

ME-NET Stakeholder Engagement Board Meeting #1

02.09.24

Agenda for today

- Welcome & introductions
 - Re-cap on the ME-NET project
 - Educational modules draft presentations with Common Knowledge
 - Feedback & evaluation
 - Future meetings
- (remember to start recording)

Ethics & Consent

If you haven't had a chance to complete the brief survey that was circulated in the reminder emails, you have time to do so now while we are introducing ourselves 😊

First ME-NET Stakeholder Board Meeting Pre-Survey



Introductions

- Your name
- Institution/community you represent/your expert lived experience area
- What comes to mind when you think 'methane'?



Methane Early Warning Network (ME-NET)

“improving awareness and understanding of the relationship between methane and health outcomes, improving access to health services for adaptation, and providing opportunities to support research ecosystems in data scarce regions”

- Wellcome Trust funded project;
- Brief: develop a dashboard to understand the impact of methane on health;
- Prototype project running for 12 months (July 1st, 2024-June 30th, 2025);
- Multi-region and international collaboration;
- Multi-sector collaboration;
- A first step towards,

Aims & Outputs

AIMS:

To pilot an integrated data platform (ME-NET) for regions with varying environmental and health data availability and quality, and with varying sources of methane emitters and super-emitters for, a) developing data synthesis approaches that are globally applicable, and b) training methane 'early warning' models that are robust to regional contexts.

OUTPUTS:

1. Machine learning algorithms showing the links between methane, ozone and health outcomes,
2. Phone/web app for health protection, tracking the impact of ozone on mental health & respiratory symptoms, & education in the UK and Ghana (including coastal sites).

Machine learning

Ozone early warning

Higher & lower income regions

Predicting health emergencies

Smart-phone & website application

RESEARCH QUESTIONS

- To what extent can Deep Learning (DL) be used to develop an ozone early warning system that incorporates health data in two regions of the world with a) higher and, b) lower/middle income, reflecting wider global variation in data availability and quality?
- What are the most relevant health measures for exploring physical and mental health emergencies associated with methane and ozone concentrations in the two regions, and is it viable to use DL to predict rates of emergencies associated with air quality?
- What user functions would improve the visibility of climate change impacts, and how deliverable are these, given data availability and quality in regions?

ME-NET for smart-phone & web application



Four main functions:

1. Alert Me
2. Explore & learn (+educational modules)
3. Our Data
4. My Profile

As we go through, please think about, and take notes on potential 'red flags'...

