UWE Bristol | University of the West of England

Presented by

Dr Jo Barnes, Senior Research Fellow

Air Quality Management Resource Centre, UWE Bristol

Benefits of Improving Air Quality and Reducing Road Traffic

Clean Air Day
Pollution in Bristol: Our Emissions and Transport

Future Economy Network and Stantec

8th October 2020

#CleanAirDay @cleanairdayuk @aqmrcUWE @jobarnes_UWE

Scale of the problem

It is estimated that **long-term exposure to man-made air pollution in the UK** has an annual effect equivalent to:

28,000 to 36,000 deaths

Over the following 18 years a **1 µg/m³ reduction in fine particulate air pollution in England** could prevent around:

50,900 cases of coronary heart disease

16,500 strokes

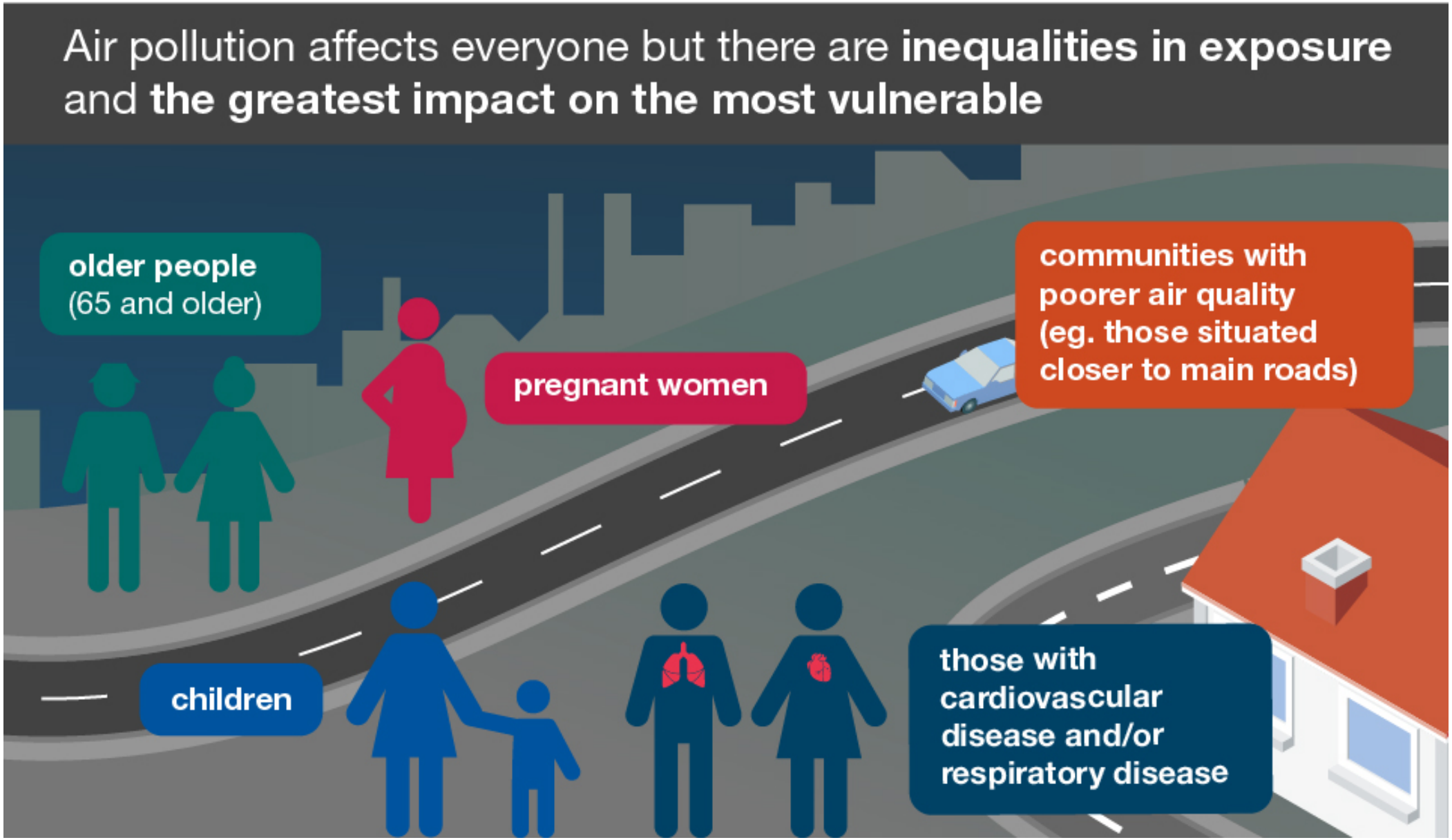
9,300 cases of asthma

4,200 lung cancers

Economic impacts of air pollution health effects

- Public Health England estimate the 2017 costs of air pollution to the NHS and social care in England as about **£157 million**.
  - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/708855/Estimation_of_costs_to_the_NHS_and_social_care_due_to_the_health_impacts_of_air_pollution_-_summary_report.pdf

- This could reach **£18.6 billion** by 2035, including chronic obstructive pulmonary disease, diabetes, low birth weight, lung cancer, and dementia.



https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution

Air Pollution and Climate Change

- Air pollution and climate change are inextricably linked.
- Fossil-fuel combustion results in local air pollution as well as increasing CO_2 emissions.
- Short-lived climate-forcing pollutants (SLCPs) e.g. methane, black carbon, ozone, and sulphate aerosols, absorb or reflect sunlight adding to atmospheric warming and cooling mechanisms.
- Changing climates may affect air pollution, e.g. hotter summers -> increased O_3 production

https://climpol.iass-potsdam.de/info/air-quality-climate-change-slps/history-slcps

https://ccacoalition.org/en/content/short-lived-climate-pollutants-slcps

https://pubs.acs.org/doi/abs/10.1021/es803650w

