



CASANZ 2021

Air pollution and climate change ahead of COP26

By Simon Birkett
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18 May 2021

What's happened since 'One Atmosphere' in 2015?

cleanair.london/one-atmosphere/

- Dieselgate
- Paris Agreement
- UNEP's sixth Global Environment Outlook (GEO-6)
- Donald Trump has come and gone. UK has 'left' Europe
- Declarations of a climate emergency
- COVID-19
- Air pollution on Ella Roberta Adoo Kissi-Debrah's death certificate
- New World Health Organisation Air Quality Guidelines (imminent)

Find more short films at vimeo.com/cleanairlondon

Overview

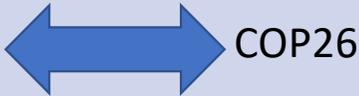
- Clean Air in London's mission
- What is air pollution?
- New WHO air quality guidelines imminent
- What's different indoors?
- UN Climate Change Conference in November 2021
- Solutions
- Opportunities

Clean Air in London's mission

Full compliance with WHO air quality guidelines

	Air pollution	Greenhouse gases
London or any city	Air pollution, cities, health, justice and nature	
Rest of world		

Clean Air in London's mission for COP26 and beyond

	Air pollution	Greenhouse gases
London or any city	Air pollution, cities, health, justice and nature	 COP26
Rest of world	 COP26	 COP26

Air pollution – then and now

- 1952 Respiratory effects from short term exposure to visible smoke from coal and wood burning
- 1956 First national Clean Air Act
- 1995 Cardiovascular effects from long-term exposure to invisible particles. The ‘Six Cities Study’
- 2021 Air pollution is the world’s largest environmental health risk killing an estimated seven million people every year. Probably effecting every organ of your body at every stage of your life

What is air pollution?

- Local air pollution and greenhouse gases
- Local air pollution comprises particles and gas
- Particles regulated as a lump for health and legal purposes e.g. PM_{2.5} and PM₁₀. Typically, particle mass or number concentrations
- Cloud of gases can include carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), sulphur dioxide (SO₂) and many others
- Pathogens e.g. COVID-19

What is the health advice? *The more scientists look the more they find*

- WHO Air Quality Guidelines 2005 (published 2006)
- Inquest into death of Ella Roberta Adoo Kissi-Debrah found air pollution ‘significantly caused’ and ‘significantly contributed’ to her death
<https://www.judiciary.uk/wp-content/uploads/2021/04/Ella-Kissi-Debrah-2021-0113-1.pdf>
- WHO Housing and health guidelines (2018)
<https://www.who.int/publications/i/item/9789241550376>
“In the absence of updated or indoor-specific guideline values, the air quality guidelines are considered applicable for indoor exposure as well. An update of these guidelines is under way.” Section 8.2, Page 95
- New WHO Air Quality Guidelines are expected in mid-2021

New WHO Air Quality Guidelines

- Recommendations of concentrations for PM₁₀, PM_{2.5}, NO₂, O₃, SO₂ and CO for relevant averaging times and critical health outcomes
- Interim targets for developing countries
- Good practice statements (that might lead to guidelines next time) for:
 - black carbon
 - desert dust
 - ultrafine particles

Expected to be published in late June or early July 2021

See 4 May event: <https://www.healtheffects.org/annual-conference>

ANZ: Health impacts of air pollution episodes

- Use new WHO air quality guidelines and concentration response functions (CRF)
- Assess the health impact of short-term exposure:
 - Bushfires
 - dust storms
 - high ozone in summer
 - particles from wood burning in winter
- Assess the health impact of long-term exposure using WHO CRF
- Look for heart and cardiovascular outcomes, including out-of-hospital events, not only respiratory

‘Pollution Protocol’ for event organisers

1. Be prepared
2. Issue updates and health advice
3. Athletes should check advice and carry their medication
4. First aid along the route
5. Water and drinks available
6. Organisers should understand air pollution
7. Organisers should monitor air pollution
8. Organisers should monitor activity on the day
9. Warn emergency services
10. Consider postponement

<https://cleanair.london/hot-topics/codeyellow-for-liverpool-marathon-and-great-manchester-run/>

Where can I find information about outdoor air pollution?