Mobilising citizen science for global social & ecological justice

Alert Me

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

✉ Get Alerts

Explore & Learn

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🌐 Explore

Our Data

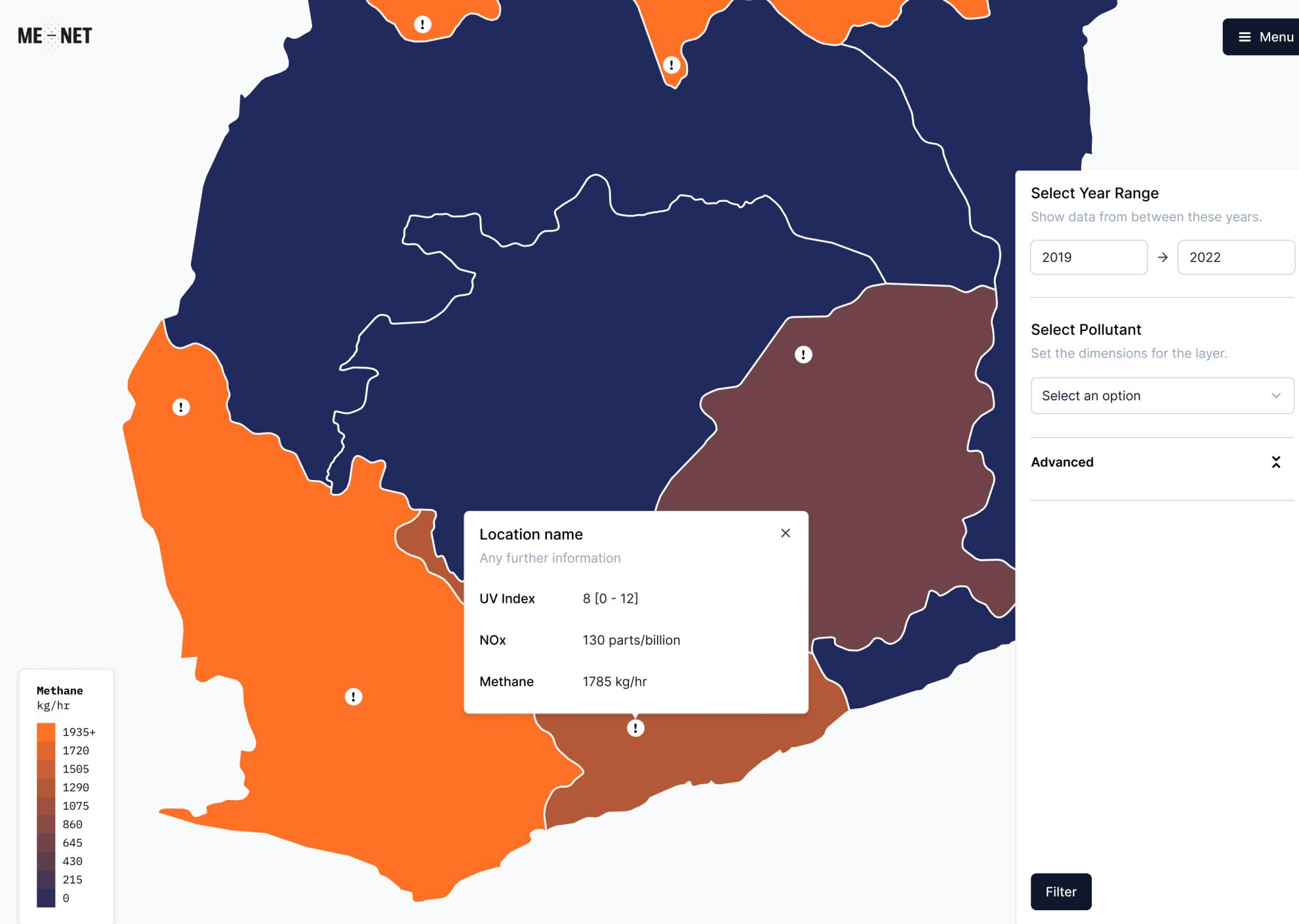
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Learn more

My Profile

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👤 Edit or Sign-up



Mobilising citizen science for global social & ecological justice

Alert Me

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✉ Get Alerts

Explore & Learn

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🌐 Explore

Our Data

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Learn more

My Profile

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👤 Edit or Sign-up

My Profile & Alert Me

Main features

1. Register a user profile including health conditions, demographic characteristics;
2. Set alerts (opt in for push-functions) for ozone in your area to receive recommendations for health protection;
3. Receive prompts to self-report daily respiratory & mental health outcomes health outcomes, including text/visual scales (e.g., emotion wheels);
4. Advanced option for setting bespoke thresholds for alerts (e.g., if particularly susceptible to asthma attacks might lower threshold for health protection recommendations.

Health profile

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Your details

User Name

UserName027

Age

24

Sex

Female

Region

Tamale

Your health conditions

Existing Health Conditions

Asthma

Ectyma

Existing Mental Health Conditions

Insomnia

Add another health condition

Health condition

Asthma

Ectyma

Chronic obstructive pulmonary disease

Pulmonary fibrosis

 Add health condition

Report your symptoms

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Report Details

Report Type

Respiratory Health

1. Please rate your symptoms on a scale of 1-7 where 1 means 'not at all' and 7 means 'very severe symptoms':

A. Shortness of breath or wheezing (1-7)

1 2 3 4 5 6 7

B. Coughing (1-7)

1 2 3 4 5 6 7

C. Chest tightness during the day (1-7)

1 2 3 4 5 6 7

2. How often have you used a rescue/quick relief inhaler in response to shortness of breath, wheezing, coughing and/or chest tightness?

