Sense and Sustainability- How do we know we are making the right choices?

On the occasion of the Fourth Basel Sustainability Forum: Health
University of Basel, Basel, Switzerland

"Thomas Edison said, "Vision without execution is just hallucination." In California, we might use more marijuana and magic mushrooms than anywhere else, but when it comes to the environment, we in California never hallucinate."
Arnold Schwarzenegger, 28 May 2019 at the R20 Austrian World Summit

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Community Engagement, Citizen Science, Sustainability & the BreatheLife Campaign
WHO/PHE/Healthier Populations
http://www.who.int/airpollution/

WHO AS A CUSTODIAN AGENCY:

THE DIVISION OF HEALTHIER POPULATIONS IS CENTRAL TO WHO EMBRACING THE SDGS

Violence prevention

Climate change and health

Safe and sustainable consumption

(1) Healthy cities with clean air

Health equity

Poverty-health nexus

Nutrition and safe food (1)

Better health through reduced risks (3)

Health literacy

Violence prevention

Water, sanitation and hygiene (6)

Clean energy for all (1)

Decent jobs

World Health Organization

Sustainable Development Goal 3

Ensure healthy lives and promote wellbeing for all at all ages

Globally, there have been improvements in most of the health-related SDG indicators Recent years have seen improvements in 24 (56%) of the 43 health-related SDG indicators tracked in World health statistics 2019* (Table 3). However, at a global level, progress has stalled or trends are in the wrong direction for five of those 43 indicators:

road traffic mortality, children overweight,
malaria incidence, alcohol consumption,
water.

SDG indicators with explicit targets for 2030

Progress stalled or trend in wrong direction	
3.6.1	Road traffic mortality
Progress made but too slow to meet target	
3.1.1	Maternal mortality
3.4.1	NCD mortality
3.4.2	Suicide mortality
6.1.1	Safe drinking-water coverage
6.2.1	Safe sanitation coverage
7.1.2	Clean energy coverage
Progress fast enough to attain target	
3.2.1	Under-5 mortality
3.2.2	Neonatal mortality

Table 3
Trends in health-related SDG indicators

Programme area
- Reproductive, maternal and child health
- Infectious and noncommunicable diseases
- Injuries, violence and environmental risks
- Health systems and financing

* Four of the health-related SDG indicators in the official list of SDG indicators (8) have more than one component (Indicators 2.2.2, 3.8.2, 3.b.1, 3.c.1). Where this is the case, each component is treated as a separate indicator in World health statistics 2019. The 43 indicators tracked have 36 unique indicator numbers in the official list of SDG indicators.

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Sustainable Development Goal 3

Ensure healthy lives and promote wellbeing for all at all ages

SDG indicators with no explicit targets for 2030

Progress stalled or trend in wrong direction	
2.2.2	Children overweight
3.3.3	Malaria incidence
3.5.2	Alcohol consumption
6.a.1	Water sector ODA
Progress made	
3.1.2	Skilled birth attendance
3.7.1	Met need for family planning
3.7.2	Adolescent birth rate
2.2.1	Stunting in children
3.b.1	DTP3 coverage
	MCV2 coverage
	PCV3 coverage
3.3.1	New HIV infections
3.3.2	Tuberculosis incidence
3.3.4	Hepatitis B prevalence
3.3.5	Need for NTD interventions
3.a.1	Tobacco use in persons ≥15 years
16.1.1	Homicide
3.9.3	Poisoning mortality
3.b.2	ODA medical research & basic health sectors
1.a.2	Domestic government health expenditure

Trend not yet reported	
2.2.2	Wasting in children
3.9.1	Air pollution mortality
3.9.2	Unsafe water and sanitation mortality
5.2.1	Intimate partner violence
11.6.2	Fine particulate matter in urban areas
3.8.1	UHC service coverage index
3.c.1	Medical doctor density
	Nurse/midwife density
	Dentist density
	Pharmacist density
3.d.1	International Health Regulations capacity
3.8.2	Household health expenditures >10%
	Household health expenditures >25%
17.9.2	Completeness of cause-of-death data

Table 3
Trends in health-related SDG indicators

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World Health Organization

The Data Must Flow

We've seen improvements in recent years. We should recall that Hans Rosling's visualizations reveal progress. But…

How do we know we are making the right choices?

Data availability is the key-
Both the data and data flow from member states and partners needs improvement to allow the world to track progress.

The World health statistics 2019 report for the first time reviews the "the availability of country data for global SDG reporting".
= Major improvements are needed to country data systems:

- 1 in 7 indicator country values included in the report have had no underlying data since 2000; low- and lower-middle-income countries in particular lack underlying data;

- for one third of countries, over half of the indicators have no recent underlying data;

- 11 health-related SDG indicators require cause-of-death data, yet only around half of countries are able to register more than 80% of adult deaths, and less than one third of countries have high-quality data on cause of death; and

- sex disaggregation is currently available for less than half (11/28) of relevant health-related SDG indicators at global level where it would be of interest.

The progress of SDG goals is slowed when we have "incomplete or outdated information on several health-related indicators. The countries lacking underlying data are often those with limited resources and the greatest health need."

Good quality data = better healthcare resource planning and interventions (well, better resource planning for anything)

We must "Invest in data systems for health, including disaggregated data."

When data is disaggregated by social and environmental factors such as gender, residential location, education, income level, fuel and emissions standards, and other factors, we have a better chance of reducing inequalities.

"Routine information systems, health facility or household surveys, and civil registration and vital statistics systems must be designed to provide relevant, timely and accurate data."

Source: WHO 2019 MONITORING HEALTH FOR THE SDGs report

How can everyone measure progress for health and related SDGs?

How do we know interventions are working? How do we measure impact?


3.1 Maternal mortality


3.2 Newborn and child mortality


3.3 Communicable diseases


3.4 Noncommunicable diseases and mental health


3.5 Substance abuse


3.6 Road traffic injuries


3.7 Sexual and reproductive health


3.8 Universal health coverage


3.9 Mortality from environmental pollution


3.a Tobacco control


3.b Development assistance and vaccine coverage


3.c Health workforce

SUSTAINABLE DEVELOPMENT GOALS

Clean Energy & Clean Air are possible

Universal Health Coverage is possible

Progress is possible

3 GOOD HEALTH AND WELL-BEING

Identify social and environmental determinants of health (risks) in your communities and vulnerable communities and groups. Then measure them and make the data open. Open data is transparency and low-cost capacity


3.d National and global health risks


1.a Mobilization of resources


2.2 Child malnutrition


6.1 Drinking water


6.2 Sanitation and hygiene


7.1 Clean household energy


11.6 Clean cities


13.1 Natural disasters

16.1 Violence


17.19 Statistical capacity-building

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

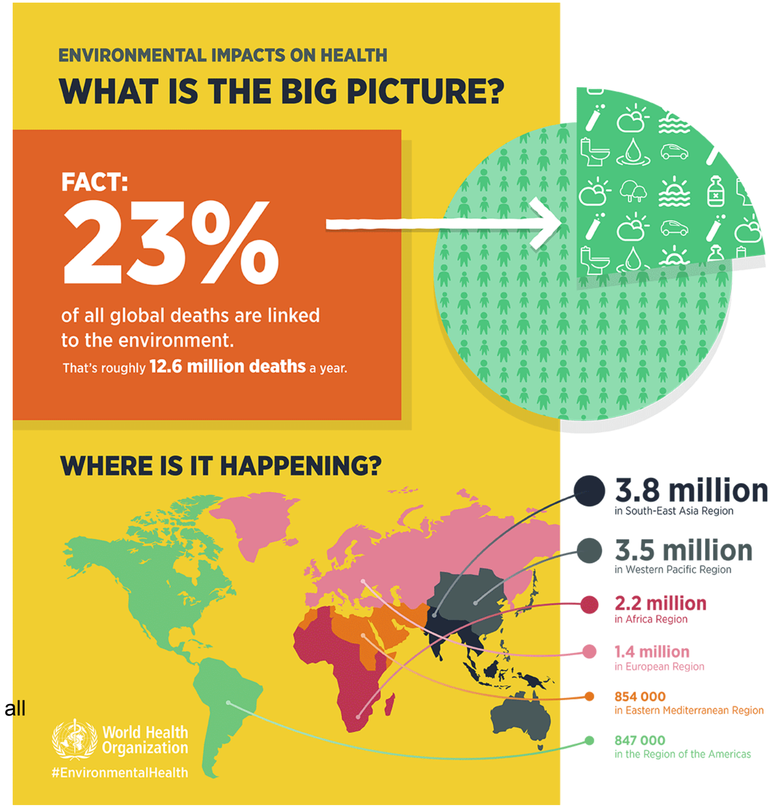
Our energy choices impact the health of millions

We must monitor, manage/control, and find sustainable methods for humanities activities that impact our environment

Environmental health risks cause more than 12.6 million deaths (almost 1 in 4 deaths) a year.

Air pollution is the greatest environmental health risk in the world causing 7 million deaths a year.

Air pollution damages crops and poses a risk to both water and food security

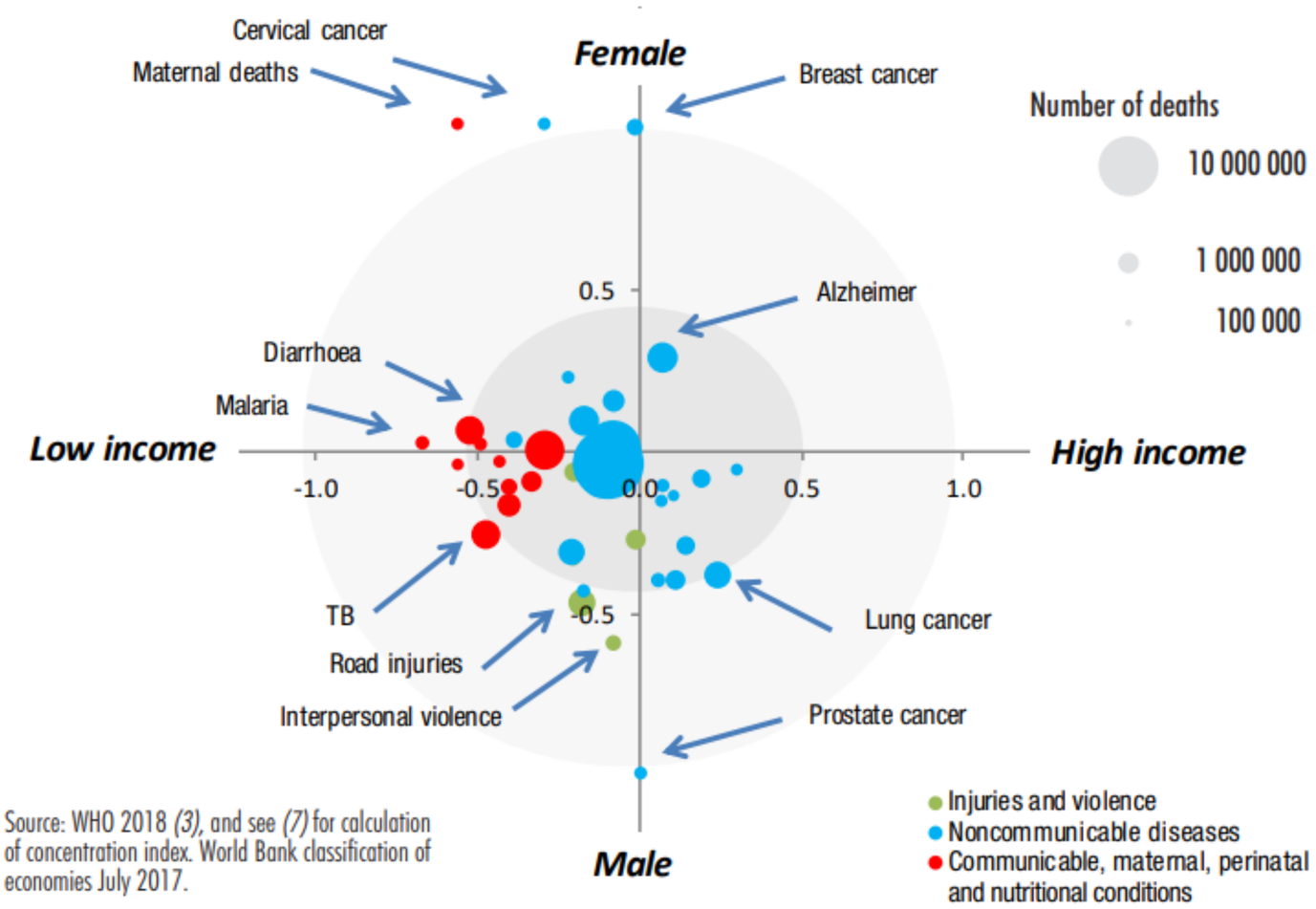


Goal 1. End poverty in all its forms everywhere
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5. Achieve gender equality and empower all women and girls
Goal 6. Ensure availability and sustainable management of water and sanitation for all
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 10. Reduce inequality within and among countries
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12. Ensure sustainable consumption and production patterns
Goal 13. Take urgent action to combat climate change and its impacts

Who are the most vulnerable? Where can the most impact be achieved?

We can save 97 million lives or 535 million life years if we invest USD$ 3.9 trillion over the next 15 years

Fig. 6
Concentration of deaths according to national income of countries and sex, 2016



Source: WHO 2018 *(3)*, and see *(7)* for calculation of concentration index. World Bank classification of economies July 2017.

Points represent the 40 leading causes of death globally, with their areas being proportional to the number of deaths in 2016. Selected causes are labelled; space does not permit labelling of all causes. The concentration index is used to summarize the extent to which deaths from a disease are concentrated in high- or low-income countries, or in males or females. The index ranges from –1 to 1: a value of 0 indicates no association with national income or sex, and a value of –1 or 1 indicates that a disease occurs exclusively in males or females or in low-income or high-income countries (e.g. maternal deaths occur exclusively in women and are concentrated in low-income countries, whereas lung cancer is concentrated in high-income countries and occurs more in males).

