USING REMOTE SENSING TO REVEAL AIR POLLUTION SOURCES AND TRENDS

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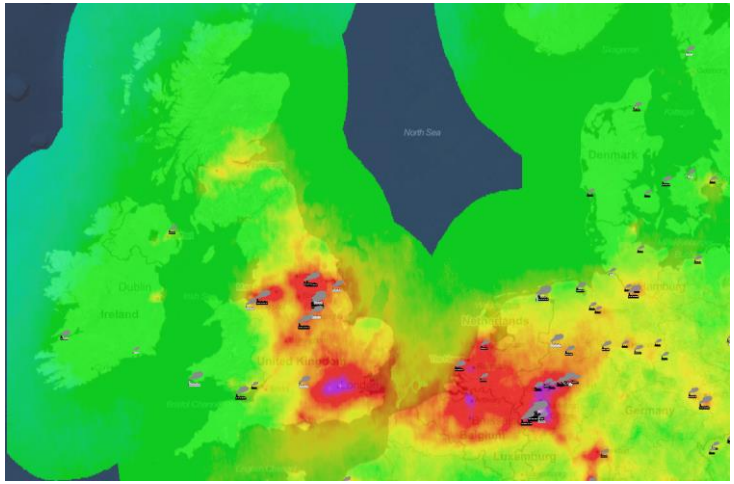
Copernicus' support to Sustainable Development Goals and International Agreements' Industry workshop - 24/01/2019

Introduction

- Who are Greenpeace?
  - The Greenpeace Research Laboratories
  - The Global Air Pollution Unit
- How does Greenpeace work with Earth Observation Data?
  - Case Stydy 1: Beijing Winter Smog
  - Case Study 2: India National Clean Air Programme
  - Case Study 3: Global Hotspots with TROPOMI
- What is the impact of our work?
  - Monitoring compliance and progress
  - National/Regional policy/commitments
  - The SDGs



Greenpeace

- an organisation guided by science;
- an independent global campaigning network;
- 26 independent national/regional organisations in over 55 countries.

Greenpeace Research Laboratories

- Established 1987
- Now based at the University of Exeter
- Scientific Research
- Critical review of Greenpeace work
- Training and Technical support
- **Bearing Witness**

Air Pollution Unit

- Scientists: technical modelling, monitoring and data capability
- Campaigners: communication and political capacity
- Finland, China, South Korea and UK

Asessing Policy Impact

Beijing Autumn-Winter 2017

- In October, the Chinese government aimed to cut winter levels of PM by 15%, compared to the previous year.
- Cement, steel, aluminium and coking plants operations restricted and construction projects halted
- Fast, reactive analysis of data from NASA's OMI instrument
- Satellite measurements revealed
  - historic drops in SO_2 and NO_2
  - SO_2 levels 50% compared with the same period in 2016

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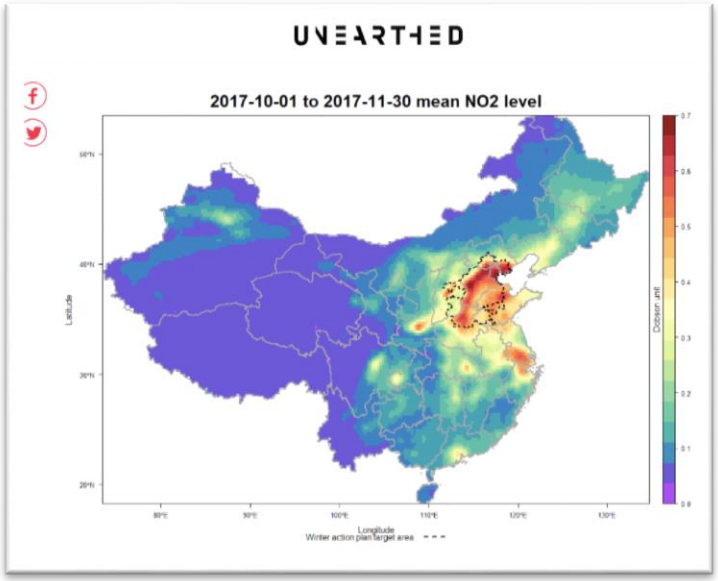
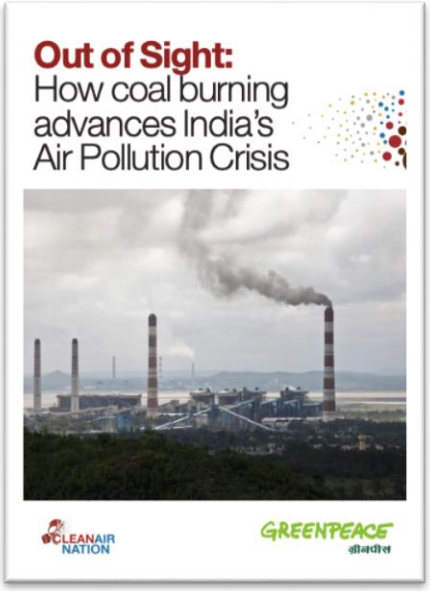


