activities
- **Innovative GHG emission monitoring methodologies.**
  - Granular and in-near-real time
  - Not dependent upon legacy methods and their potential shortcomings (self-reporting, coverage gaps…)
- **Accountability** (regulatory, corruption, emission leakage, naming and shaming)
- **Empower Global South**
- Advance **more ambitious targets** and policies (e.g. Paris Agreement)
- Support **climate litigation**
- Support and improve current climate instruments and regulations
  - **Carbon offset**
  - **Cap-and-trade systems** (towards a single, global instrument?)

Thanks for your attention!

Questions?