SOURCE: WHO 2019 - MONITORING HEALTH FOR THE SDGs

TOP 10 CAUSES OF DEATH FROM THE ENVIRONMENT

8.2 million out of **12.6 million** deaths caused by the environment are due to noncommunicable diseases

1st STROKE 2.5 million

2nd ISCHAEMIC HEART DISEASE 2.3 million

3rd UNINTENTIONAL INJURIES 1.7 million

4th CANCERS 1.7 million

5th CHRONIC RESPIRATORY DISEASES 1.4 million

6th DIARRHOEAL DISEASES 846 000

7th RESPIRATORY INFECTIONS 567 000

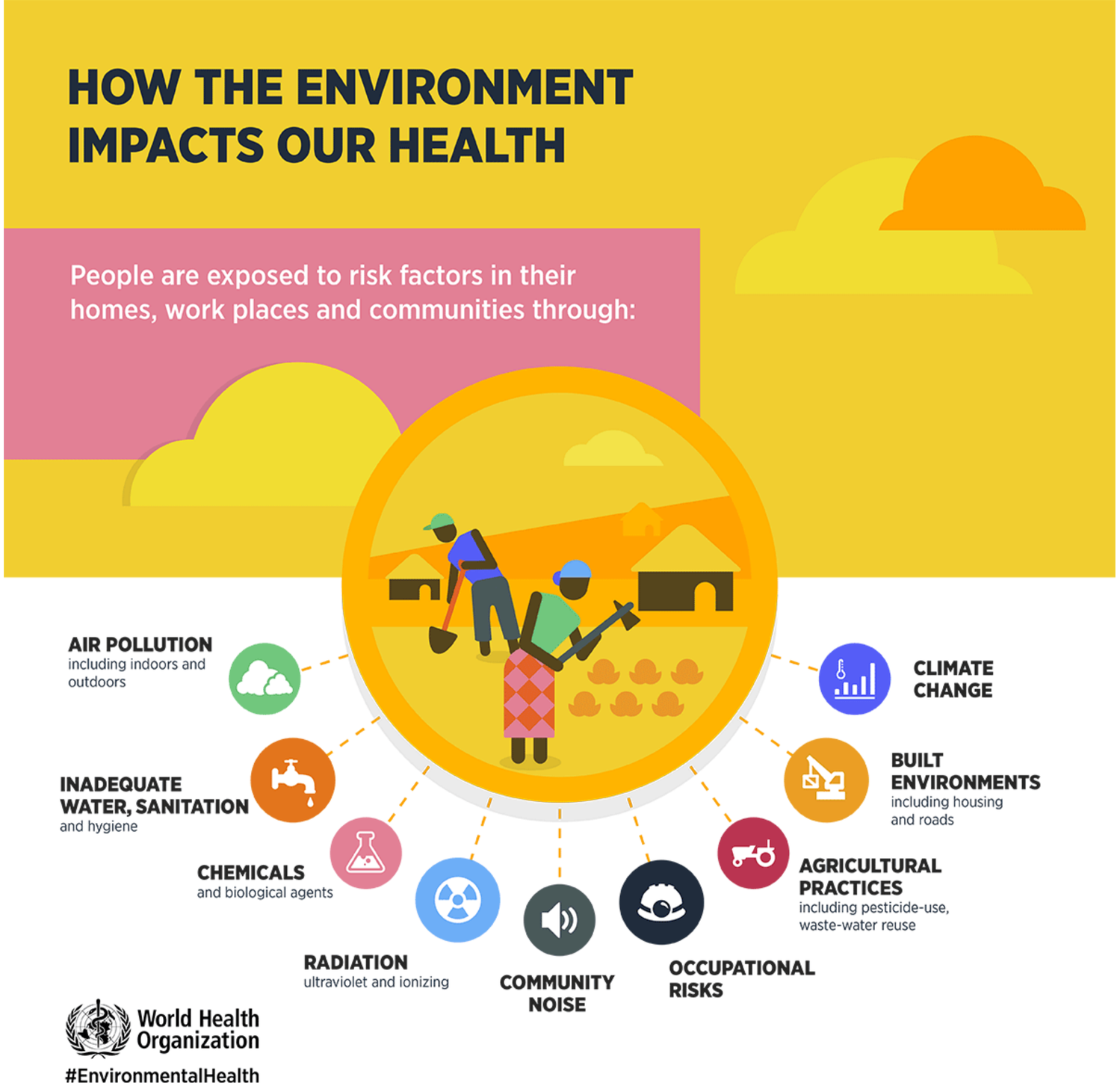
8th NEONATAL CONDITIONS 270 000

9th MALARIA 259 000

10th INTENTIONAL INJURIES 246 000

World Health Organization

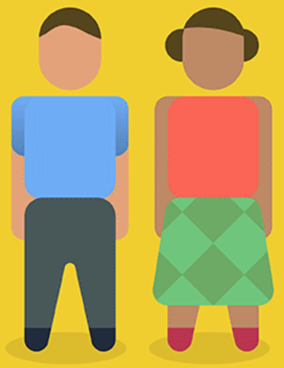
#EnvironmentalHealth


HOW THE ENVIRONMENT IMPACTS OUR HEALTH
People are exposed to risk factors in their homes, work places and communities through:
AIR POLLUTION including indoors and outdoors
INADEQUATE WATER, SANITATION and hygiene
CHEMICALS and biological agents
RADIATION ultraviolet and ionizing
COMMUNITY NOISE
OCCUPATIONAL RISKS
AGRICULTURAL PRACTICES including pesticide-use, waste-water reuse
BUILT ENVIRONMENTS including housing and roads
CLIMATE CHANGE
World Health Organization
#EnvironmentalHealth

WHO IS MOST IMPACTED BY THE ENVIRONMENT

Environmental impacts on health are uneven across age and mostly affect the poor.

Low- and middle-income countries bear the greatest share of environmental disease.



Men

are slightly more affected due to occupational risks and injuries.

Women

bear higher exposures to traditional environmental risks such as smoke from cooking with solid fuels or carrying water.

Children under five and adults between 50 and 75 years old are most affected by the environment.

YEARLY

4.9 MILLION

Deaths in adults

between 50 and 75 years. The most common causes are noncommunicable diseases and injuries.

1.7 MILLION

Deaths in children

under five. The most prominent causes are lower respiratory infections and diarrhoeal diseases.

World Health Organization

#EnvironmentalHealth

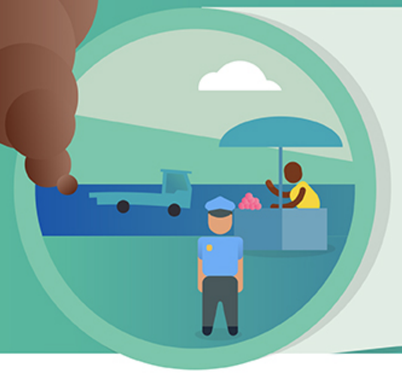
WHO IS MOST IMPACTED BY AIR POLLUTION?

Children

Pneumonia is the leading cause of death in children under five years of age. Air pollution is a major risk factor.

Women

Women working in smoky kitchens are exposed to high levels of household air pollution.



Outdoor workers

People who work outdoors, such as street vendors and traffic officers, are affected by air pollution.

CLEAN AIR FOR HEALTH

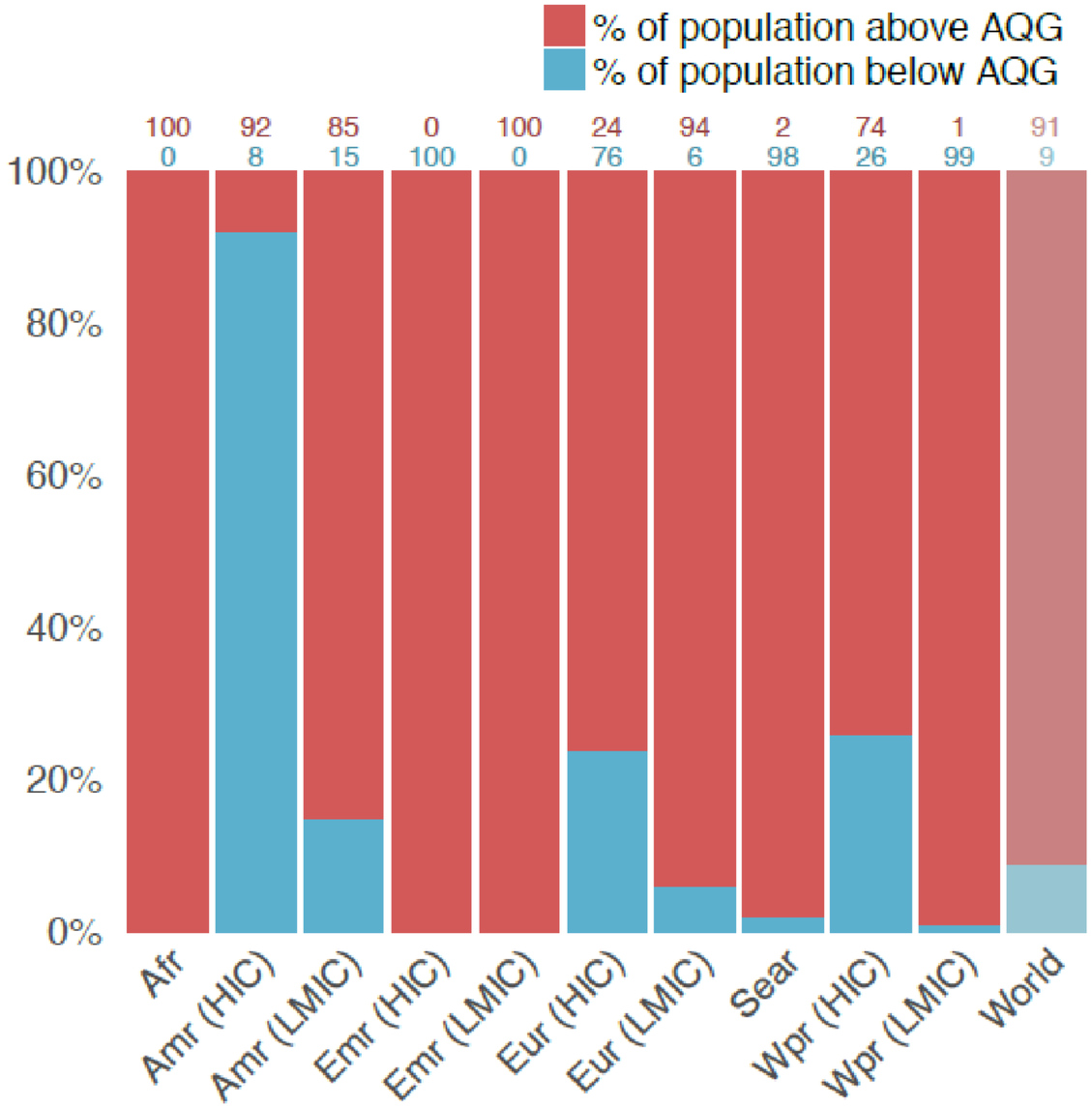
#AirPollution

World Health Organization

Exposure to air pollution in 2016

World Health Organization

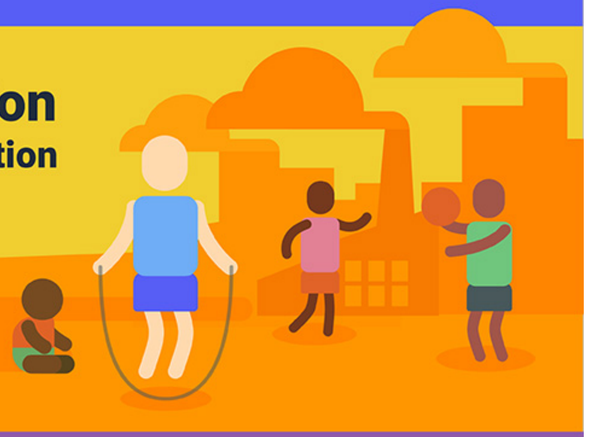
91% of world population breathe an air above the WHO Air Quality Guidelines



Afr: Africa; Amr: America; Emr: Eastern Mediterranean; Eur : Europe; Sear: South-East Asia
Wpr: Western Pacific; HIC: high-income countries; LMIC : low-and middle-income countries

AIR POLLUTION IS A GLOBAL CHILDREN'S HEALTH ISSUE

Globally 93% of all children and 630 million children under 5 years are exposed to air pollution levels* above the WHO air quality guidelines



*fine particulate matter 2.5 micrometers or less in diameter (PM2.5)

THE BURDEN OF DISEASE FROM POLLUTED AIR IS HEAVIEST IN LOW- AND MIDDLE-INCOME COUNTRIES

Percentage of children under 5 years exposed to PM2.5* levels higher than the WHO air quality guideline are:

100%
Africa & Eastern Mediterranean

99%
South-East Asia

98%
Western Pacific

87%
Americas

98% Low- and middle-income countries | **52%** High-income countries

CLEAN AIR FOR CHILDREN'S HEALTH *#AirPollution* World Health Organization

IMPACT OF AIR POLLUTION ON CHILDREN'S HEALTH

A child who is exposed to unsafe levels of pollution can face a lifetime of health impacts. Exposure in the womb or in early childhood can lead to:

- Stunted lung growth
- Reduced lung function
- Increased risk of developing asthma
- Acute lower respiratory infections

- Impaired mental and motor development
- Behavioral disorders

- Low birth weight
- Premature birth
- Infant mortality

- Childhood cancers

- Increased risk of heart disease, diabetes and stroke in adulthood

IN 2016, AMBIENT AND HOUSEHOLD AIR POLLUTION CAUSED

543,000 deaths in children under 5 years

52,000 deaths in children aged 5 -15 years

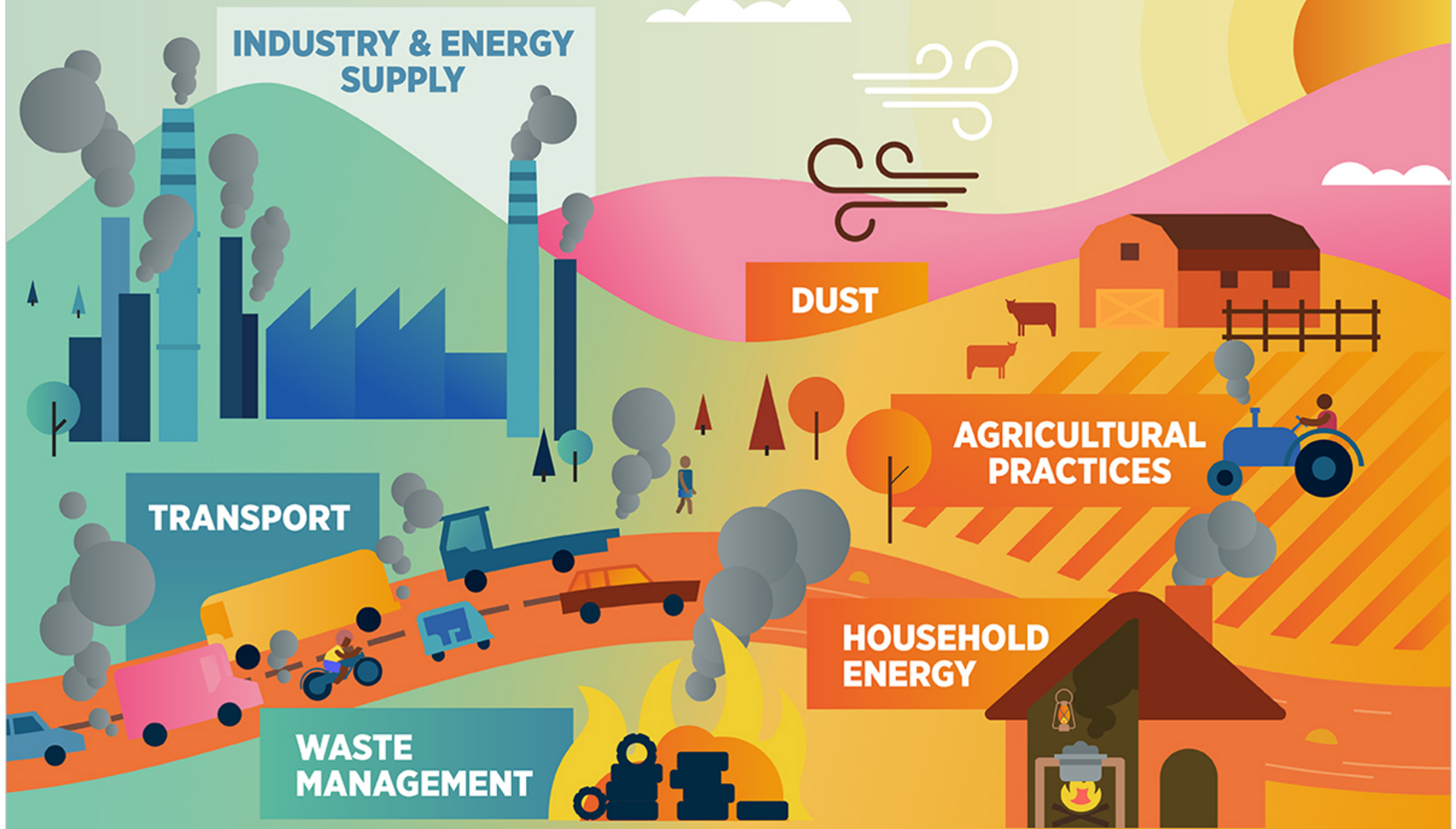
Household and ambient air pollution cause more than 50% of acute lower respiratory infection in children under 5 years in lower- and middle-income countries.

CLEAN AIR FOR CHILDREN'S HEALTH *#AirPollution*

World Health Organization

WHAT ARE THE SOURCES OF AIR POLLUTION?

Outdoor air pollution affects urban and rural areas and is caused by multiple factors:



Countries cannot tackle air pollution alone.
It is a global challenge we must all combat together.

CLEAN AIR FOR HEALTH #AirPollution World Health Organization

HOUSEHOLD AIR POLLUTION

3.8 million

die prematurely every year from household air pollution from cooking (2016). Household air pollution is mostly created by using kerosene and solid fuels such as wood with polluting stoves, open fires and lamps.