- Monitoring – real time, scientific monitoring
 - Global <https://aqicn.org/map/world/>
 - National and locally managed monitors
 - City networks
- Forecast ‘maps’ often look ‘Green’ 330 days of the year
- Modelling e.g. 20 metre to one kilometre grids
- Other sources e.g. addresspollution.org
- Do your own monitoring e.g. NO₂ diffusion tubes

Clean Air in Cities app

Health impact of long-term exposure to PM_{2.5}



The app is available for iPhones, iPads and android devices

<https://cleanairincities.link/app>

<https://cleanairincities.link/android>

<https://cleanaircities.link/guide>

What's different indoors?

Camfil has sponsored our campaign on indoor air since 2011

- 'Supply' air from outside can include traffic and other pollutants
- Pollution from indoor sources
 - Cleaning products
 - Cooking – carbon monoxide (CO) and oxides of nitrogen (NOx)
 - Dust
 - Fireplaces, stoves and candles
 - Furniture
- Pathogens such as COVID-19

We spend around 90% of our time indoors

Improving indoor air quality

Address traditional pollutants and COVID-19

1. What pollutants are you targeting? Pathogens? PM₁. Traffic pollution?
2. What building constraints e.g. ducted system, standalone units. Whole of system?
3. Quality, temperature, humidity of supply air? Location of air intake?
4. If multiple technologies are used, which work(s) best?
5. 'Cleaning' or 'treating' the air? If 'treating', distance and airspeed?
6. 20% supply air; 80% recirculation is typical with five air changes/hour
7. Multi-stage filtration can provide cumulative 'cleaning' e.g. 70%→97%
8. What UK, EU or international guidance or standards apply?
9. Ongoing compliance (e.g. cleaning), monitoring and improvements
10. We need to 'walk and chew gum' to reduce energy and improve air quality

Understand the technology being used in your building (E&OE)

	Building clean indoor air technology	Process	Performance standard	Independent testing
	'Air cleaning' – HVAC or standalone air filtration		BS EN ISO technical standards	
	Particle air filtration for general ventilation	Mechanical particle removal	BS EN ISO 16890:2016	Yes
	High efficiency particle air filtration e.g. HEPA	Mechanical particle removal	BS EN 1822:2019 ISO 29463:2017	Yes
	Molecular or gas phase air filtration e.g. carbon	Adsorption Chemisorption	BS EN ISO 10121-2:2013 WHO Air Quality Guidelines	Yes
	Electrostatic air filtration	Electrostatic particle removal	?	?
	'Air (or surface) treatments'			
1	Ultraviolet germicidal irradiation e.g. UV lamp	Irradiation	BS ISO 15714:2019	?
2	Photocatalytic oxidation	Chemical	?	?
3	Pulsed light	Irradiation	?	?
4	Ionisation	Ion particle effect	?	?
5	Ozone	Chemical	?	?
6	Green technologies e.g. vegetation	Biological	?	?
7	Thermal disinfection or desiccation	Irradiation	?	?
8	Microwaves	Irradiation	?	?
9	Ultrasonication	Energy shock	?	?
10	Plasma technology (similar to corona)	Irradiation	?	?
11	Corona discharge (ionisation related)	Irradiation	?	?
12	Free radicals	Electron pairing	?	?
13	Chemical disinfection	Chemical	?	?
14	Antimicrobial coatings	Chemical	?	?

Latest UK, EU and international standards

Those who write 'guidance' may not understand the latest 'standards' or that most buildings need ventilation, temperature control and filtration

- BS EN 16798-3: 2017. Energy performance – Ventilation for buildings
- BS EN ISO 16890:2016. Particulate air filters for general ventilation
- BS EN ISO 10121-2:2013. Gas phase air filters for general ventilation
- ASHRAE 52.2-2012 – Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size

Ashrae filter test standards refer to 'Minimum Efficiency Reporting Value' (MERV) which have approximate equivalent ratings in ISO 16890:2016 e.g. the recommended equivalent of MERV 13 is ePM₁ 80% (or ePM₁ 60% minimum)