Not at all

Once or twice

More than once or twice

3. Please consider how limited your daily activities have been as a result of shortness of breath, wheezing, coughing and/or chest tightness. Rate your experience on a scale of 1-7 where 1 means 'not at all' and 7 means 'severely limited':

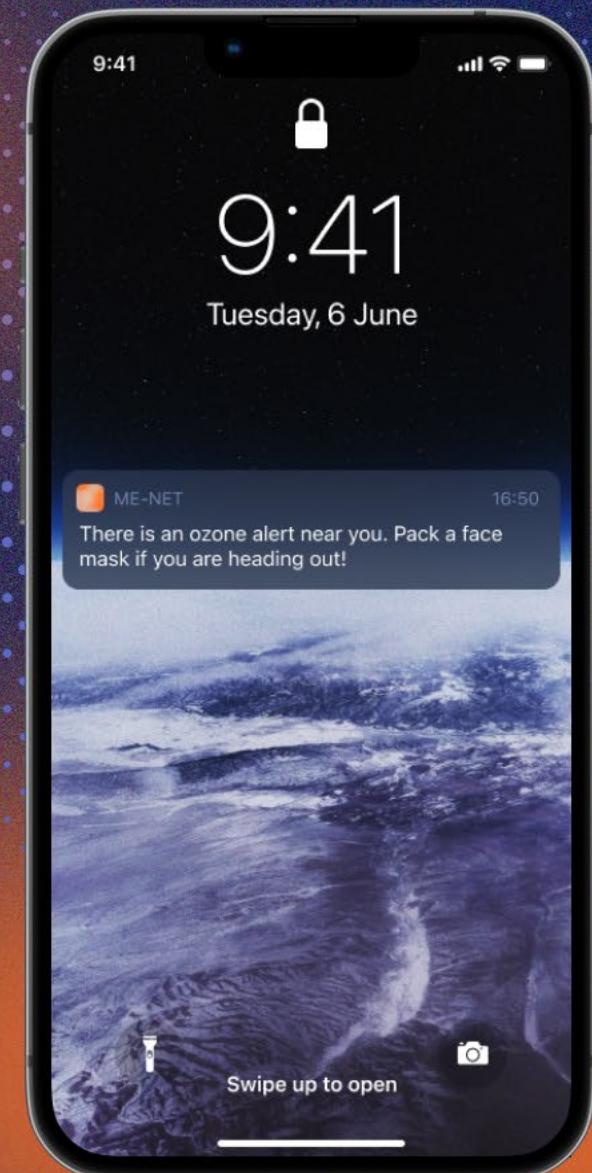
1 2 3 4 5 6 7

 Submit Symptoms

Methane Early Warning Network

Mobilising citizen science for global
social and ecological justice

ME – NET





Before we move on....

Take a moment to think about the material presented so far about the ME-NET project.

Any questions? Is anything unclear so far?

Consider the people in your life, including your personal life as well as your work life who might benefit from a health application like ME-NET.

'Red flags'

Can you think of any 'red flags' e.g., unintended consequences of the application? Let's see....

Unintended consequences?



Little break....resume in 5!

- The Perfect Storm
- Ozone & Health (input activity)

First, we will discuss the evidence base

Second, we will share Common Knowledge content

Third, we will ask you to evaluate the content...

The Perfect Storm

Sunlight + CH₄ + non-MVOCS + NO_x → O₃

- Ozone (O₃) occurs naturally in the stratosphere, making the Earth habitable.
- Ground level O₃ occurs in the troposphere and effects the air people breath, drives global warming and produces health impacts.
- There are no 'natural' sources of ozone in the troposphere, it is produced from interactions between emissions from human activities and meteorological conditions.
- Specifically, ozone is created when hydrocarbons interact with nitrogen oxides and sunlight.
- Nitrogen oxides (NO_x) occur when fuel is burned, e.g., car emissions, and commercial, industrial and residential emissions.
- Sources of methane (CH₄) and non-methane volatile organic compounds (non-MVOCS) include vegetation, waste processing, fuel production and combustion.

Methane (CH₄)

- Methane important because it stays in the troposphere longer than other pollutants – up to 12 years – compared to <1 day to months for NMVOCs.
- While non-methane VOCs are more reactive, accounting for a greater proportion of ozone production, methane is more abundant due to its longer atmospheric lifetime.
- Methane is also a major driver of climate change, with 80xs the warming power of CO₂.
- Background levels reflect cumulative build up.
- Methane & climate change are linked via a positive feedback loop:

O₃ → global warming → permafrost melt → CH₄ → O₃

Now we will present the Common Knowledge content developed for The Perfect Storm educational module....

As we are going through, consider taking some notes for evaluation....

Think about the people you represent...

How well would they understand the content?

Are there any 'red flags' that might have unintended consequences?