18%
from stroke

27%
from ischaemic heart disease

20%
from chronic obstructive pulmonary disease (COPD)

8%
from lung cancer

27%
are due to pneumonia

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SOLUTIONS

CLEAN AIR FOR HEALTH #AirPollution World Health Organization

WE CAN IMPROVE OUR ENVIRONMENT TO IMPROVE OUR HEALTH

These WIN-WIN strategies are fundamental to achieving the

SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

1. Apply low **carbon strategies** in energy generation, housing and the industry.

2. Use more active and **public transportation**.

3. Introduce **clean fuels** for cooking, heating and lighting and clean technologies.

4. Reduce **occupational exposures** and improve working conditions.

5. Increase **access to safe water** and adequate sanitation and promote hand washing.

6. Change **consumption patterns** to lower the use of harmful chemicals, minimize waste production and save energy.

7. Implement interventions that can increase **sun protective behaviour**.

8. Pass **smoking bans** to reduce exposure to second-hand tobacco smoke.

9. Always use a **health in all policies** approach to create healthier environments and prevent disease.

World Health Organization

#EnvironmentalHealth

Let's all work towards a healthier environment for our health.

Existing technology and policy solutions can bring clean air to 22% of the Asia Pacific population by 2030

An additional 650,000 people in the region could enjoy clean air by 2030 if a package of 25 Clean Air Measures is implemented starting today.

Source: https://www.ccacoalition.org/en/resources/25-clean-air-measures-asia-and-pacific

Air Quality Monitoring - Regulatory monitors

What do we really need to measure very accurately?
SDG progress is one thing. But, using sensors as detectors also allows us to make informed decisions in real-time and respond to health and safety events more quickly. More on practical applications of sensors later.

Regulatory continuous emission monitoring stations allow governments to provide high accuracy data typically to enforce national and state or local emissions standards.

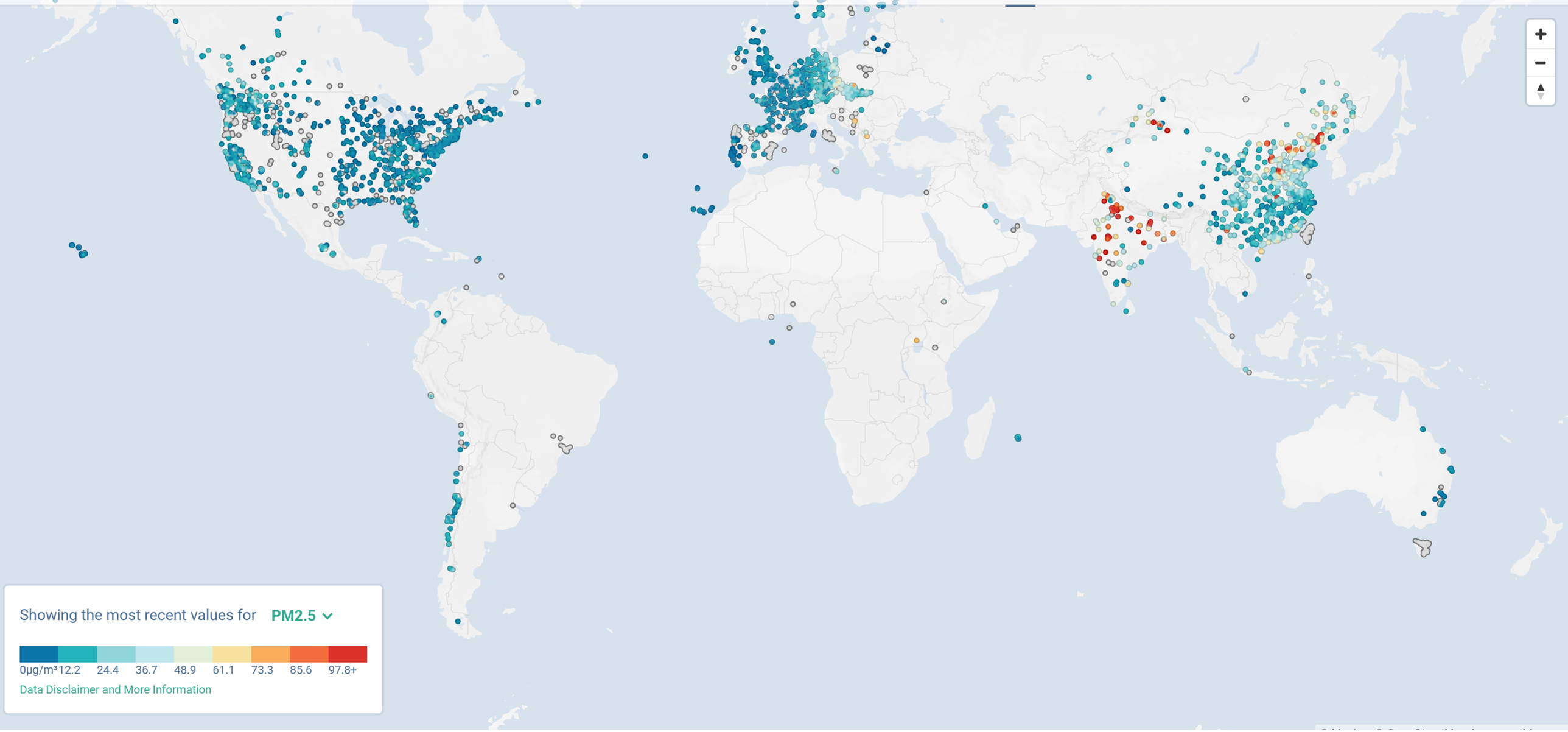
Many governments in recent years provide open real-time data through the internet. Each month more regulators provide streaming APIs that enable researchers, citizen scientists, and others can gain insights and better understand air pollution around our cities.

Regulatory monitors are not perfect
- have margins of error;
- are expensive to maintain & frequently have
  Downtime = Knowledge Gap
- They do provide correction factors for low-cost and remote sensing systems.

https://openaq.org/#/map?_k=6sc8v7

openaq

Home Data Map Community Blog FAQ About



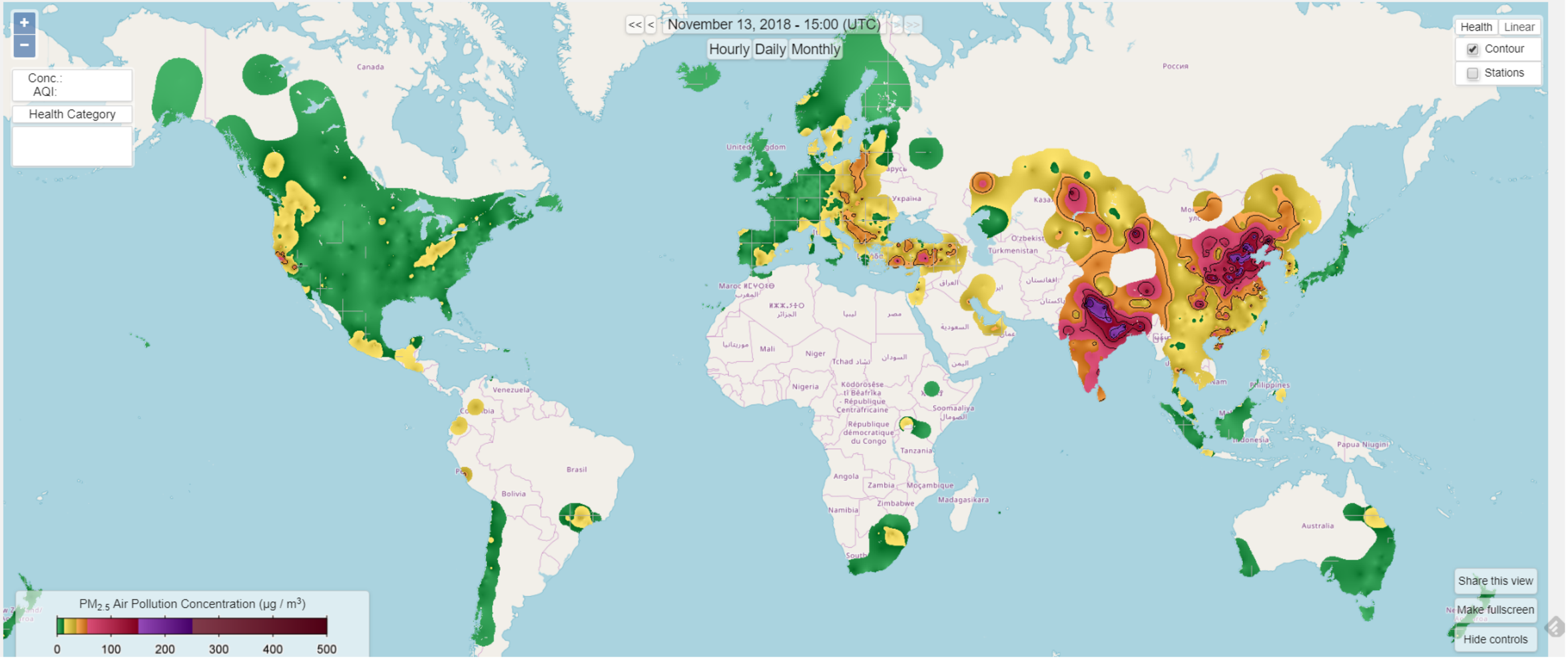
Showing the most recent values for PM2.5

0µg/m³ 12.2 24.4 36.7 48.9 61.1 73.3 85.6 97.8+

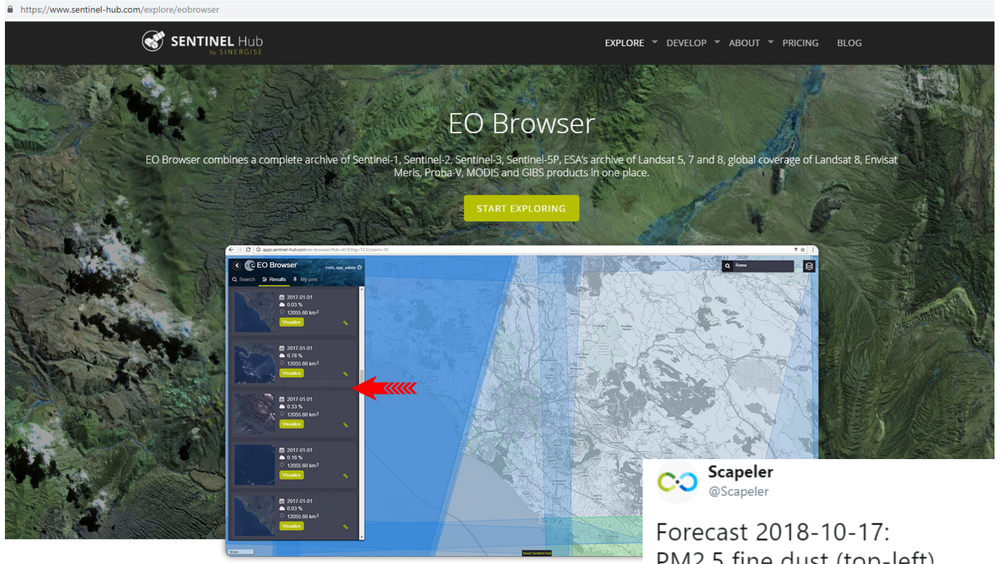
Data Disclaimer and More Information

Not secure | berkeleyearth.org/air-quality-real-time-map/

- Whole Earth
- Asia
- Australia
- Europe
- North America
- Canada
- Chile
- China
- France
- Germany
- India
- Japan
- Malyasia
- Poland
- South Korea
- Spain
- Sweden
- Turkey
- United States
- United Kingdom
- Bangkok
- Beijing
- Chengdu
- Delhi
- Dhaka
- Istanbul
- Kyoto
- London
- Los Angeles
- Mumbai
- New York City
- Paris
- Seoul
- Shanghai
- Tokyo



Environmental Monitoring
-
Remote Sensing



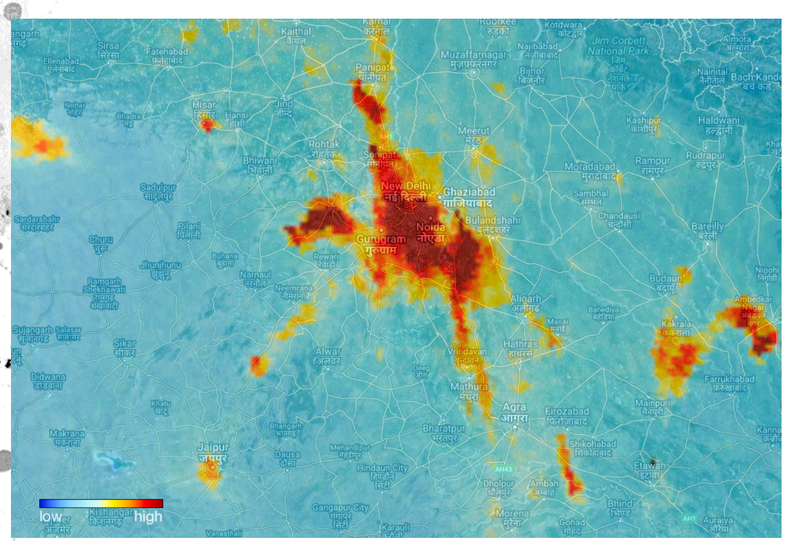
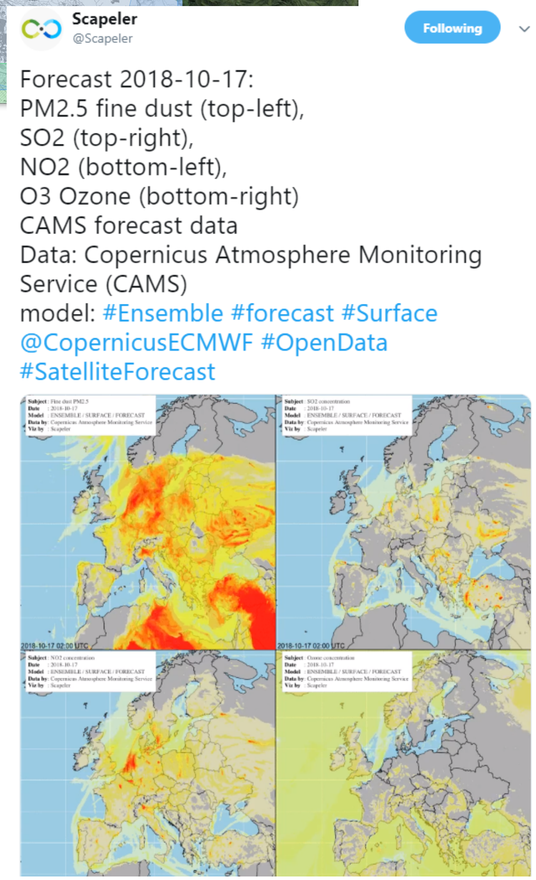


Image credit: Pollution over Delhi from Sentinel-5P 10NOV2017



NASA's Worldview & Suomi/VIIRS, 08NOV2018 – Inset: ESA's Sentinel 5P Tropomi instrument Carbon Monoxide 10NOV2017