<https://www.ashrae.org/technical-resources/filtration-and-disinfection-faq>

Air filter groups and classes

Group or type of particle air filters	Filter class ISO 16890 or EN1822 for E10 and above	Example of use	Average collection efficiency for the most penetrating particle size (MPPS)% EN1822	ISO 16890 tested PM efficiency for particles %	ISO 16890 Gravimetric Arrestance of test dust ISO 15957-L2 %
Coarse	ISO Coarse 70%	Warehouses			70%
Medium	ePM ₁₀ 50%	Protection of ventilation systems		PM ₁₀ 50% removed in one pass	
	ePM _{2.5} 50%			PM _{2.5} 50% removed in one pass	
Fine	ePM ₁ 70%	Schools		PM ₁ 70% removed in one pass	
	ePM ₁ 80%	Laboratories		PM ₁ 80% removed in one pass	
	ePM ₁ 85%	Healthcare		PM ₁ 85% removed in one pass	
Efficient particulate filters	E10	Precision tooling	85% @ MPPS		
	E11		95% @ MPPS		
	E12		99.5% @ MPPS		
High efficiency particulate filters	H13 and H14	Operating theatres	Over 99.95% @ MPPS		
Ultra low penetration air filters	U15, U16 and U17	Space craft	Over 99.9995% @ MPPS		

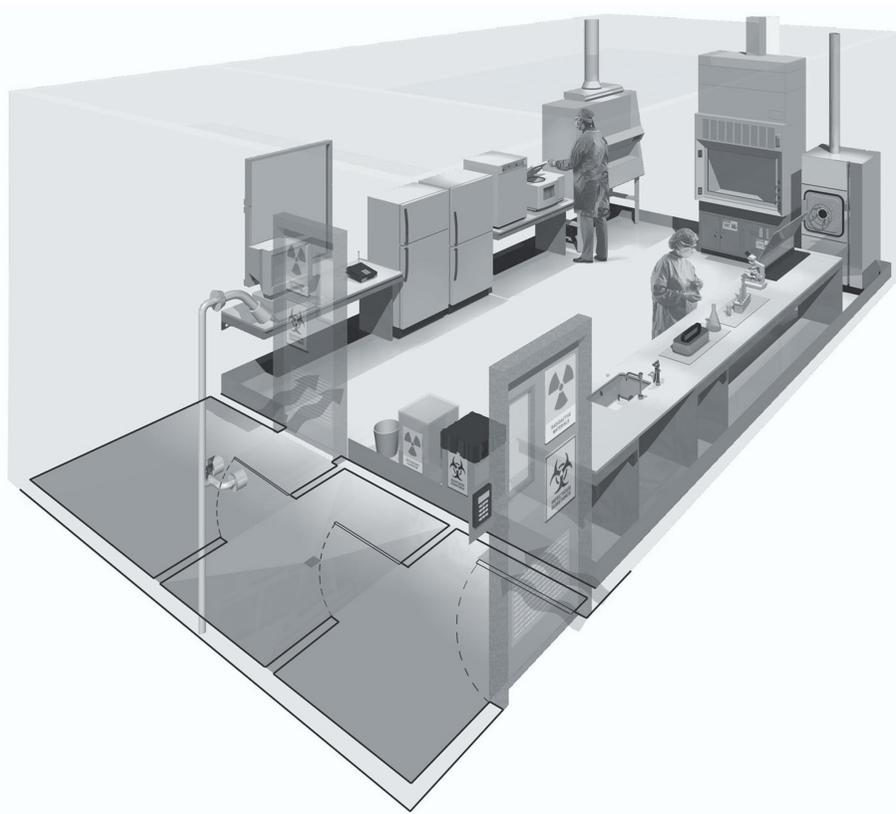
British and European standard BS:EN 16798-3 *for buildings since 2017*

Outdoor Air Quality (ODA)		Supply Air Quality (SUP) e.g. SUP 1 for higher indoor air quality			
		SUP 1 (High)	SUP 2 (Medium)	SUP 3 (Moderate)	SUP 4 (Low)
Increasing pollution 	ODA 1 eg countryside	ISO coarse + ePM ₁ 85%	ISO coarse + ePM ₁ 80%	ePM ₁ 70%	ePM ₁₀ 50%
	ODA 2 eg smaller towns	ePM ₁ 70% + ePM ₁ 85%	ePM ₁₀ 50% + ePM ₁ 80%	ePM ₁₀ 50% + ePM ₁ 70%	ePM ₁₀ 50% + ePM _{2.5} 50%
	ODA 3 eg city centres	ePM ₁ 70% + GF + ePM ₁ 85%	ePM ₁ 70% + GF + ePM ₁ 85%	ePM ₁₀ 50% + ePM ₁ 70%	ePM ₁₀ 50% + ePM _{2.5} 50%

GF = Gas filter (carbon filter) and/or chemical filter.
Table based on appendix A.3 "Use of air filters" in European standard BS:EN 16798-3

EN779 classifications are outdated and replaced by ISO16890. Indoor air depends on supply, recirculation and indoor sources

4. THE CONTAINMENT LABORATORY – BIOSAFETY LEVEL 3



(c) 2021 Clean Air in London



BIOHAZARD

WHO 04.64

ADMITTANCE TO AUTHORIZED PERSONNEL ONLY

- Biosafety containment laboratories have used H14 HEPA filters for decades. Current standards EN 1822:2019 and ISO 29463.
- Clean room standards, guidance and practice illustrate what can be achieved in modern buildings e.g. ISO 14644.