Towards New Policy in India



- 2016 Greenpeace 'Out of Sight' Report
- Debate at the time focussed on visible pollutant sources in urban areas, traffic and solid fuel burning.
- Data from NASA's OMI instrument revealed sources and pollutant concentration trends at a time of increasing coal use in power generation

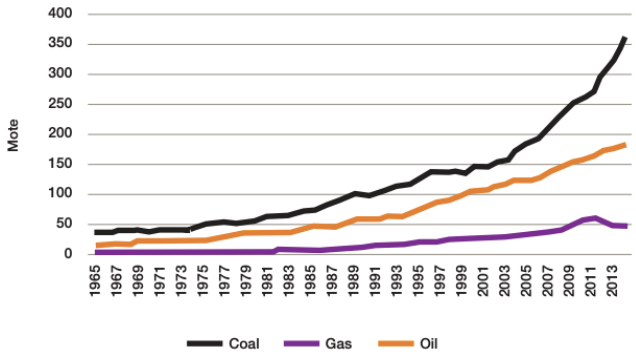
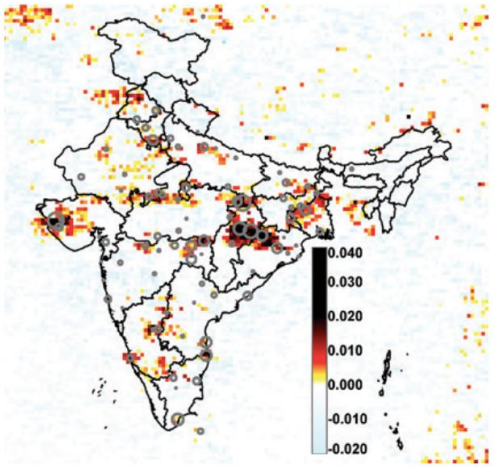
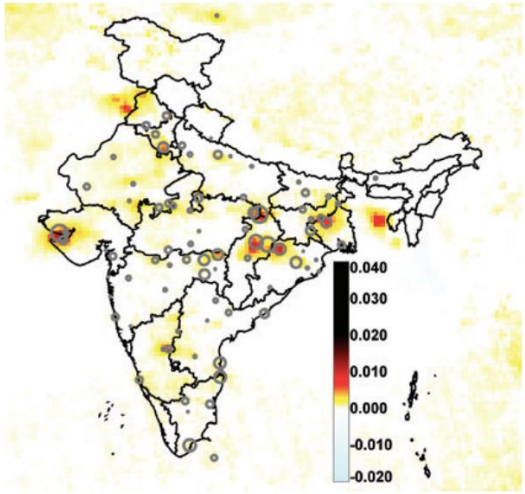


Figure 3: Fossil fuel consumption in India

Towards New Policy in India



Average change in SO_2 levels from 2009-2015



Average change in NO_2 levels from 2009-2015

- Changes in annual mean $PM_{2.5}$, SO_2 and NO_2 column amount across India
- 2009 to 2015 anomalies highlight the impact of increased industrial coal use
- January 2019 India's National Clean Air Programme was announced
- Targets include 20% to 30% reduction of $PM_{2.5}$ & PM_{10} by 2024
- SDG 11.6