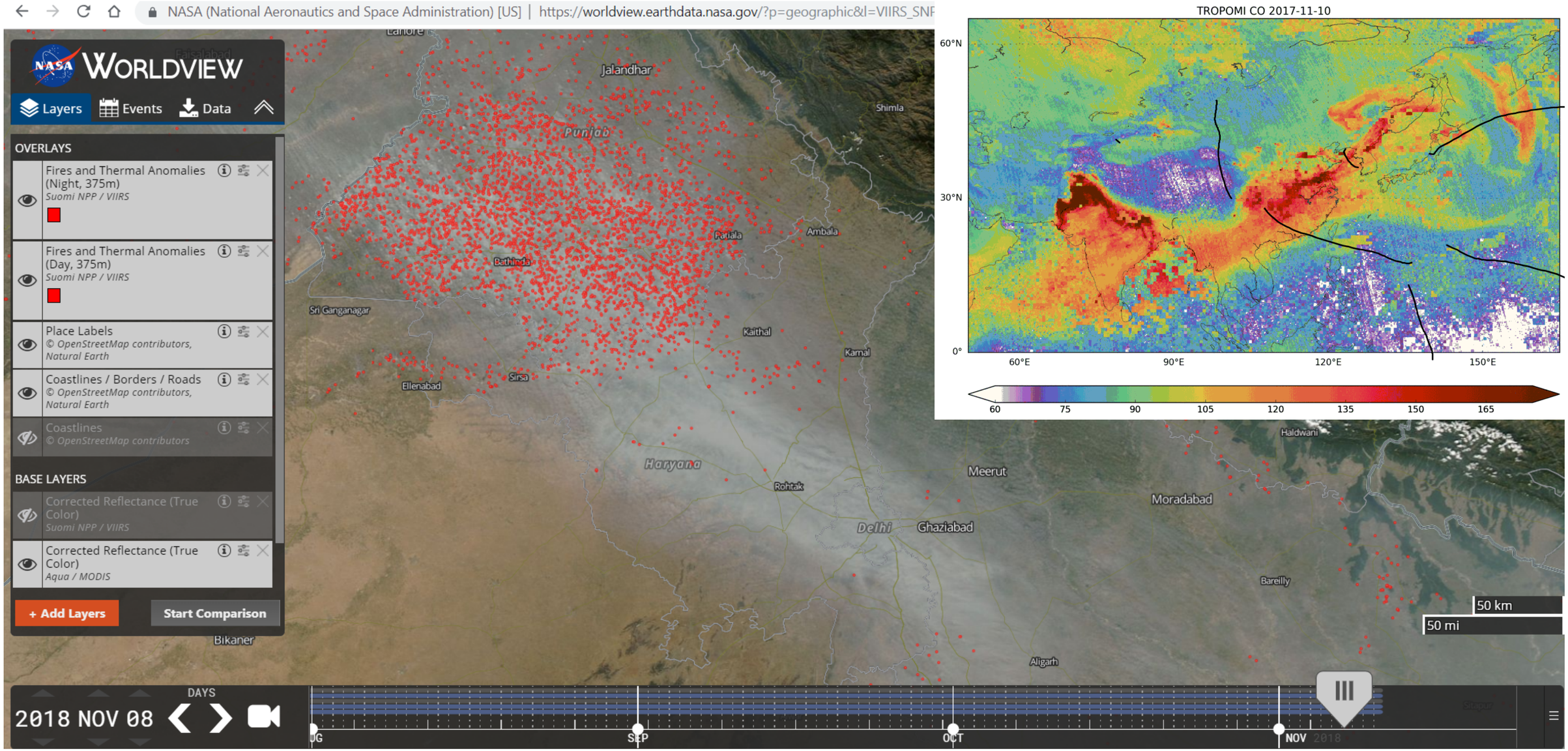


Image Credit: NASA - https://worldview.earthdata.nasa.gov

Earth:

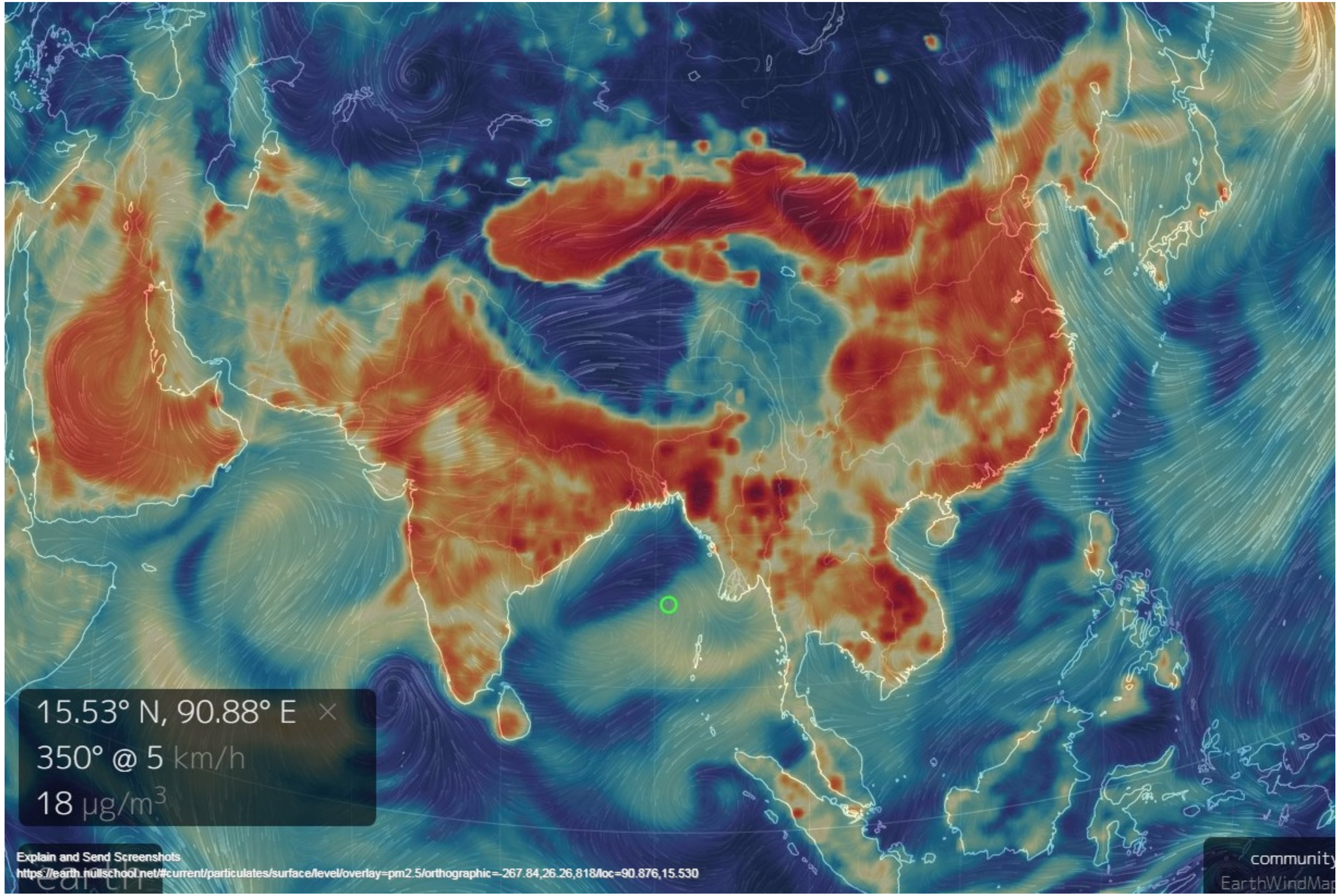
www.earth.nullschool.net

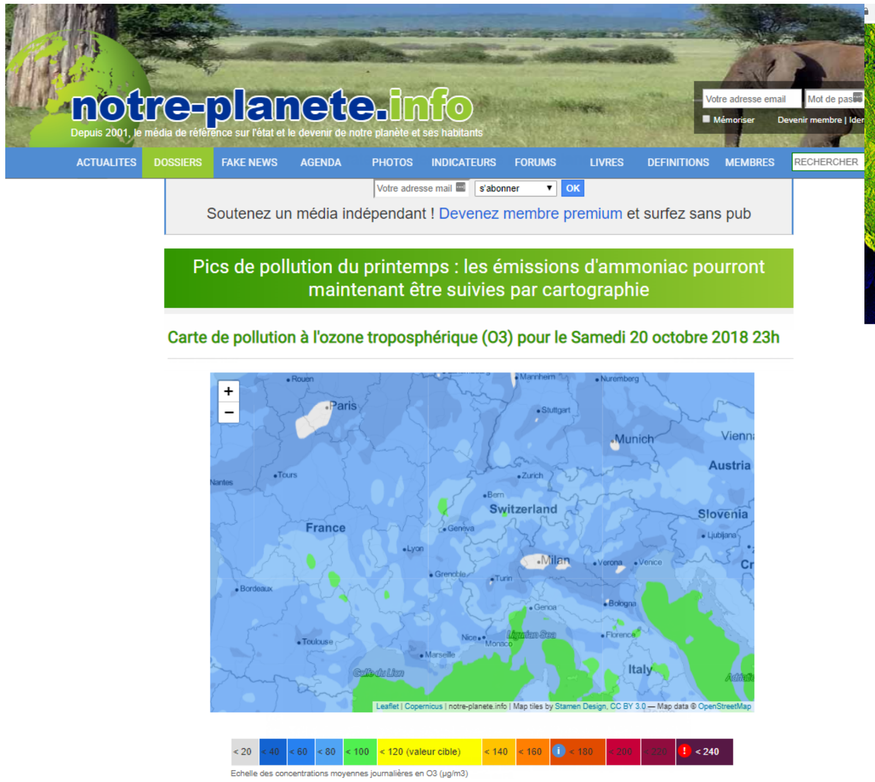
a visualization (artistic model) of global weather and air quality conditions “forecast by supercomputers and updated every three hours.”

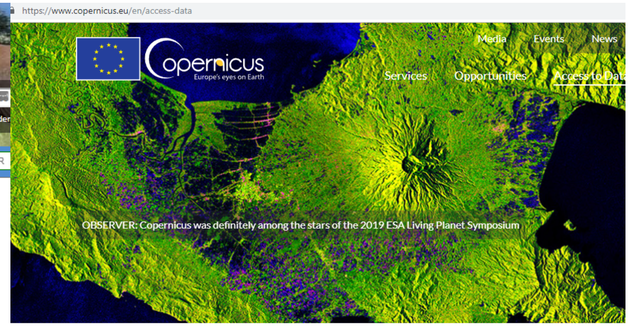
ocean surface current estimates updated every five days

Provides aerosol and chemical layers from NASA’s GEOS-5 (Goddard Earth Observing System)
&
ESA’s CAMS (Copernicus Atmosphere Monitoring System)

Twitter @cambecc







DIAS

Conventional Data Access Hubs

Access to Data

Copernicus builds on a constellations of satellites making million of thousands of land-, air- and marine-based sensors to create t

The TROPOspheric Monitoring Instrument (TROPOMI) is the satellite instrument on board the Copernicus Sentinel-5 Precursor satellite. The Sentinel-5 Precursor (S5P) is the first of the atmospheric composition Sentinels, launched on 13 October 2017, planned for a mission of seven years.

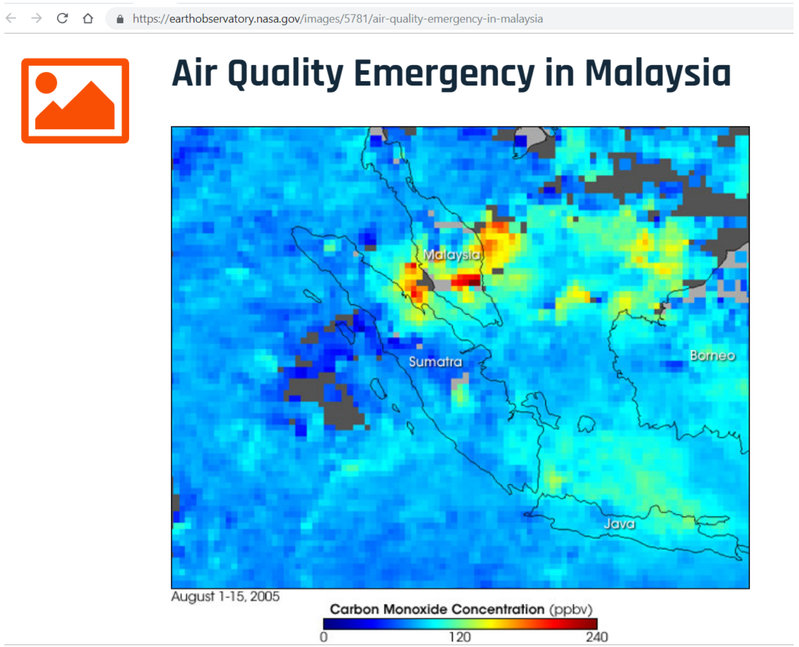
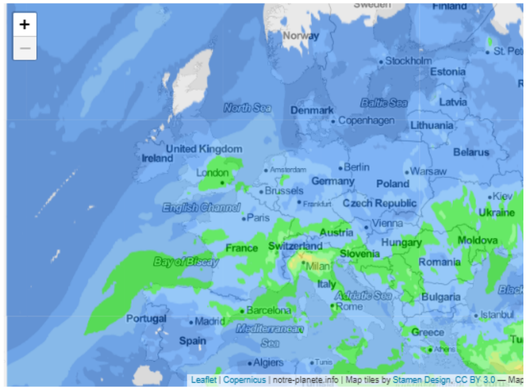


Image Credit: - https://earthobservatory.nasa.gov/images

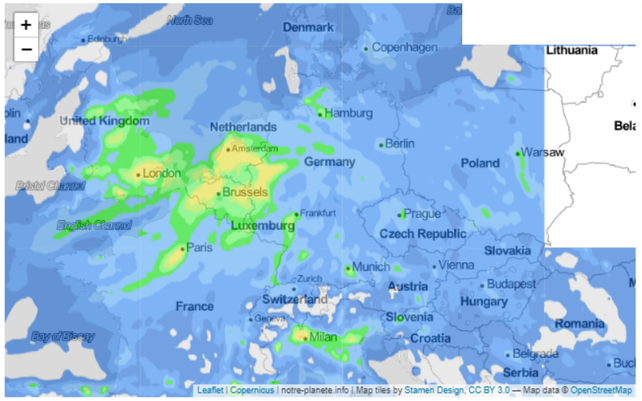
Carte de pollution aux particules fines (PM2.5) pour le Samedi 20 octo

- **PM 2.5** : particules de diamètre inférieur ou égal à 2.5 µm, d'origine naturelle (volcans, sels marins, poussièr activités humaines (industries, chauffage, trafic...).
- **PM 10** : particules de diamètre inférieur ou égal à 10 µm



Carte de pollution au dioxyde d'azote (NO2) pour le Samed

Précurseur de l'ozone et produit intermédiaire des réactions photochimiques à l'origine de la produ issu du trafic routier.