What is 'climate change'?

- Greenhouse gases trap more energy and increase the planet's temperature
- Conflates many issues e.g. emissions, global warming and changes in climate
- Short, medium and long-term effects. Temperature multiplier in polar regions
- ST: warmer, drier summers, wetter winters, acidification of oceans, biodiversity loss, bush/wildfires, droughts, flooding, heatwaves and disease vectors, landslides and stronger storms/cyclones. Air pollution episodes – dust and ozone.
- MT: crop failure, desertification, disasters, loss of Hindu Kush glaciers, migration
- LT: sea level rise and other 'lagged' effects
- Many justice issues including inter-generational

UN Climate Change Conference (COP26)

Who? What? Where? When? Why?

- Paris Agreement adopted by 196 parties at COP21 in December 2015
- UNCCC (COP26) in Glasgow 1-12 November 2021
- UK and Italy will lead COP26. Alok Sharma is COP26 President Designate
- Build up includes: UK hosting G7 in June and Italy hosting G20 in October
- US has re-joined the Paris Agreement

What did the Paris Agreement do in 2015?

- Goal to limit global warming to “well below” 2 degrees, preferably 1.5 degrees, Celsius compared to pre-industrial levels
- Countries aim to reach global peaking of greenhouse gas emissions ‘as soon as possible’ to achieve a climate neutral world by mid-century
- Countries supporting one another on finance, technology and capacity-building
- Review progress every five years [2020->2021]
- Developed countries agreed to provide \$100 billion a year in climate finance to help poorer countries by 2020 with a commitment to further finance in future

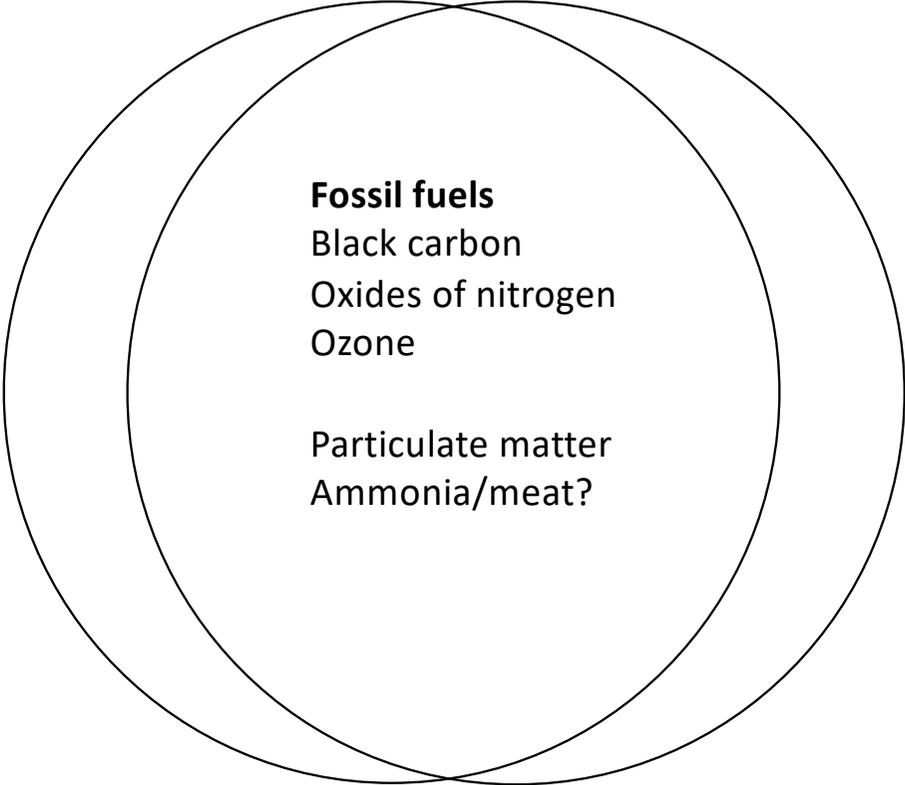
What did the Paris Agreement leave to COP26?