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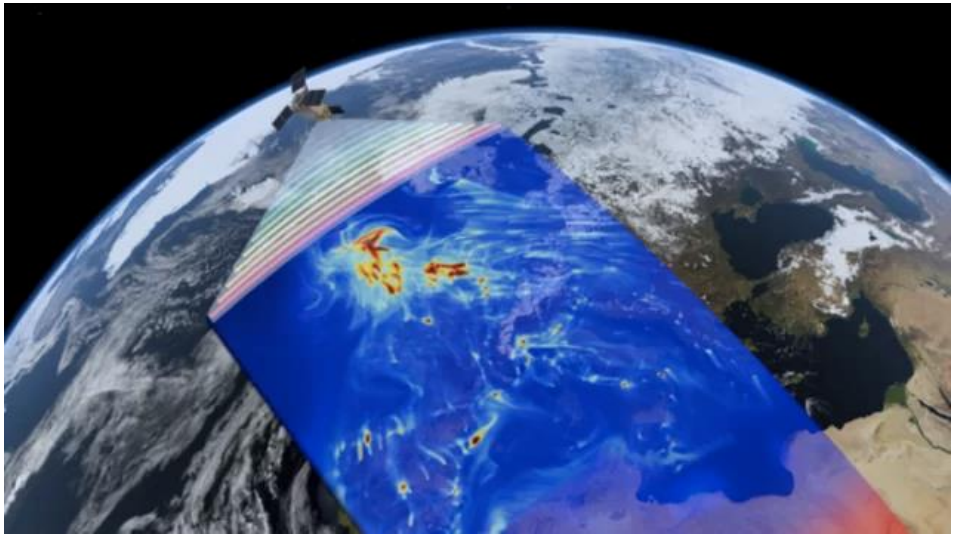
Govt launches National Clean Air Programme to tackle air pollution: Key features

Union Minister of Environment, Forest and Climate Change, Dr Harsh Vardhan just launched the National Clean Air Programme (NCAP) that aims to reduce toxic particulate matter by 2024, taking 2017 as the base year.

TROPOMI Analysis

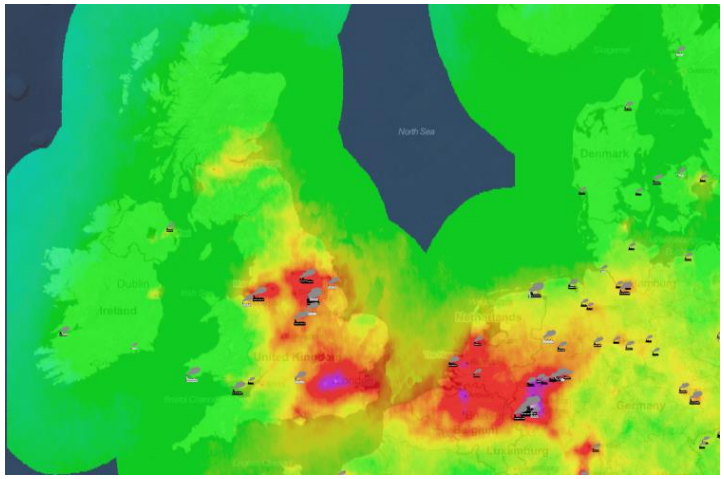


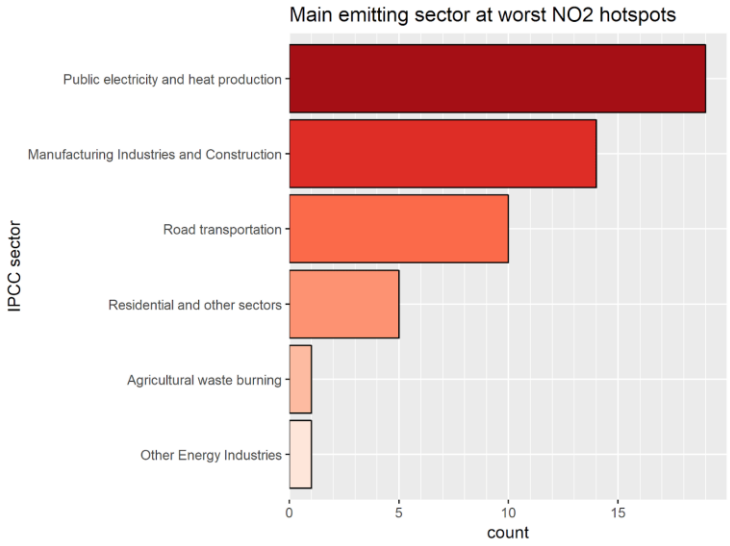
Sentinel 5P & TROPOMI

- New ESA Satellite
- Producing data since June 2018.
- Unprecedented high resolution global data
- Scanning 6 major air pollutants daily and globally.
- NO_2, O_3, SO_2, CH_4, CO and Formaldehyde

1. Designed to coinside with the First WHO Global Conference on Air Pollution and Health Oct/Nov 2018 & Asian Smog season
2. Using the first three months of data from TROPOMI
3. Satellite retrieval highlights ‘hotspots’ with greatest column NO_2
4. Highlighting a link with major fossil fuel emission sources