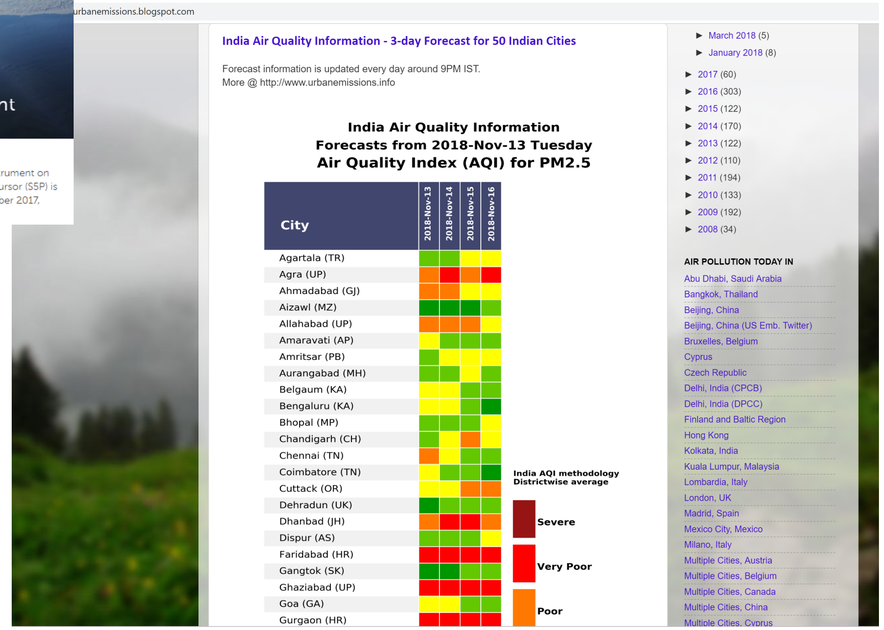


Image Credit: - http://urbanemissions.blogspot.com/

Environmental Monitoring
-
Low Cost Sensors

Image credit: http://www.curieuzeneuzen.eu/en/experiment-results/

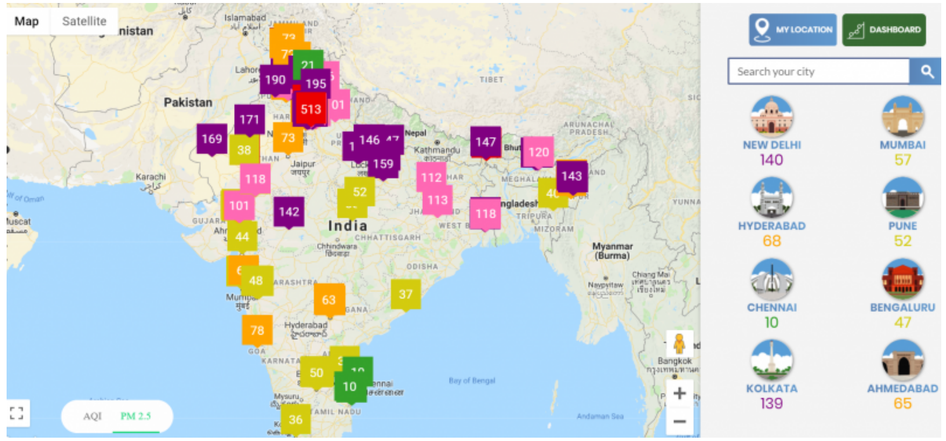


Image Credit: - https://www.aqi.in

Citizen Science

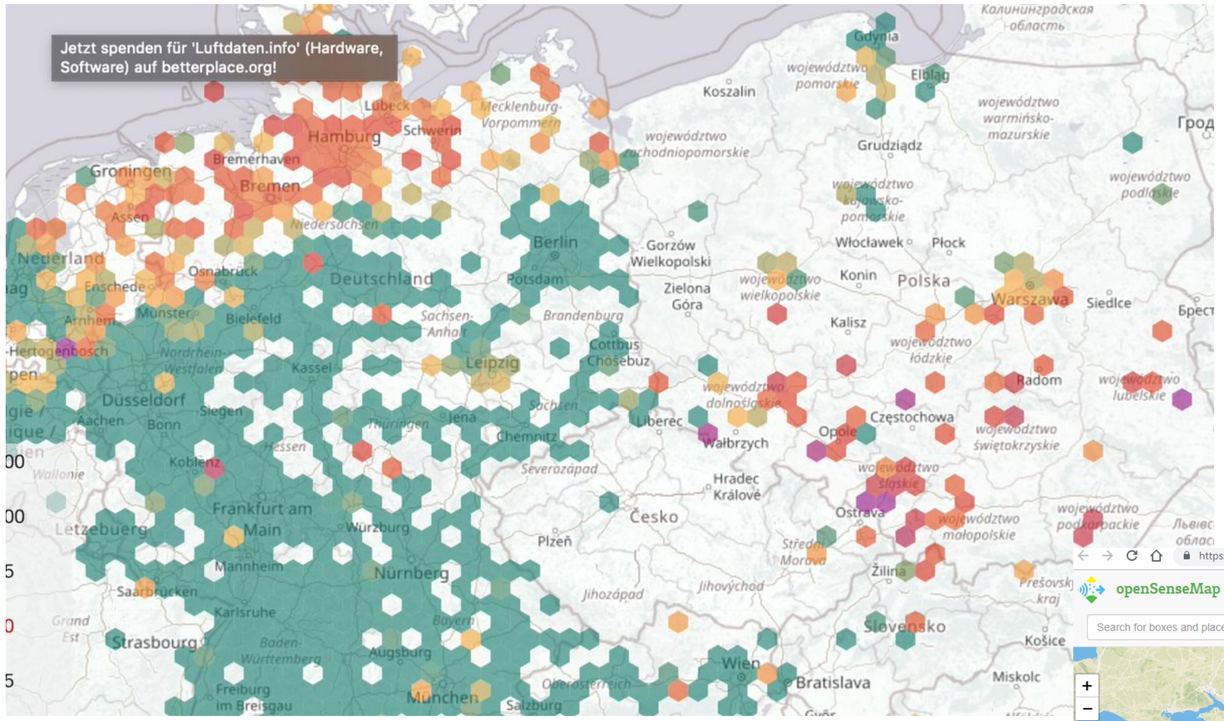
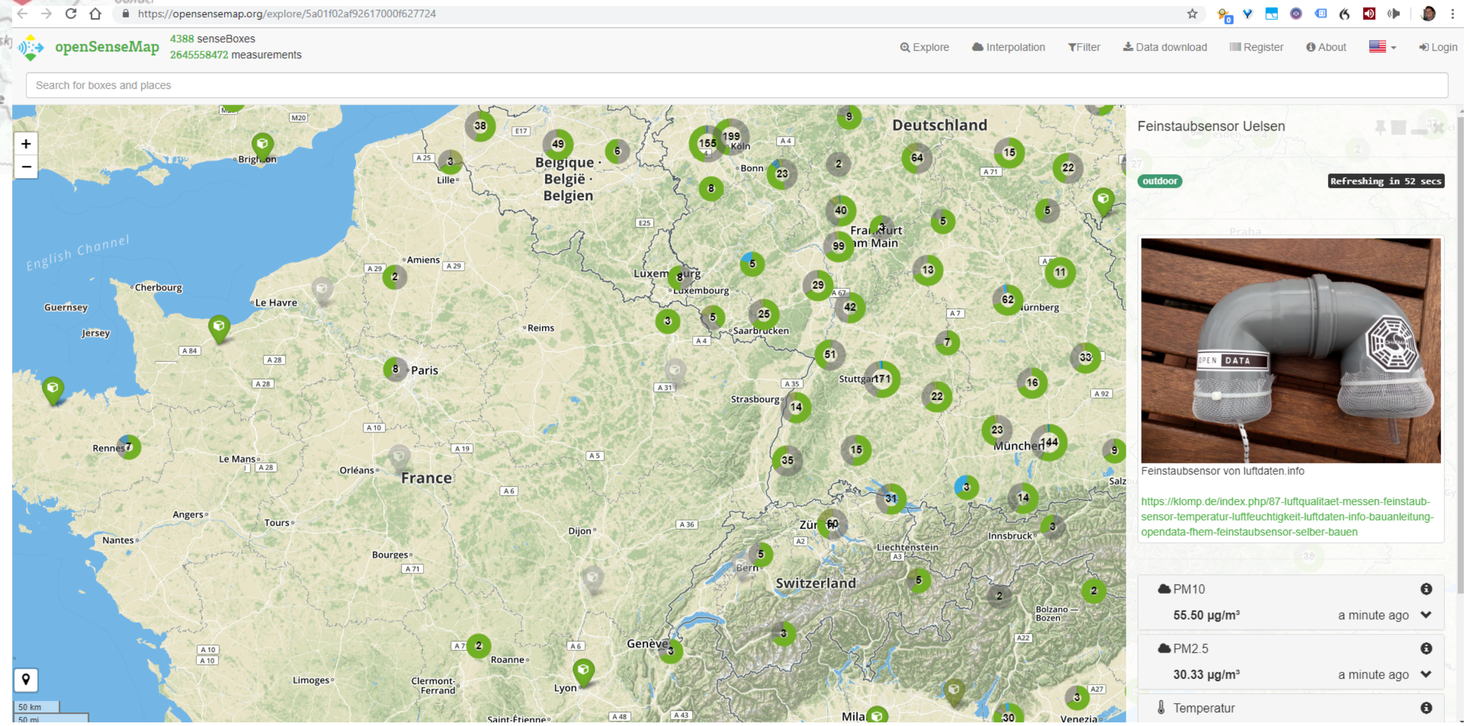


Image Credit: https://luftdaten.info/

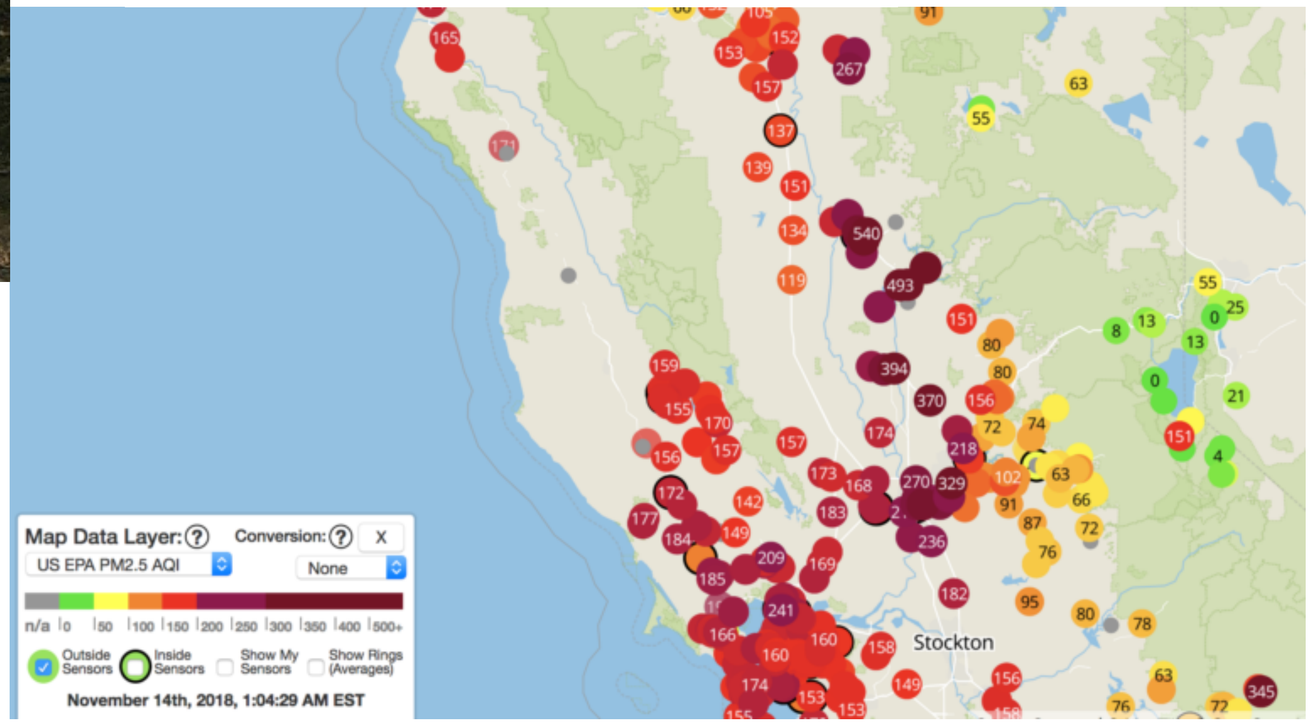
Image Credit: - https://openSenseMap.org/



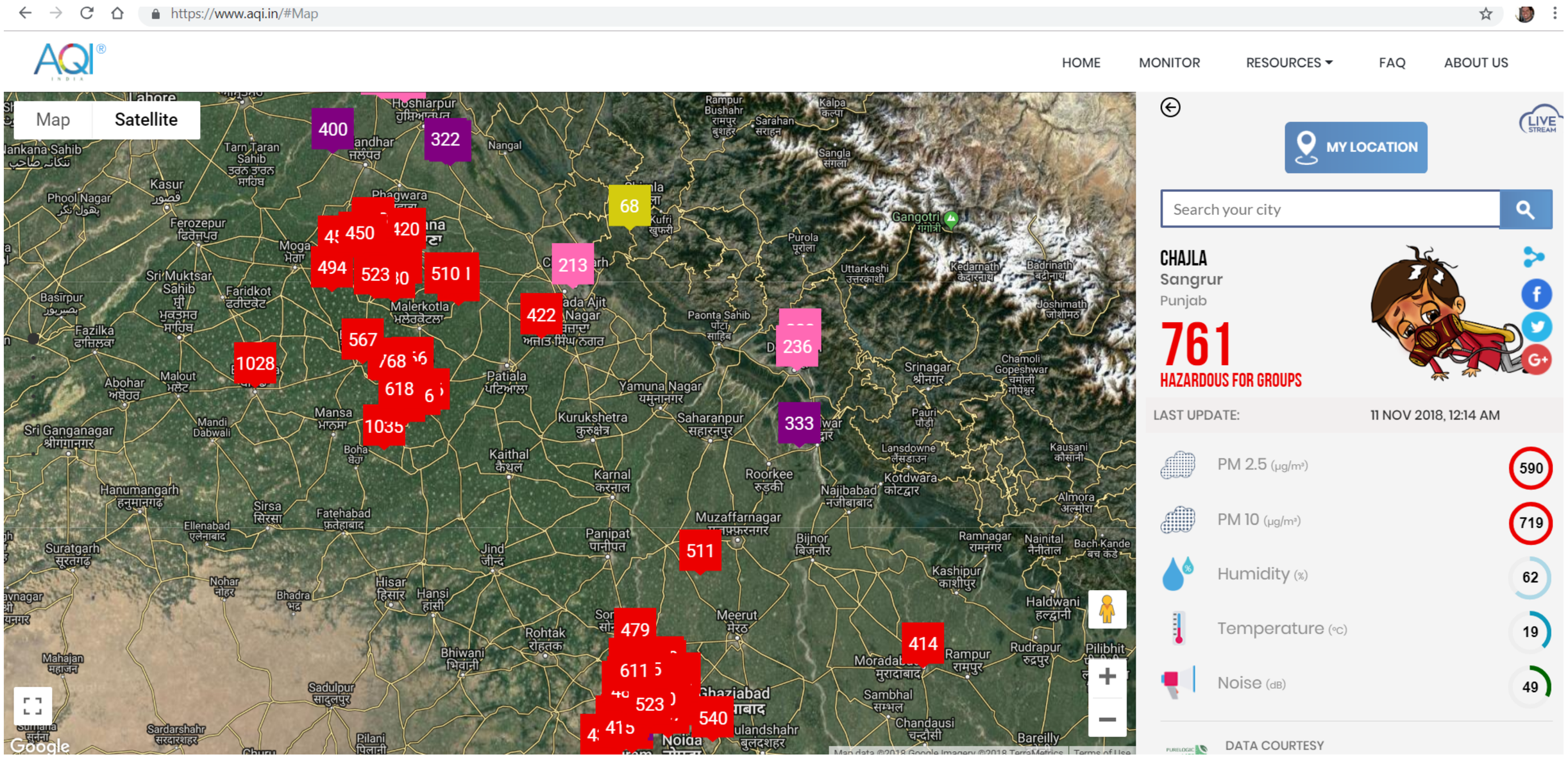
Drones are good at sensing & providing real-world environmental sustainability

Image Credit: NASA Earth Observatory/Aqua/MODIS

Image Credit: PurpleAir



Northern India crop stubble smoke is detected by a AQI.in low-cost network - 11NOV2018 Noon – Indian NAQI values

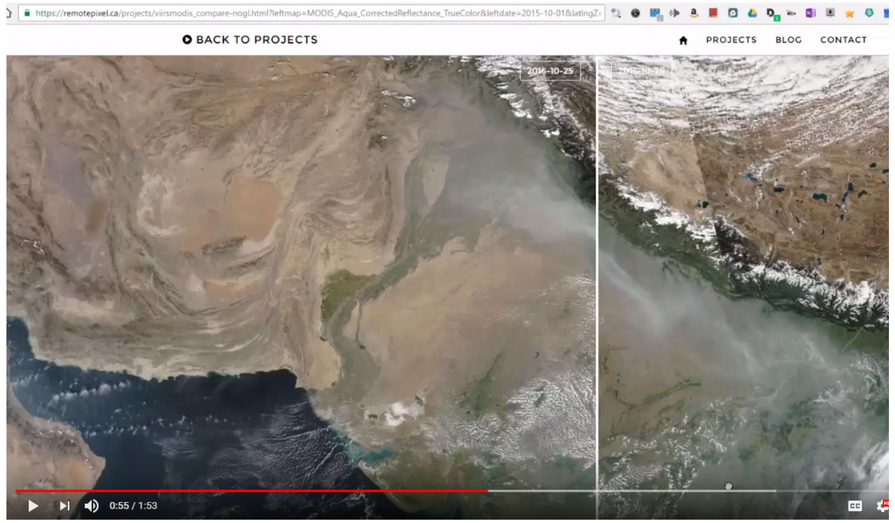


What’s the goal of the open platforms and tools?

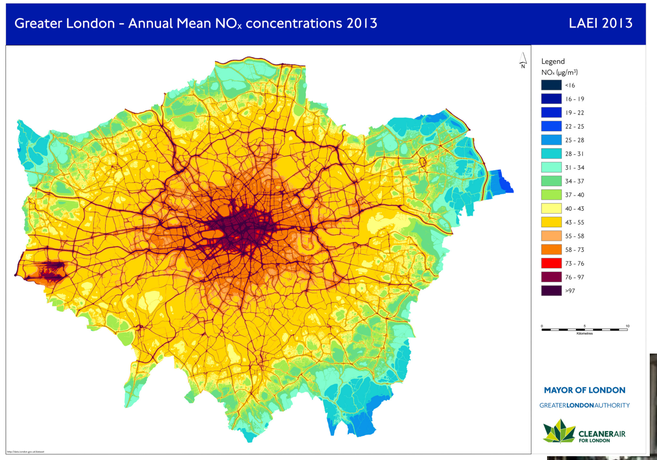
Increase Awareness and Accelerate Solutions

Monitor
Satellites = everywhere
Large networks of sensors will fill the knowledge gap in rural and urban areas.