- Countries to submit their plans for climate actions to reduce GHG emissions known as nationally determined contributions (NDCs) by [2020]
- Countries invited to submit long-term low GHG development strategies by [2020]
- Wealthy nations due to deliver \$100bn pa climate finance
- Sticking points from 2015 carried forward e.g. Paris Rule Book

Fossil fuels accounted for 78% of total UK gases in 2019 (and buildings generate 78% of greenhouse gases in cities)

Local air pollution

Airborne metals
Particulate matter
VOCs

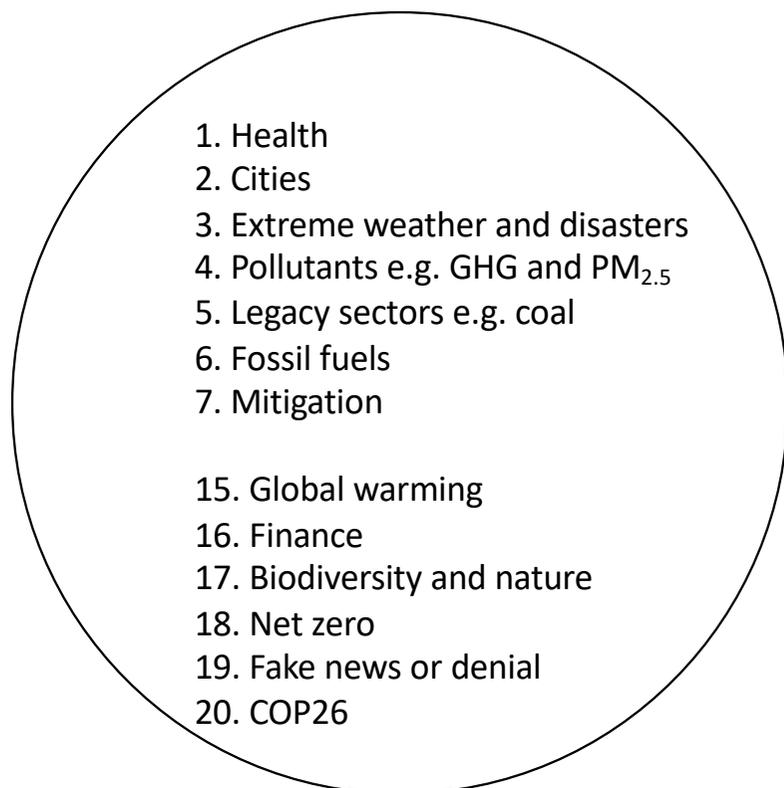


Greenhouse gases

Carbon dioxide
Methane/meat?

But discussion around COP26 is still focused on generalisations

Air pollution
3.4m tweets. 11.0m engagements

- 
1. Health
 2. Cities
 3. Extreme weather and disasters
 4. Pollutants e.g. GHG and PM_{2.5}
 5. Legacy sectors e.g. coal
 6. Fossil fuels
 7. Mitigation

 15. Global warming
 16. Finance
 17. Biodiversity and nature
 18. Net zero
 19. Fake news or denial
 20. COP26

COP26
2.6m tweets. 11.3m engagements

- 
1. Climate activists
 2. Climate change
 3. Climate emergency
 4. Pollutants
 5. Net zero
 6. Fossil fuels