TROPOMI Analysis

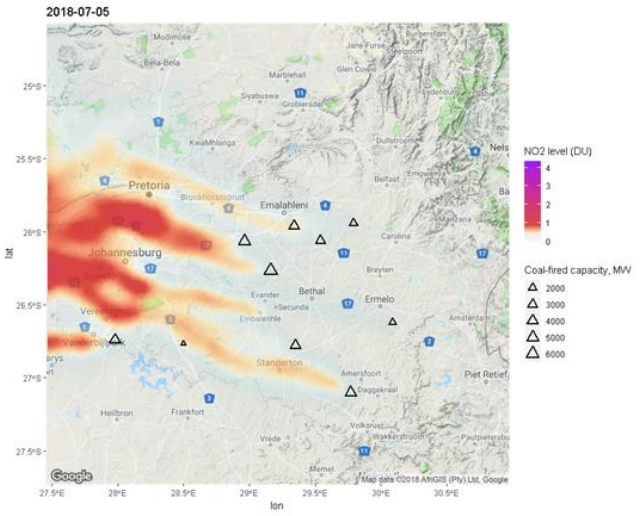


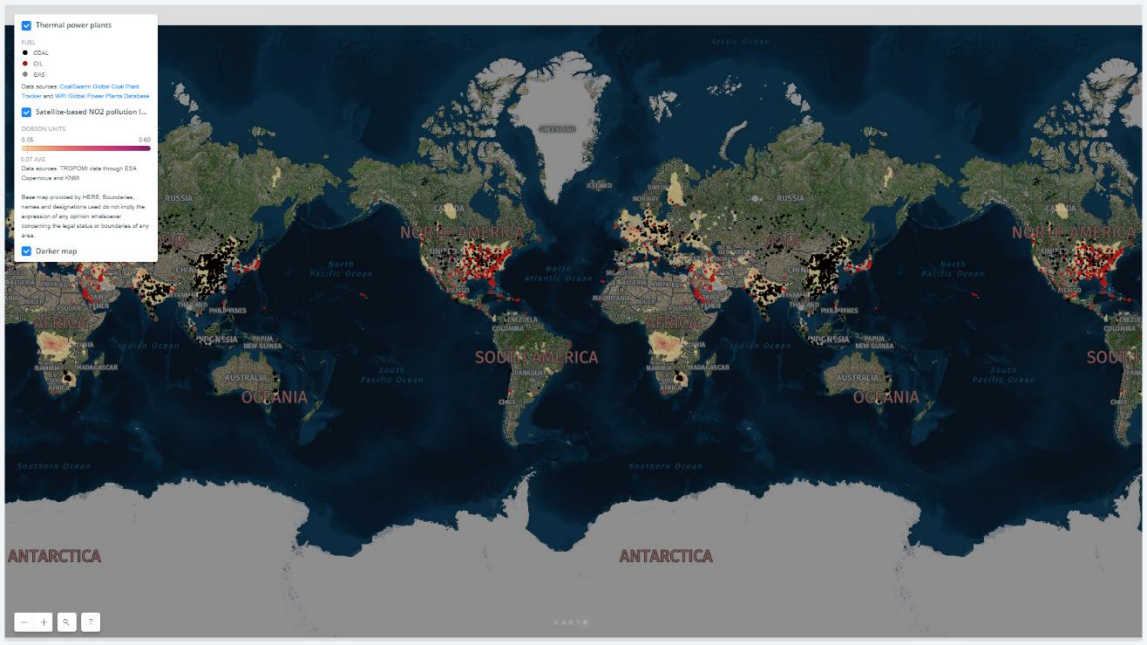


- Offline processed data from TEMIS (until Aug 14)
- Near-real time data from Copernicus (Aug 15-31)
- Gridded to a fixed 0.025x0.025 degree grid
- Identified ‘hotspots’, a circle with a radius of 25km, centered on the cell with the highest column NO_2
- Combined with the EDGAR Global Emissions Inventory