Create visualizations of the data
The data will provide insights about the sources and activities that create pollution.



#AgriculturalBurning #India #Pakistan
Tsunami of smoke descends upon New Delhi due to crop stubble burning (25th-26th October 2016)



Generate Awareness
Local & microenvironment data will generate a sense of ownership and motivate average citizens to change their behaviour and = more accountability governments and regulators.

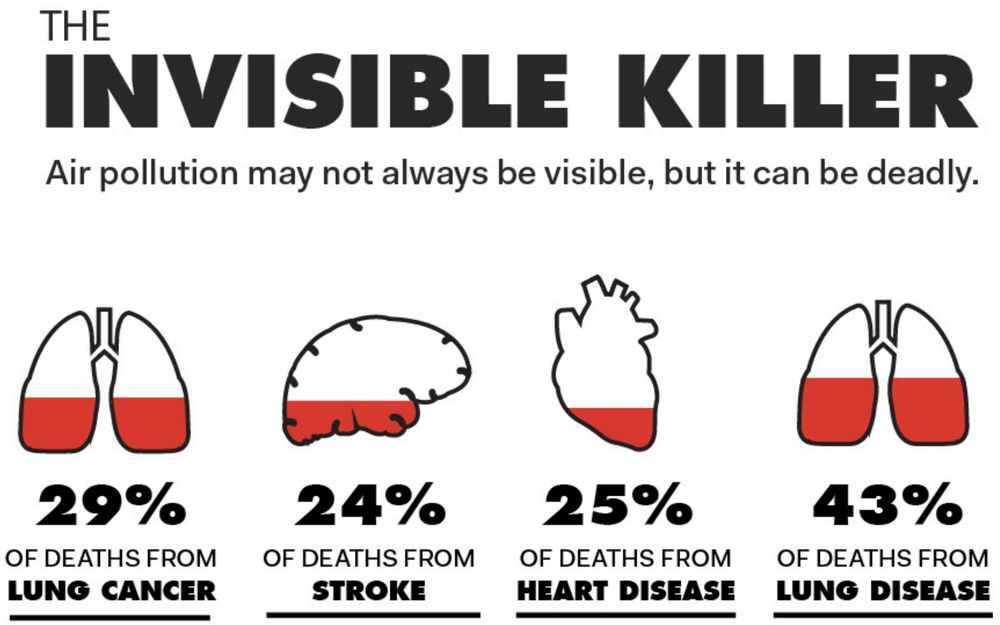
Solutions
Accelerate the adoption of cleaner and clean energy as city managers, policymakers, and businesses

Identification of Health Impact

-Researchers can detect and correlate air pollution measurements from low-cost, regulatory, and satellite networks to hospitalization rates for heart disease, stroke, respiratory and other illnesses to which air pollution contributes.

Health studies reveal exercise along busy and congested streets is not beneficial.

Activity apps Running, Cycling, and Walking Apps are identifying the best routes for exercise and commuting safely.



BREATHELIFE.
Clean Air. Healthy Future.
World Health Organization
UN environment
CLIMATE & CLEAN AIR COALITION

Citizen Science projects promote Participatory Urbanism & Community Engagement

Creating Awareness of Air Pollution

-Charts, graphs, tables, and maps of pollution and the micro-environment create awareness.

-Citizens can detect and map pollution “hotspots” and participate in policymaking and improving the environment in their city and neighbourhoods.

Citizen Science can assist Environmental Impact Assessments

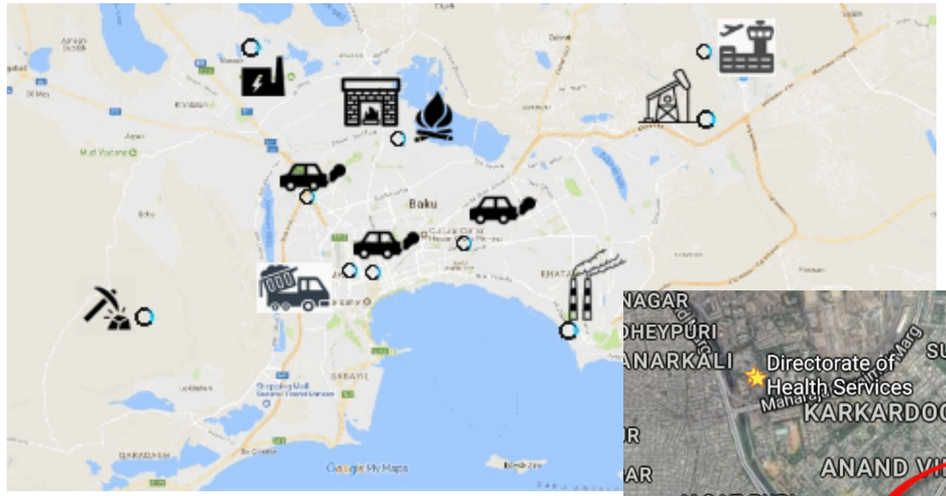
Acute & chronic locations & sources of pollution = hotspots or micro-environments of pollution.

Detect wildfires and seasonal air quality events.

Traffic-related hotspots

Waste and garden debris fires

Wood burning events that are causing unhealthy air. Pizza ovens in Milan and New York City have been regulated.



Little Ninja
@LittleNinjaUK

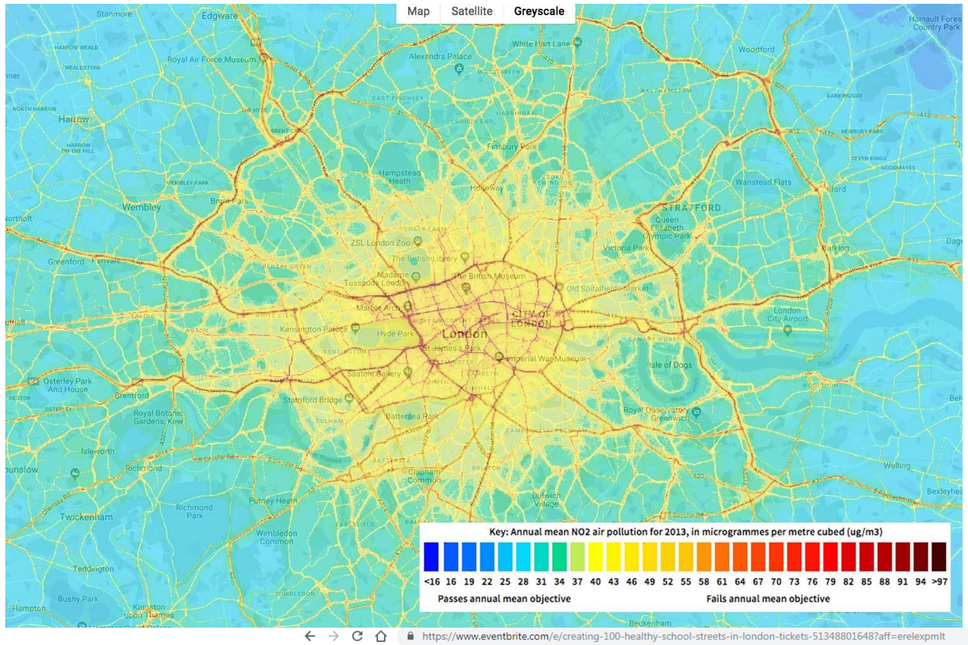
Following

Children are much closer to vehicle exhaust and can be exposed to up to 60% more #AirPollution than adults. When this #AirMonitor reads 125ugm3 (red line on graph) a child / baby in a buggy is likely breathing #ToxicAir. TfL are not protecting our #ChildrensHealth 😰 #Asthma

Dr Alexey Kulikov
@KulikovNMAH
Following

In-pram babies can be exposed up to 60% higher #airpollution than adults. The air within the first few meters above road is usually most polluted.
sciencedirect.com/science/articl...

11:30 AM - 13 Nov 2018



https://www.eventbrite.com/e/creating-100-healthy-school-streets-in-london-tickets-51348801648?aff=erelexpmlt

eventbrite Search for events Browse Events Help Sign In

NOV
02

Creating 100 Healthy School Streets in London

by London Car Free Day

Free

REGISTER

DESCRIPTION

Join us for the launch of the #100HealthySchoolStreets Initiative

In the 12 months leading up to Car Free Day 2019, the #100HealthySchoolStreets initiative seeks to catalyse ambitious action towards a healthier and more prosperous future for all residents, starting with our children! School Streets mean that the roads around a school are closed to motor vehicle traffic and opened up to pedestrians. The streets around a school temporarily become **pedestrian and cycle only** at set times in the morning and afternoon (drop-off and pick-up times during term time). In some cases, the opened up streets can be Play Streets before and after school.

During the week before Car Free Day on Sunday, 22 September 2019, we are encouraging schools to support staff and students to walk, cycle, or take public transit, and to run School Streets.

DATE AND TIME

Fri, November 2, 2018
8:00 AM – 11:00 AM GMT
Add to Calendar

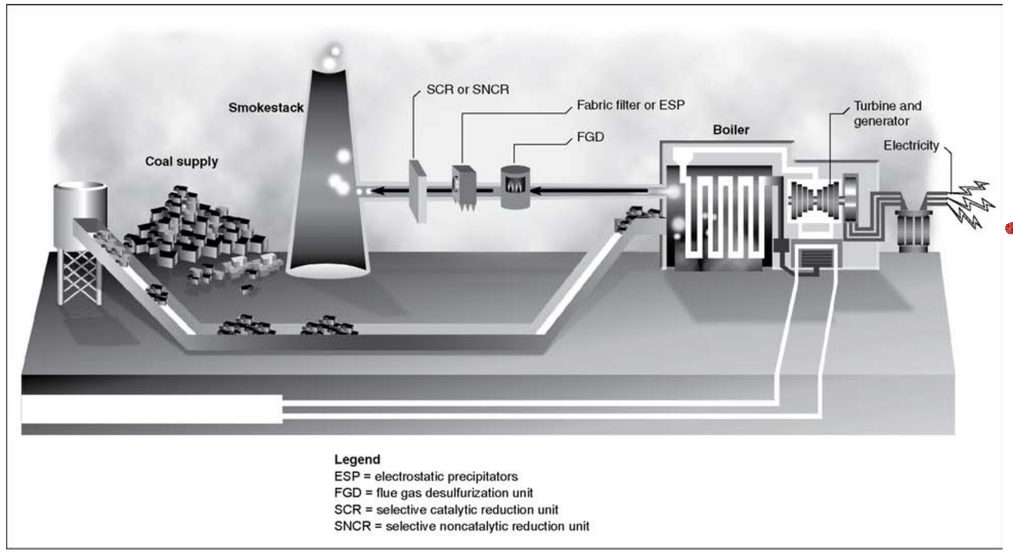
LOCATION

Sustrans
70 Cowcross Street
London
EC1M 6EJ
United Kingdom
View Map

Take Action for Solutions

Citizens groups will be empowered to form broad networks and coalitions. These groups will **identify** and **notify** the industries that are not using or maintaining emissions controls. They can ask for responsible and sustainable change.

People can help create roadmaps for policymakers.



Sources: GAO analysis of information from Electric Power Research Institute and Tennessee Valley Authority.

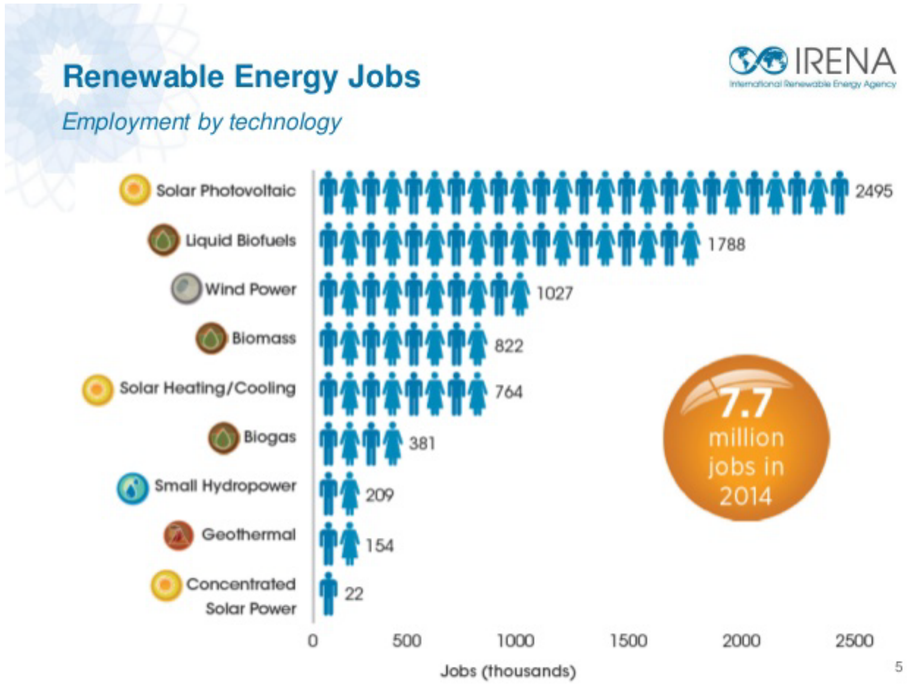
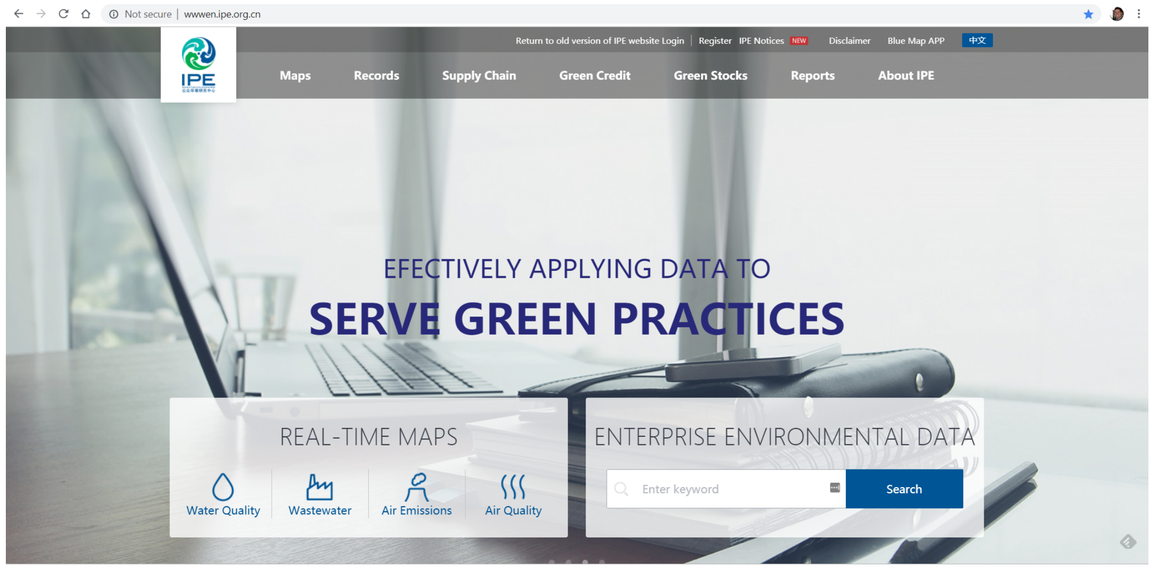
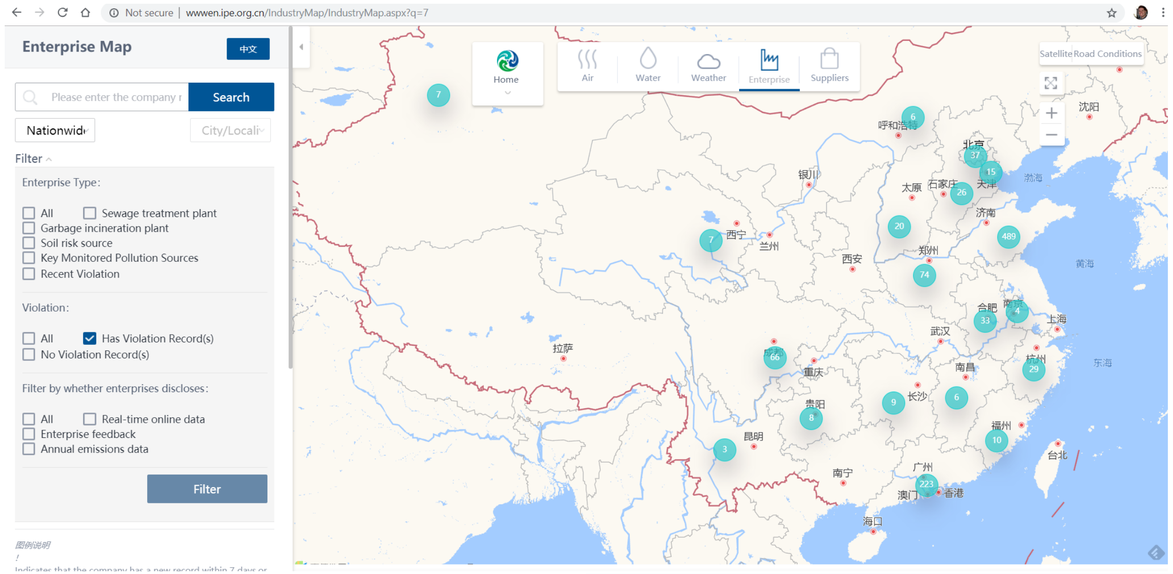