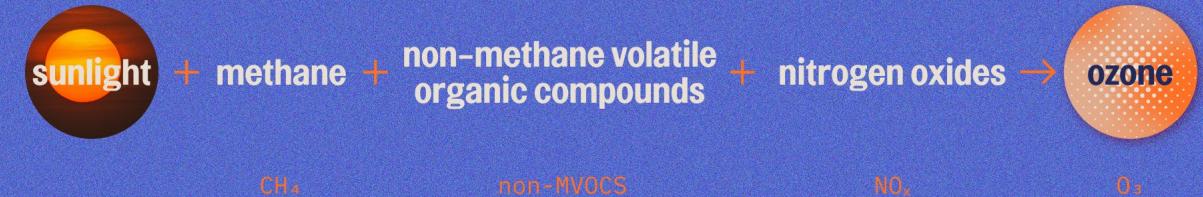
The Perfect Storm

The Perfect Storm

ME.NET

Ozone (O_3) occurs naturally in the stratosphere, making the Earth habitable.

ME.NET



ME.NET

Ground level O₃ occurs in the troposphere and effects the air people breath, drives global warming and produces health impacts.

ME.NET



+ methane + non-methane volatile organic compounds + nitrogen oxides →

CH_4

non-MVOCs

NO_x

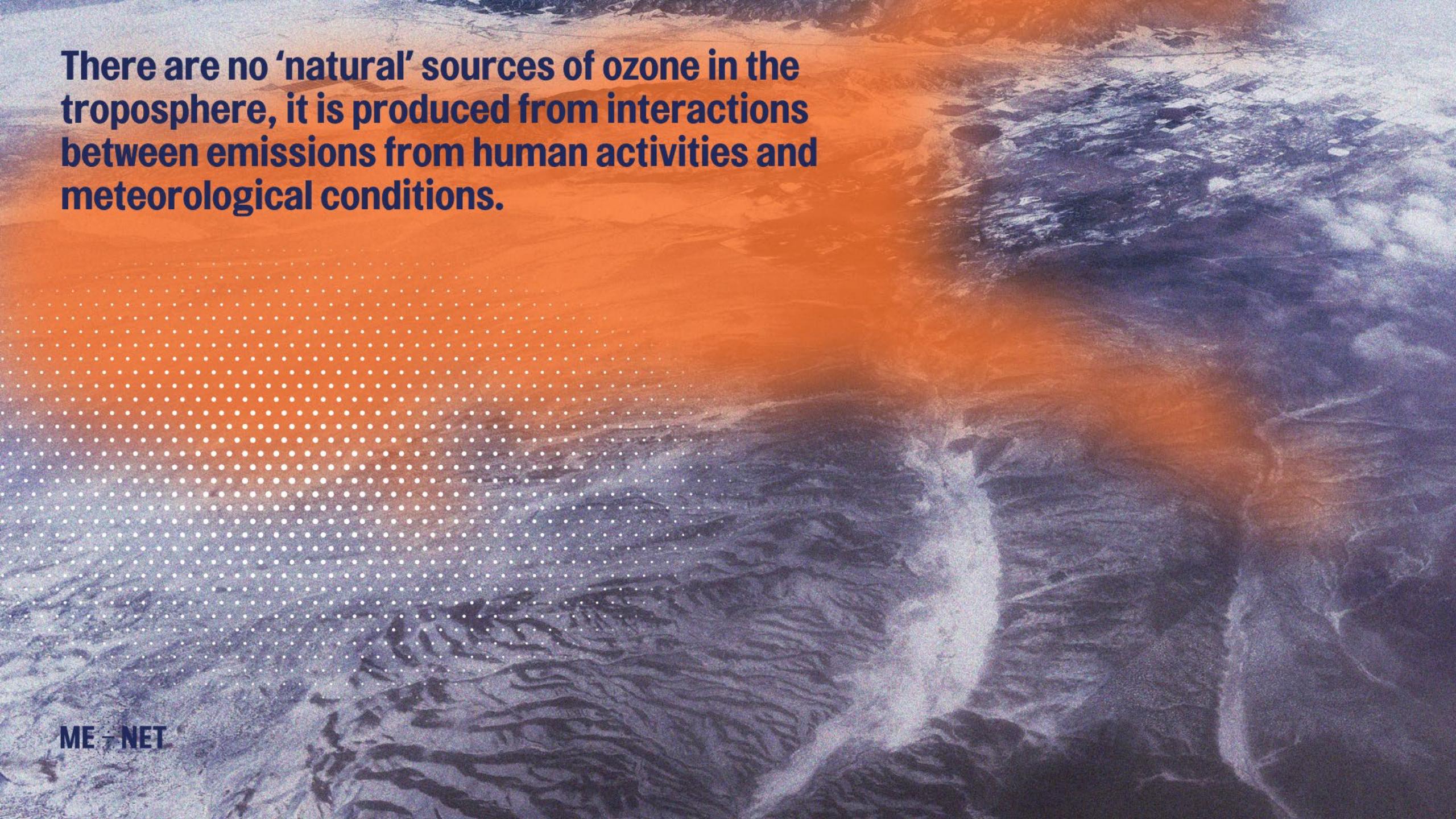
O_3



Ozone (O_3) occurs naturally in the stratosphere, making the Earth habitable.

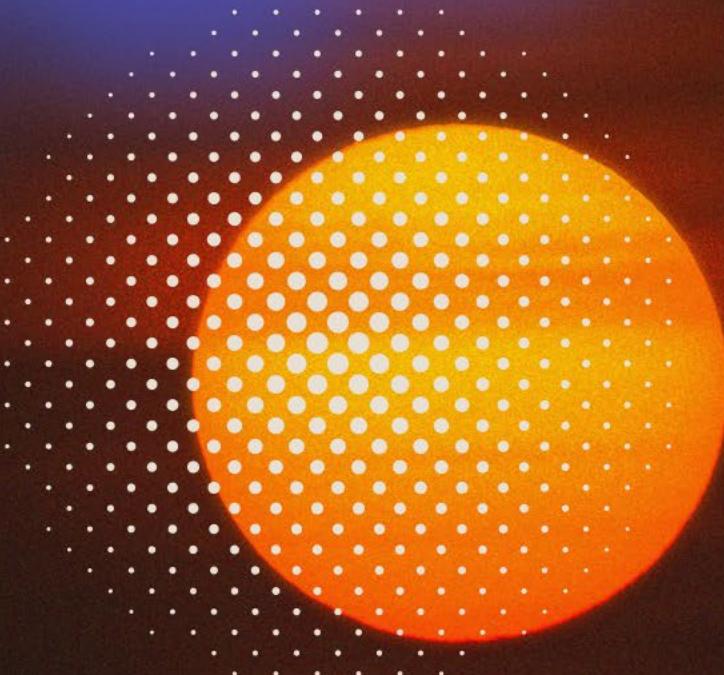