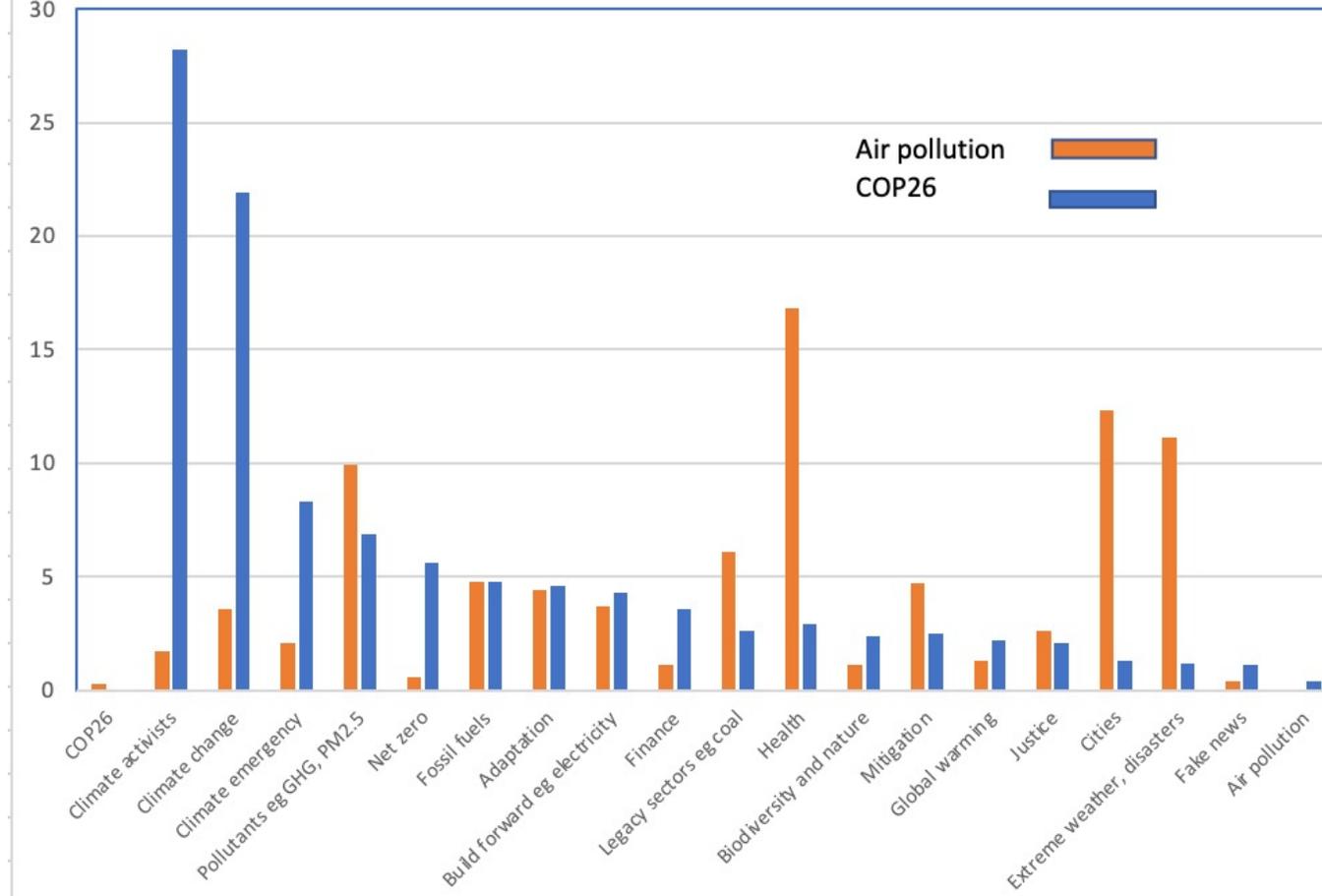
 11. Health

 15. Global warming
 16. Justice
 17. Cities
 18. Extreme weather and disasters
 19. Fake news or denial
 20. Air pollution

CAL analysis of over 6m tweets and 22m engagements using Sprout Social 'Listening' (12 months ended 30/4/21)

%

Sprout Social 'Listening' on Twitter - 12 months to 30 April 2021



What are the UK presidency's goals for COP26?

Patricia Espinosa to LSE (26 February 2021)

1. Strong NDCs
2. Wrap up negotiation items e.g. Article 6
3. Raise ambition on adaptation and finance
4. Bring state and non-state voices together

Alok Sharma speech (14 May 2021)

1. Net zero by 2050 and 1.5c. Abandon coal
2. Adaptation to protect people and nature
3. Mobilise climate finance
4. Work together e.g. finalise Paris Rulebook
5. Physical meeting

What are Australia's goals for COP26?

- Net zero 'as soon as possible' and preferably by 2050
- Criticise carbon tariffs
- Green technology as priorities for its technology roadmap
- Renewable energy

100-page report analyses priorities, 20 themes, people and events for top 20 (territorial) emitters at: <https://cleanair.london/sources/unccc/>

Mood music – COP26 was always going to be a difficult meeting...