Image Credit: IRENA

Participatory Urbanism / Citizenship

http://wwwen.ipe.org.cn/





http://wwwen.ipe.org.cn/IndustryMap/

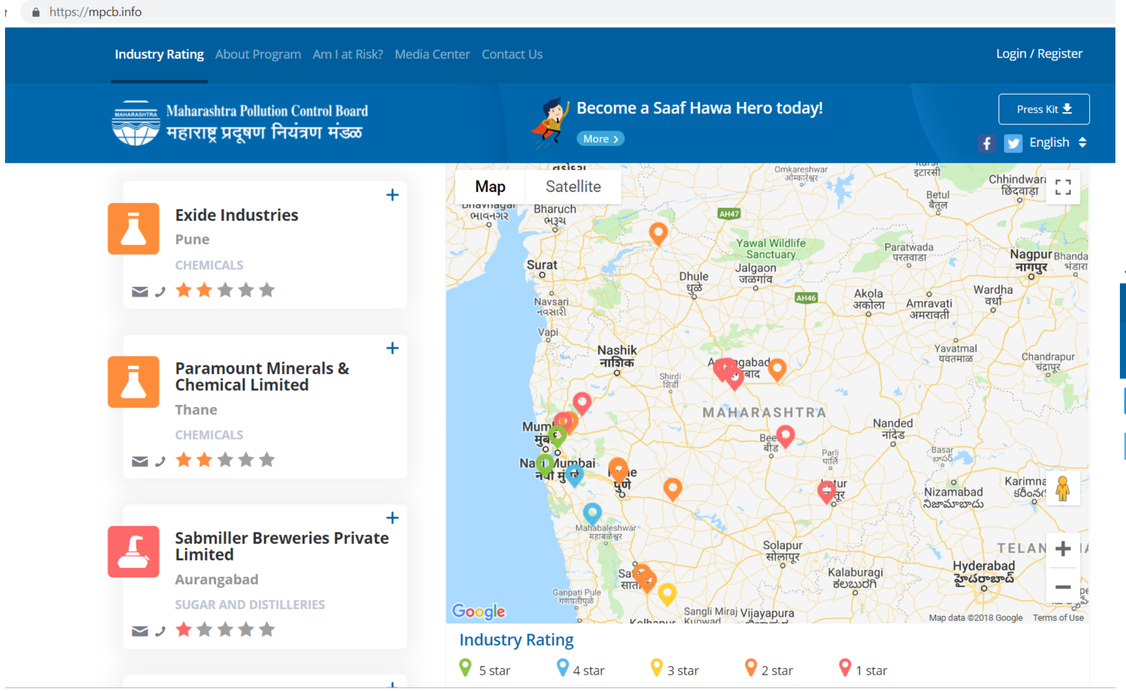


Image Credit: https://mpcb.info/

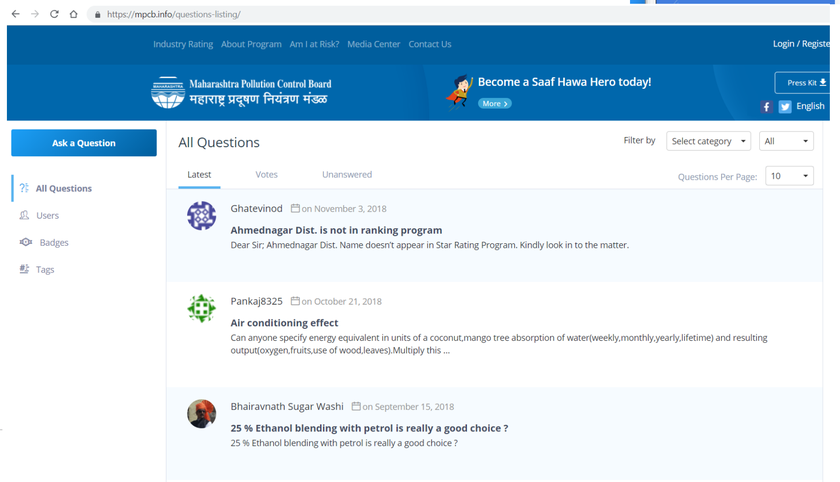
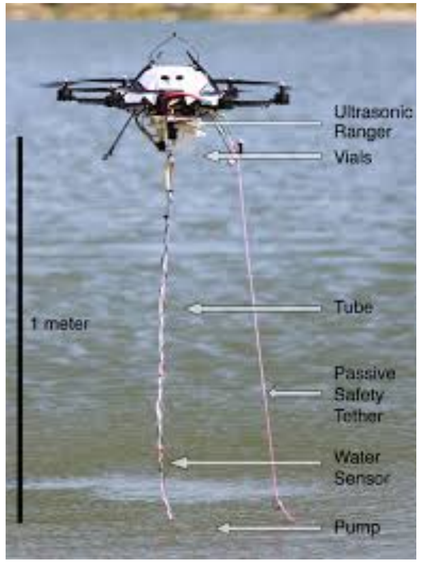
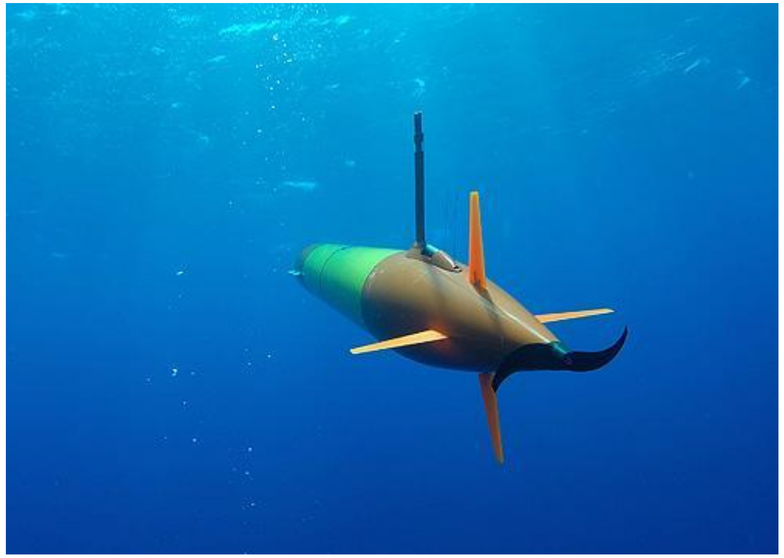


Image Credit: https://mpcb.info/

Drones are good at sensing & providing real-world environmental sustainability



Water monitoring drone –
Image Credit: UNL CSE - University of Nebraska–Lincoln



Ocean chemical & biological relationships, phytoplankton,
& climate change monitoring
Image Credit: Monterey Bay Aquarium Research Institute

Air quality drone - Image Credit: Scentroid

ESM30 Water monitoring drone - Image Credit: Yunzhou-Tech

Criteria 6 Air quality drone –
Image Credit: AQI.in - https://www.aqi.in/

Tree planting & land use monitoring drone –
Image Credit: BioCarbon Engineering

Can using agricultural drones reduce pesticide exposures?

Agricultural drone - Image Credit: DJI MG-1S - Agricultural Wonder Drone

Drones are good for urgent medical applications

Image Credit: Italo Subbarao –
HiRO (Health Integrated Rescue Operations) emergency telemedicine drone

Image Credit: defibrulator drone

Image Credit: Zipline
Blood and vaccine transport

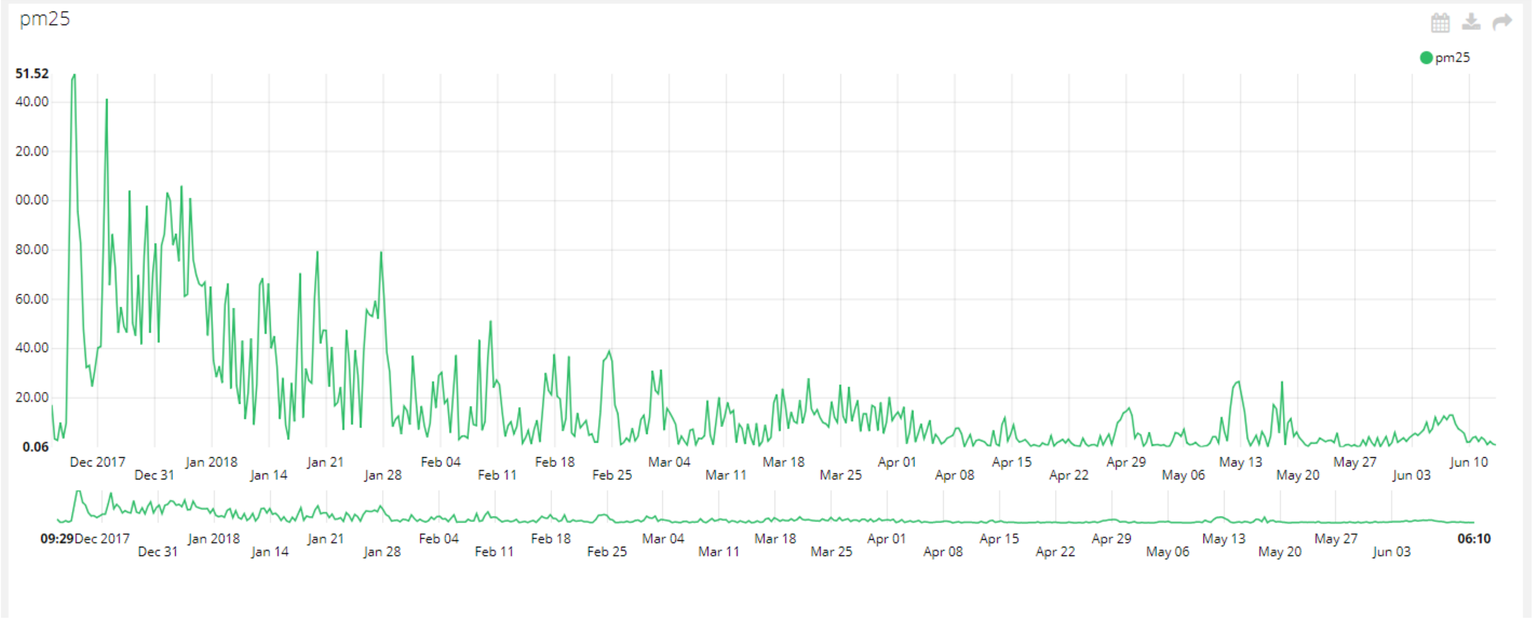
Safe last cm delivery drone – Lausanne, CH
Image Credit: https://dronistics.epfl.ch/

Are our actions working?

(intervention evaluation)

Monitoring networks will allow us to know when our actions to reduce air pollution are working.

We can make “Before and After” relative comparisons of changes in ambient levels



WHO's Urban Health Initiative (in collaboration with CCAC)

Health Impact Assessment (HIA)
Methods

WHO ambient air quality database
Regulatory and Sattelite-derived dataset

AirQ+
Air pollution risk assessment

Integrated Transport & Health Impact Modelling Tool – ITHIM
Transport

Health Economic Assessment Tool - HEAT
Transport

iSThAT (Integrated Sustainable Transport & Health Assessment Tool)
Transport

GreenS+
Transport and urban planning

Clean Household Energy Solutions Toolkit - CHEST
Household Energy

WHO-CHOICE
Health Services

OneHealth
Health Services

www.who.int/sustainable-development/urban/guidance-tools/en/

World Health Organization | Health Topics | Countries | News | Emergencies | About Us

Health Impact Assessment

Methods

Photography by Bash Carlos - Manila, Philippines

Health Impact Assessment (HIA) is a means of assessing the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative and participatory techniques. Identify and address health co-benefits and risks of policy interventions in cities, as well as measures to improve health and reduce health inequities.

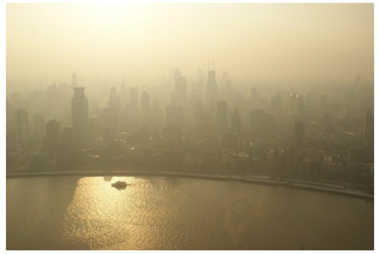
HIA helps decision-makers make choices about alternatives and improvements to prevent disease/injury and to actively promote health. WHO supports tools and initiatives in HIA to dynamically improve health and well-being across sectors.

Learn more about Health impact assessment (HIA)

WHO ambient air quality database

Dataset

WHO Global Ambient Air Quality Database (update 2018)



Photography by by Alex Ginden - Hong Kong, China

In the past two years, the WHO ambient air quality database – now covering more than 4300 cities and settlements in 108 countries – has nearly doubled. More and more locations are measuring air pollution levels and recognizing the associated health impacts. While all regions of the world are affected, populations in low-income cities are the most impacted.

More about the WHO ambient air quality database

AirQ+

Air pollution risk assessment

Photography by Jean-Etienne Minh-Duy Poirrie - Smog over New Delhi

Quantifying the effects of exposure to air pollution in terms of public health has become a critical component in policy discussion.

WHO/Europe's software tool AirQ+ is a health risk assessment and modeling tool that calculates the health effects of long-term exposure to both ambient and household (indoor) air pollution. Air Q+ will allow you to estimate the reduction in life expectancy, and health effects as air pollution levels change.

AirQ+ estimates the effects of long-term exposures (using life-tables approach and based on risk estimates from cohort studies)

Get started with AirQ+

Integrated Transport & Health Impact Modelling Tool - ITHIM

Transport

Photography By Rajesh Appalla - Volkswagen Beetle recycled

ITHIM (Integrated Transport and Health Impact Modelling Tool) – performs integrated urban and national level assessments of the health impacts of transport scenarios and policies, including: changes in physical activity, road traffic injury risk, and exposure

Health Economic Assessment Tool - HEAT

Transport

Mark Edwards - Hard Rain series - Mexico City

HEAT (Health Economic Assessment Tool) calculates the health benefits and economic impact of increased proportions of urban walking and cycling (these activities reduce diseases associated with physical inactivity). In addition, HEAT can accounts for any health effects of injury risks and air pollution

iSThAT (Integrated Sustainable Transport & Health Assessment Tool)

Transport

Photo by Jace Grandinetti - Amsterdam, Netherlands

iSThAT (Integrated Sustainable Transport Carbon-Health-Economic Assessment Tool) calculates the air pollution emissions (PM, NOx, SO2 and CO2) from the existing mix of bus, car and motorcycle traffic.

We can save 97 million lives or 535 million life years if we invest USD$ 3.9 trillion over the next 15 years

Questions?