Ground level O₃ occurs in the troposphere and effects the air people breath, drives global warming and produces health impacts.



An aerial photograph showing a patchwork of agricultural fields in various shades of green and brown. A winding river or stream cuts through the landscape. A dotted grid pattern is overlaid on the left side of the image, transitioning from white dots to a solid orange color.

There are no 'natural' sources of ozone in the troposphere, it is produced from interactions between emissions from human activities and meteorological conditions.

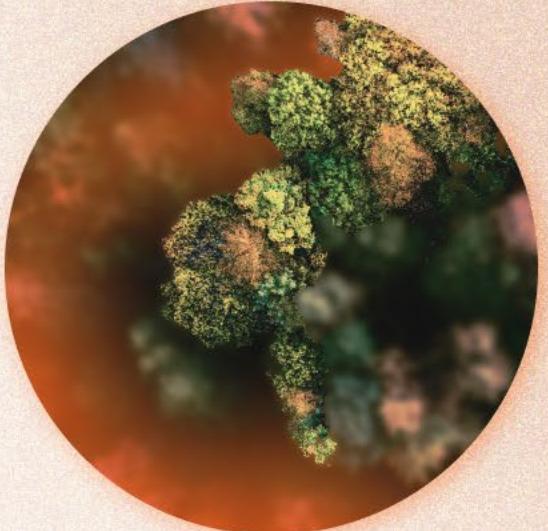
Specifically, ozone is created when hydrocarbons interact with nitrogen oxides and sunlight.