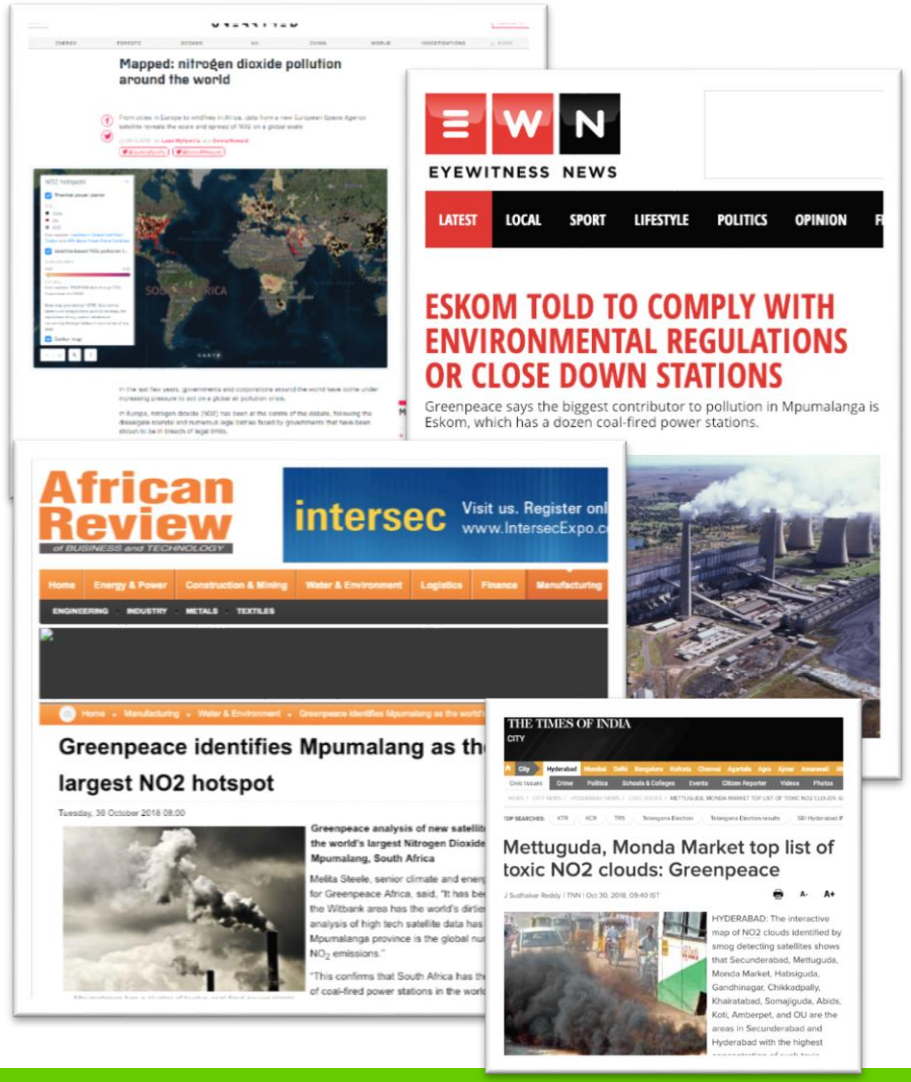
TROPOMI Analysis

- List of the 50 largest ‘hotspots’ globally by sector (power/transport/industry/agriculture)
- Interactive maps
- Animations and satellite images showing plumes





TROPOMI Analysis



- Press in :

Belgium, UK, Australia, South Africa, Germany, China, Pakistan, Middle East, Argentina, Hungary, India.

- Presentation of to South African parliament November 21st 2018

- New collaborations with research groups in Europe to develop new data products from TROPOMI

- **Next phases**
  - **SO_2**
  - **Annual Data**
  - **Identifying Sources**

The SDGs

Goal 3: Healthy lives and wellbeing

3.9 …reduce the number of deaths and illnesses from … air, water and soil pollution.

3.9.1 Mortality rate attributed to household and ambient air pollution

Goal 13: Take urgent action to combat climate change and its impacts

Identifying sources, and publicising impacts

Goal 11: Safe, sustainable cities

11.6 By 2030, reduce the adverse environmental impact of cities, …paying special attention to air quality…

11.6.2 Annual mean levels of fine particulate matter in cities

Monitoring progress and change

Goal 12. Sustainable consumption

12.4 By 2020, …environmentally sound management of waste …and significantly reduce their release to air …

12.4.1 Number of parties to international multilateral agreements

Evidence Base

Conclusions

- NGOs have a strong track record using EO data

- Copernicus' full, free and open data products are invaluable
  - 'bearing witness'
  - blue skies research
  - campaining evidence base
  - monitoring progress, change and enforecment

- Wish list
  - Data interfaces to streamline processing
  - Short timescales, campaigning work can move fast


Greenpeace Science Unit
scienceunit.greenpeace.org