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World Health Organization (consultant)
Geneva
smithj@who.int
jeff@cleantech.earth (under construction)
jeff@crowdsourcingcleantech.com

Table 4 Latest values of health-related SDG indicators by sex, WHO region and World Bank income group

Table 4
Latest values of health-related SDG indicators by sex, WHO region and World Bank income group[a]

	SDG indicator (by topic area)	Year	Global			WHO region						World Bank income group				2030 numeric target
			Male	Female	Both sexes	AFR	AMR	SEAR	EUR	EMR	WPR	LI	LMI	UMI	HI	
Reproductive and maternal health																
3.1.1	Maternal mortality ratio (per 100 000 live births)	2015	-	216	-	542	52	164	16	166	41	495	253	55	17	<70
3.1.2	Proportion of births attended by skilled health personnel (%)	2013–2018	-	81	-	59	95	81	99	79	97	60	76	99	99	-
3.7.1	Family planning satisfied with modern methods[b] (%)	2019	-	76	-	56	83	71	77	61	87	58	65	78	82	-
3.7.2	Adolescent birth rate (per 1000 women aged 15–19 years)	2015–2020	-	44	-	99	49	33	17	45	14	97	46	29	12	-
Child health																
3.2.1	Under-five mortality rate (per 1000 live births)	2017	41	37	39	74	14	36	9	50	13	69	49	14	5	25
3.2.2	Neonatal mortality rate (per 1000 live births)	2017	-	-	18	27	8	21	5	27	6	48	49	26	7	12
2.2.1	Prevalence of stunting in children under 5[c] (%)	2018	-	-	21.9	33.1	6.5	31.9	-	24.7	6.4	34.2	31.1	6.3	-	-
2.2.2	Prevalence of wasting in children under 5[c] (%)	2018	-	-	7.3	7.0	0.8	15.0	-	7.8	2.2	7.4	11.6	1.8	-	-
2.2.2	Prevalence of overweight in children under 5[c] (%)	2018	-	-	5.9	3.5	7.2	3.8	-	5.7	6.0	3.1	3.9	7.4	-	-
3.b.1	DTP3 immunization coverage among 1-year-olds (%)	2017	-	-	85	72	91	88	94	81	97	78	82	94	95	-
3.b.1	MCV2 immunization coverage by the nationally recommended age (%)	2017	-	-	67	25	74	77	90	67	94	29	63	88	91	-
3.b.1	PCV3 immunization coverage among 1-year olds (%)	2017	-	-	44	68	82	12	70	52	16	68	32	33	85	-
Infectious diseases																
3.3.1	New HIV infections (per 1000 uninfected population)	2017	0.26	0.24	0.25	1.22	0.16	0.08	0.18	0.06	0.06	0.66	0.23	0.24	0.07	-
3.3.2	Tuberculosis incidence (per 100 000 population)	2017	168	99	134	237	28	226	30	113	95	244	223	58	11	-
3.3.3	Malaria incidence (per 1000 population at risk)	2017	-	-	59.1	219.4	7.3	7.0	0.0	14.8	2.5	189.3	42.8	2.5	-	-
3.3.4	Hepatitis B surface antigen prevalence among children under 5 years (%)	2017	-	-	0.80	2.34	0.07	0.26	0.21	0.69	0.38	2.31	0.72	0.30	0.16	-
3.3.5	Reported number of people requiring interventions against NTDs (millions)	2017	-	-	1582.9	594.1	75.5	733.3	5.5	75.4	98.4	398.4	1068.6	114.7	0.5	-

Darker shading represents high values for mortality, incidence, prevalence, risk factor and catastrophic out-of-pocket health spending indicators; and lower values for coverage, ODA, health workforce and health expenditure indicators.

[a] Excludes SDG 5.2.1 and density of dentists and pharmacists in SDG 3.c.1 which have low coverage or are not available across most regions.
[b] Women of reproductive age.
[c] High income figure has low coverage, interpret with caution.
[d] Age-standardized.
[e] Amount that is part of a government-coordinated spending plan, refers to water sector only.
[f] Population with household expenditures on health greater than 10% or 25% of total household expenditure or income.
[g] Recipient countries.

Source: WHO (2019) *(1)*.

Table 4 is continued on the next slide

World Health Organization

Table 4 Latest values of health-related SDG indicators by sex, WHO region and World Bank income group

Table 4
Latest values of health-related SDG indicators by sex, WHO region and World Bank income group[a]

Continued...

	SDG indicator (by topic area)	Year	Global			WHO region						World Bank income group				2030 numeric target
			Male	Female	Both sexes	AFR	AMR	SEAR	EUR	EMR	WPR	LI	LMI	UMI	HI	
Noncommunicable diseases																
3.4.1	Probability of dying from CVD, cancer, diabetes, CRD between age 30 and exact age 70 (%)	2016	21.6	15.0	18.3	20.6	15.1	23.1	16.7	22.0	16.2	21.3	23.3	17.7	12.0	Reduce 1/3
3.4.2	Suicide mortality rate (per 100 000 population)	2016	13.5	7.7	10.6	7.4	9.8	13.2	15.4	3.9	10.2	6.8	10.6	10.0	14.3	Reduce 1/3
3.5.2	Total alcohol per capita (≥15 years of age) consumption (litres of pure alcohol)	2016	10.1	2.7	6.4	6.3	8.0	4.5	9.8	0.6	7.3	3.8	4.7	7.0	9.8	-
3.a.1	Prevalence of tobacco smoking among persons aged 15 years and older[d] (%)	2016	33.7	6.2	19.9	9.8	16.9	16.9	29.4	18.1	24.5	11.4	17.2	23.1	24.1	-
Injuries and violence																
3.6.1	Road traffic mortality rate (per 100 000 population)	2016	-	-	18.2	26.6	15.6	20.7	9.3	18.0	16.9	27.5	19.2		8.3	Half by 2020
16.1.1	Mortality rate due to homicide (per 100 000 population)	2016	10.1	2.6	6.4	10.4	17.9	4.1	3.3	6.7	1.9	8.7	5.9	7.9	2.9	-
Environmental risks																
3.9.1	Mortality rate attributed to household and ambient air pollution[d] (per 100 000 population)	2016	128.5	101.1	114.1	180.9	29.7	165.8	36.3	125.0	102.8		131.7		17.8	-
3.9.2	Mortality rate attributed to exposure to unsafe WASH services (per 100 000 population)	2016	11.4	12.1	11.7	45.8	1.1	15.4	0.3	10.6	1.0	42.4	18.6	1.1	0.3	-
3.9.3	Mortality rate from unintentional poisoning (per 100 000 population)	2016	1.6	1.2	1.4	2.7	0.6	1.8	0.7	1.5	1.1	2.8	1.8	1.1	0.5	-
6.1.1	Proportion of population using safely managed drinking-water services (%)	2015	-	-	71	26	82	-	91	56	-	23	59	92	98	Universal
6.2.1	Proportion of population using safely managed sanitation services (%)	2015	-	-	39	-	43	-	67	-	57	-	-	50	81	Universal
6.a.1	WASH-related ODA[e] (constant 2016 US$ millions)	2017	-	-	8698.25	2483.89	676.69	1484.41	-	1836.26	1011.10	1983.59	4262.35	1750.49	-	-
7.1.2	Proportion of population with primary reliance on clean fuels (%)	2017	-	-	61	17	92	45	>95	72	62		54		100	Universal
11.6.2	Annual mean concentrations of fine particulate matter (PM2.5) in urban areas (μg/m^3)	2016	-	-	39.6	35.5	13.4	57.3	17.6	54.0	42.9		44.0		14.4	-
UHC and health systems																
3.8.1	UHC service coverage index	2015	-	-	64	44	78	55	73	53	75	40	54	74	80	-
3.8.2	Catastrophic out-of-pocket health spending >10%[f]	2010	-	-	11.7	10.3	11.1	12.8	7.0	9.5	14.8	8.1	12.4	13.8	7.2	-
3.8.2	Catastrophic out-of-pocket health spending >25%[f]	2010	-	-	2.6	2.6	1.9	2.8	1.0	1.4	3.9	1.1	2.8	3.2	1.4	-
1.a.2	Domestic general government health expenditure as percentage of GGE (%)	2016	-	-	10.6	7.3	15.6	6.7	12.5	8.5	11.0	6.6	8.1	11.5	14.9	-
3.c.1	Density of medical doctors (per 10 000 population)	2017	-	-	15.1	2.8	23.3	7.4	33.8	9.9	18.0	3.1	7.5	19.4	30.4	-
3.c.1	Density of nursing and midwifery personnel (per 10 000 population)	2017	-	-	34.8	10.9	61.9	19.9	80.6	15.2	32.6	8.5	18.9	35	85.6	-
3.d.1	Average of 13 International Health Regulations core capacity scores	2018	-	-	60	42	65	56	74	66	64	42	52	64	77	-
3.b.2	Total net ODA to medical research and basic health sectors per capita[g] (US$)	2017	-	-	1.39	4.83	0.42	0.60	-	1.89	0.30	5.64	1.23	0.33	-	-
17.19.2	Completeness of cause-of-death data (%)	2017	-	-	49	6	94	10	97	32	64	3	15	73	97	-

Darker shading represents high values for mortality, incidence, prevalence, risk factor and catastrophic out-of-pocket health spending indicators; and lower values for coverage, ODA, health workforce and health expenditure indicators.

[a] Excludes SDG 5.2.1 and density of dentists and pharmacists in SDG 3.c.1 which have low coverage or are not available across most regions.
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[d] Age-standardized.
[e] Amount that is part of a government-coordinated spending plan, refers to water sector only.
[f] Population with household expenditures on health greater than 10% or 25% of total household expenditure or income.
[g] Recipient countries.

Source: WHO (2019) *(1)*.

World Health Organization

Source: WHO 2019 – MONITORING HEALTH FOR THE SDGs report

Health SDGs (longer descriptions)

3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100 000 live births.

3.2 By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births.

3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.

3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents.

3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes.

3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

3.a Strengthen the implementation of the WHO Framework Convention on Tobacco Control in all countries, as appropriate.

3.b Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health to provide access to medicines for all.

3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States.

3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.

SDG Health-related indicators (by topic area)	
Reproductive and maternal health	
3.1.1	Maternal mortality ratio (per 100 000 live births)
3.1.2	Proportion of births attended by skilled health personnel (%)
3.7.1	Family planning satisfied with modern methods[b] (%)
3.7.2	Adolescent birth rate (per 1000 women aged 15–19 years)
Child health	
3.2.1	Under-five mortality rate (per 1000 live births)
3.2.2	Neonatal mortality rate (per 1000 live births)
2.2.1	Prevalence of stunting in children under 5[c] (%)
2.2.2	Prevalence of wasting in children under 5[c] (%)
2.2.2	Prevalence of overweight in children under 5[c] (%)
3.b.1	DTP3 immunization coverage among 1-year-olds (%)
3.b.1	MCV2 immunization coverage by the nationally recommended age (%)
3.b.1	PCV3 immunization coverage among 1-year olds (%)
Infectious diseases	
3.3.1	New HIV infections (per 1000 uninfected population) Tuberculosis incidence (per 100 000 population)
3.3.2 3.3.3	Malaria incidence (per 1000 population at risk)
3.3.4	Hepatitis B surface antigen prevalence among children under 5 years (%)
3.3.5	Reported number of people requiring interventions against NTDs (millions) Neglected tropical diseases (NTDs)
Noncommunicable diseases	
3.4.1	Probability of dying from CVD, cancer, diabetes, CRD between age 30 and exact age 70 (%)
3.4.2	Suicide mortality rate (per 100 000 population)
3.5.2	Total alcohol per capita (≥15 years of age) consumption (litres of pure alcohol)
3.a.1	Prevalence of tobacco smoking among persons aged 15 years and older[d] (%)
Injuries and violence	
3.6.1	Road traffic mortality rate (per 100 000 population)
16.1.1	Mortality rate due to homicide (per 100 000 population)
Environmental risks	
3.9.1	Mortality rate attributed to household and ambient air pollution[d] (per 100 000 population)
3.9.2	Mortality rate attributed to exposure to unsafe WASH services (per 100 000 population)
3.9.3	Mortality rate from unintentional poisoning (per 100 000 population)
6.1.1	Proportion of population using safely managed drinking-water services (%)
6.2.1	Proportion of population using safely managed sanitation services (%)
6.a.1	WASH-related ODA[e] (constant 2016 US$ millions)
7.1.2	Proportion of population with primary reliance on clean fuels (%)
11.6.2	Annual mean concentrations of fine particulate matter (PM2.5) in urban areas (μg/m^3)
UHC and health systems	
3.8.1	UHC service coverage index
3.8.2	Catastrophic out-of-pocket health spending >10%[f]
3.8.2	Catastrophic out-of-pocket health spending >25%[f]
1.a.2	Domestic general government health expenditure as percentage of GGE (%)
3.c.1	Density of medical doctors (per 10 000 population)
3.c.1	Density of nursing and midwifery personnel (per 10 000 population)
3.d.1	Average of 13 International Health Regulations core capacity scores
3.b.2	Total net ODA to medical research and basic health sectors per capita[g] (US$)
17.19.2	Completeness of cause-of-death data (%)

Source: WHO 2019 – MONITORING HEALTH FOR THE SDGs report

World Health Organization

Examples of Open Data sets, platforms, and tools

Government	Regulatory (reference)	Too many to list		
AQICN.org	Regulatory (reference)	http://aqicn.org/map/#@g/22.4891/1.8281/3z		
OpenAQ.org	Regulatory (reference)	https://openaq.org/		
State of Global Air (HEI & IHME)	Regulatory (reference)	https://www.stateofglobalair.org/data/#/air/plot		
Berkeley Earth Air Quality map	Regulatory (reference)	http://berkeleyearth.org/air-pollution-%20overview/		
ESA CAMS data model	Remote Sensing	https://www.sentinel-hub.com/explore/eobrowser		
NASA GEOS data model	Remote Sensing	https://gmao.gsfc.nasa.gov/GEOS_systems/	https://ntrs.nasa.gov/search.jsp?R=20120009164	
NASA FIRMS – Fire data & tools	Remote Sensing	https://firms.modaps.eosdis.nasa.gov		
NASA Worldview	Remote Sensing	https://worldview.earthdata.nasa.gov/	https://earthdata.nasa.gov/earth-observation-data/near-real-time/hazards-and-disasters/air-quality	
earth	Remote Sensing	earth.nullschool.net	3-min. introduction to earth - https://youtu.be/MMmkooO52Z4	
NexGen Earth Labs	Remote Sensing	https://www.nexgenearth.info/aqforecast		
AQI.in	Low-Cost	https://www.aqi.in/		
Luftdaten	Low-Cost	https://luftdaten.info/		
Purple Air	Low-Cost	https://www.purpleair.com/		
US EPA's Environmental Benefits Mapping and Analysis Program - Community Edition (BenMAP-CE)	Environmental / Urban	https://www.epa.gov/benmap		
World Resources Institute's Resource Watch	Environmental / Urban	https://resourcewatch.org/data/explore		
Our World in Data	Environmental / Urban	https://ourworldindata.org/		
Clean Air Asia's Cities Clean Air Partnership	Environmental / Urban	http://cleanairasia.org/cities-clean-air-partnership/	http://cleanairasia.org/all-toolbox	
Maharashtra, India state's Star Rating Program	Environmental / Urban	https://mpcb.info/	https://epic.uchicago.in/industries-join-maharashtras-star-rating-program/	
Institute of Public and Environmental Affairs - Blue Map	Environmental / Urban	http://wwwen.ipe.org.cn/appdownload30_en/pc/index.html	http://wwwen.ipe.org.cn/	
Stockholm Environment Institute LEAP-IBC	Environmental / Urban	https://energycommunity.org/default.asp?action=IBC		
World Health Organization - Urban Health Initiative tool-set	Environmental / Urban	http://www.who.int/sustainable-development/urban/guidance-tools/en/	http://www.who.int/airpollution/data/cities/en/	

Remarks on Low Cost Sensors use

LCSs can be used for:

- Short-term variation of air pollution
- Citizen science applications providing rough information about air quality
- Awareness raising

Caution should be taken for the use of LCSs for the following applications:

- Mixed pollutants concentration patterns
- Personal exposure
- Long term background trends

Low-cost sensors are not currently a direct substitute for reference instruments, especially for mandatory purposes and determining compliance with legal or regulatory standards

For more info:
http://www.wmo.int/pages/prog/arep/gaw/documents/Low_cost_sensors_16_Oct.pdf