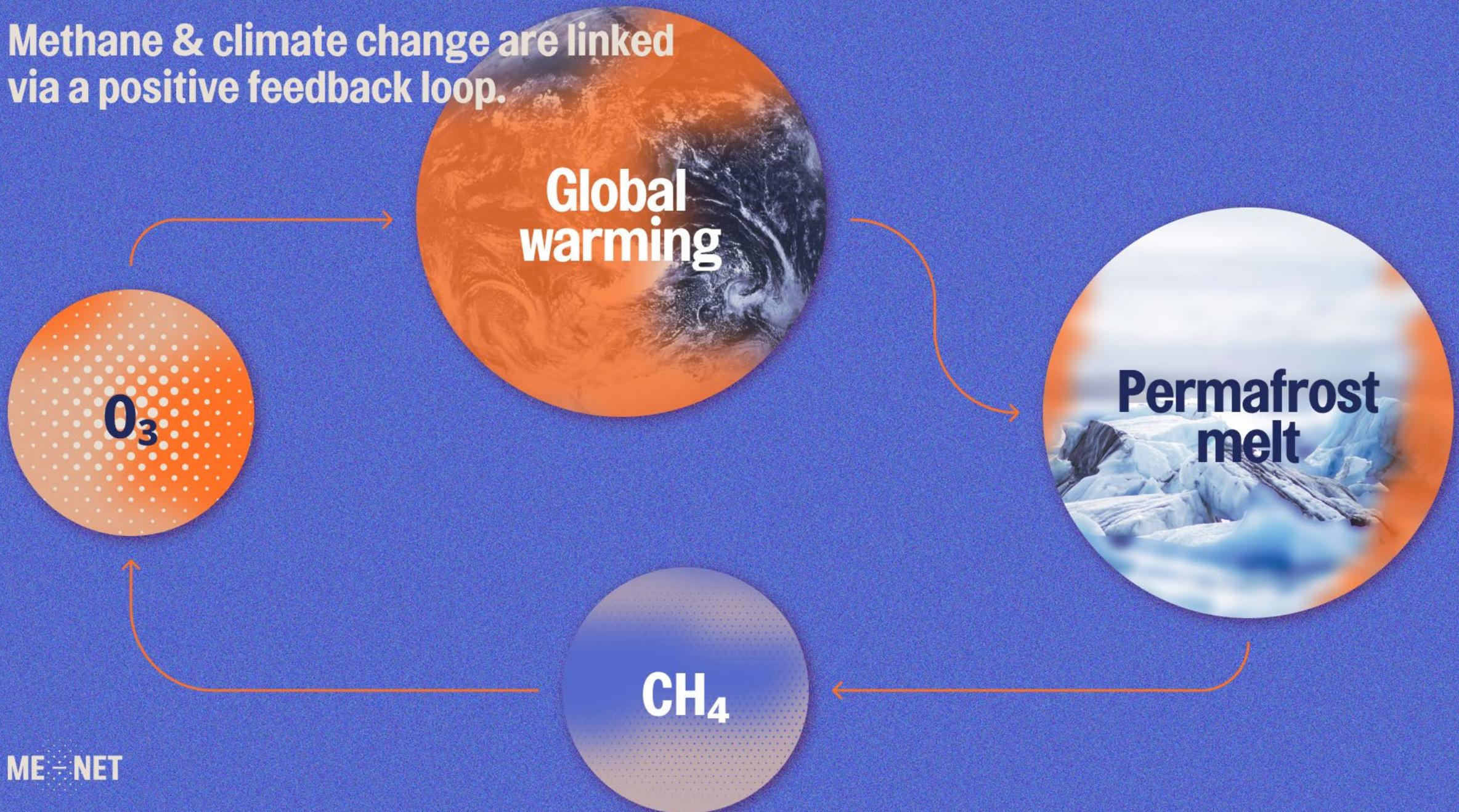
**Nitrogen oxides (NO_x) occur when fuel is burned,
e.g. car emissions, and commercial, industrial
and residential emissions.**



Sources of methane (CH_4) and non-methane volatile organic compounds (non-MVOCs) include vegetation, waste processing, fuel production and combustion.



Methane & climate change are linked via a positive feedback loop.



ME-NET

Evaluation

Take a couple of minutes to consider the people in your life who might benefit from the ME-NET application.

Do you think 'The Perfect Storm' module will be easy to understand for those people?

Please respond to three brief survey items about usability via the QR code.