- No global net zero deadline. Global temperatures heading to 3.5c rise
- NDCs from 75 of 194 parties
- Finance – \$67bn at last count
- Boost from President Biden/US re-joining the Paris Agreement
- India ‘reluctant’ to set a net zero deadline citing failures of developed countries to deliver on their commitments e.g. finance
- Australia aiming for net zero asap and ‘preferably’ before 2050...
- Developed countries are accused of ‘protectionism’ and ‘hypocrisy’

What we need at COP26?

1. Outcome that will limit global warming to 1.5c-2.0c. Is 2050 too late?
2. NDCs, long term plans, global net zero deadlines with progress by 2030
3. Deliver financial and other pre-2020 commitments
4. Paris Rule Book agreed
5. Adaptation plans
6. Build engagement and momentum among state and non-state actors
7. Physical meeting

Countries must put their own houses in order e.g. comply with existing air pollution laws and publish plans and legislation to deliver net zero by 2050

Solutions – Mitigation and adaptation. Opportunities

- Urgency. One atmosphere not air pollution vs GHG. Include lifestyle changes. Governance
- Zero air emissions – a unifying theory for air quality and climate change
- Zero air emissions is not ‘net zero’ or ‘carbon neutral’. ‘Net’ is a fudge. ‘Carbon neutral’ can mean ‘no change’ rather than ‘zero’
- Political leadership, technology and lifestyle changes
- Remove subsidies. Ban solid fuels including wood. New Clean Air Act
- Beware biomass and blue hydrogen.
- Mobilise everyone everywhere: health, cities, justice, nature etc.
- Opportunities – cleaner, healthier cities and towns

What are 'lifestyle change' policies?

And how do we get them?

1. Bans
2. Charges
3. Public understanding campaigns
4. Incentives
5. Adoption

Campaigners and others can create the 'political space' for politicians to implement 'lifestyle change' policies by making the political costs of inaction greater than action e.g. diesel 'bans' in London

#Mayor4CleanAir 2021

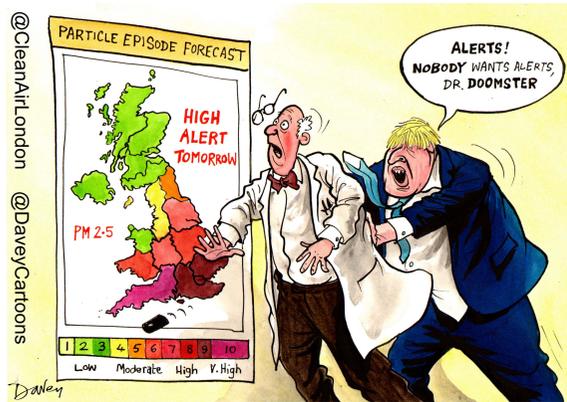
1. [#NetZero](#) between 2030/2040
2. Better [#AirPollution](#) alerts
3. Bigger, stronger, smarter, fairer ultra low emission zone [#ULEZ](#)
4. Making London the first [#VegetarianMegaCity](#) by 2030*
5. National party supporting a new [#CleanAirAct](#) by [#COP26](#)

<https://cleanair.london/cal/sian-berry-10-10/>

*51% menus and people mostly or entirely vegetarian or vegan



Scoring of Mayoral manifestos London 2021



Suggestions for Australia and New Zealand

- Calculate critical health outcomes for local areas, states and nationally for each pollutant using new WHO Air Quality Guidelines and CRFs
- Update laws and regulations for ambient air to align with new AQGs
- Update indoor air rules based on recognised international standards e.g. ISO, ASHRAE etc. Ventilation, air filtration and/or air conditioning
- Encourage air pollution, biodiversity, cities, health and justice stakeholders to talk about climate change and COP26 (and vice versa)
- Ensure Australia and New Zealand play their full part at COP26

Opportunities

- New WHO Air Quality Guidelines in mid-2021
- Possible UN right to a safe, clean, healthy and sustainable environment
- New Clean Air Act to decarbonise buildings
- Legal action e.g. Climate case Urgenda. Supreme Court in Netherlands
- Science Based Targets needed for biodiversity, land, fresh water and oceans i.e. similar to WHO air quality guidelines and 1.5-2.0c
- G7 and UN Climate Change Conference (COP26)
- Healthy people, healthy planet

“In nature there are neither rewards nor punishments;
there are consequences.”

Robert G. Ingersoll (1833-1899)

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