The Perfect Storm

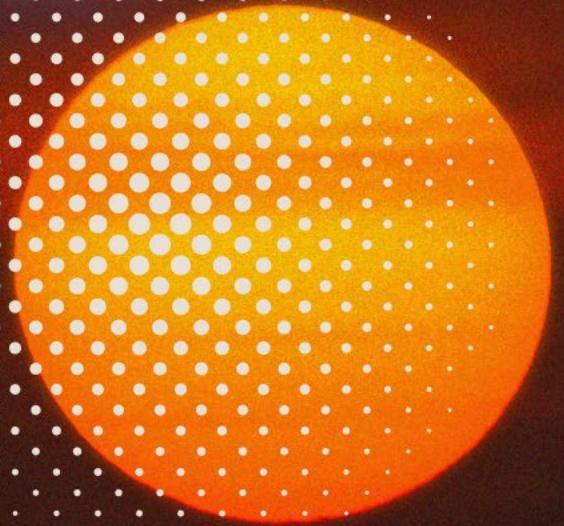


Take a 10min break, grab a coffee...

Next up: ozone and health evidence base.

What do you think an educational module should include?

Created when hydrocarbons react with oxides and sunlight.



Ozone & respiratory health

PRETTY STRAIGHT FORWARD:

- W.H.O estimates >7 million deaths per year from air pollution;
- Deaths attributable to O_3 specifically during warm periods across Europe between 2015-2017 was >100,000 (Achebak et al., 2024);
- O_3 is associated with approximately 0.7 million deaths per year, on average 6.3 million years of lost life related to cardiovascular & respiratory illness (Anenborg et al., 2010);
- Long and short-term exposure decreases lung function, particularly for children (Holm and Balmes, 2022);
- Peak daily O_3 and O_3 in warmer months is associated with cardiopulmonary & respiratory mortality (Atkinson et al., 2016).

Zhao et al (2018) reviewed 31 studies -> links between O_3 and cognitive function, possible links to suicide, depression and ED admission for panic attacks, notably:

- Two cohort studies showing association with depression, including increased risk of reporting symptoms per 10 ppb O_3 exposure, association with ambient concentration and suicide mortality in Belgium for all seasons except winter;
- One case-control study showing difference in O_3 for days with +2 suicides ($x=86.4\mu\text{g}/\text{m}^3$) and those without ($x=79.8\mu\text{g}/\text{m}^3$).

Mental health research is less clear

* $\mu\text{g}/\text{m}^3$ = micrograms per cubic metre air

What are the actual links, drivers & pathways?

- Increasing evidence base for direct impact of pollutants on Central Nervous System, cerebral white matter, cortical grey matter & basal ganglia (Bernardini et al, 2020b);
- Alterations to brain regions and processes linked to psychopathology e.g., changes to neurotransmitters (Zundel et al., 2022);
- Maybe some indirect pathways too?

E.g., Possible links between respiratory symptoms and mental health flare-ups/escalations....

Biophysical effect of blue inhaler (salbutamol) over-use e.g., increased heart rate, tremors, stomach acid precipitating anxiety?

Direct vs Indirect Pathways

SOME POINTS TO CONSIDER

W.H.O estimates that dangerous O₃ concentrations are >100 µg/m³

Thresholds might be lower for mental health

What are the actual links, drivers & pathways?

Much more research needed



'OZONE AND YOUR HEALTH'

YOUR INPUT (15mins)

Think about the most important thing you have learned about ozone and health.

Which 'bits' are the most important to include in the educational module 'ozone and your health'?

Which 'bits' should be represent visually?

*Art designed by Lincolnshire's University Academy Holbeach & Kings Grammar Grantham students.

'How bad air things get out'

FOLLOW UP SURVEY

- 'Find out more': your ideas about the links we should embed in the app;
- Opportunity to recommend additional stakeholders for the board;
- Days of week/times of day for future meetings;
- Further opportunity for feedback and input.

MEETING TRANSCRIPTION

- All recorded meetings will be transcribed;
- Transcriptions will be uploaded to Microsoft Teams sites
- Opportunity to feedback.

Next steps

FUTURE MEETINGS

- Similar format, feed-back and co-develop content for the application following the themes below;
- Time-line for future meetings:
e.g., October/November,
January/February, March/April, May/June
in person(?)

FUTURE THEMES

Visual self-assessments tools for MH and respiratory symptoms

Graphing self-reported data; 'alert me'

Mapping observational data; 'explore and learn'

Prototyping functionality of the alerts system/app.

FINAL COMMENTS, QUESTIONS, CONCERNS?

Thanks for
attending & see
you next time

02.09.24