Air Pollution and Ecosystems

- Air pollution can affect ecosystems in complex ways.
  - Direct toxicity
    - Leaf tip damage and speckly lesions, decreased vitality and loss of sensitive species, e.g. lichens
    - "Critical levels" set for concentrations of SO_2, NOx, O_3, NH_3 and cloud water droplets.
  - Accumulated deposition (indirect effects)
    - Eutrophication and acidification
    - Long term change in plant species competition and changes in soil nutrient status
    - "Critical loads" set for deposition of nutrient nitrogen and sulphur for different habitat classes – used in impact assessments
  - Heavy metals e.g. cadmium, mercury and lead, particularly on aquatic fish and invertebrates
  - Ecosystem services e.g. biodiversity, CO_2 sequestration, crops, livestock, timber, recreational fishing

http://www.apis.ac.uk/ecosystem-services-and-air-pollution-impacts
http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis
https://www.eea.europa.eu/data-and-maps/indicators/exposure-of-ecosystems-to-acidification-14

Air Pollution and the Built Environment

- Black carbon and acid deposition can severely soil and corrode ancient buildings and monuments, particularly those made from limestone or bronze.
- Loss of cultural heritage and costs of maintenance may be significant.
- Contemporary air pollutants have the potential to degrade organic coatings and polymers on modern structures.
- Outdoor air pollution ingresses to indoor affecting choice of ventilation systems.

https://www.flickr.com/photos/wonker/2377311315

https://www.worldscientific.com/worldscibooks/10.1142/p243

http://www.corr-institute.se/icp-materials/web/page.aspx?sid=3293

Improving air quality improves…

- **Health** by:
  - Reducing mortality
  - Reducing morbidity and increasing quality of life
  - Reducing the NHS and social care costs
  - Reducing inequalities

- **Climate change** by:
  - Reducing CO_2 emissions and short-lived climate-forcing pollutants

- **Ecosystems** by:
  - Reducing direct toxicity and deposition effects

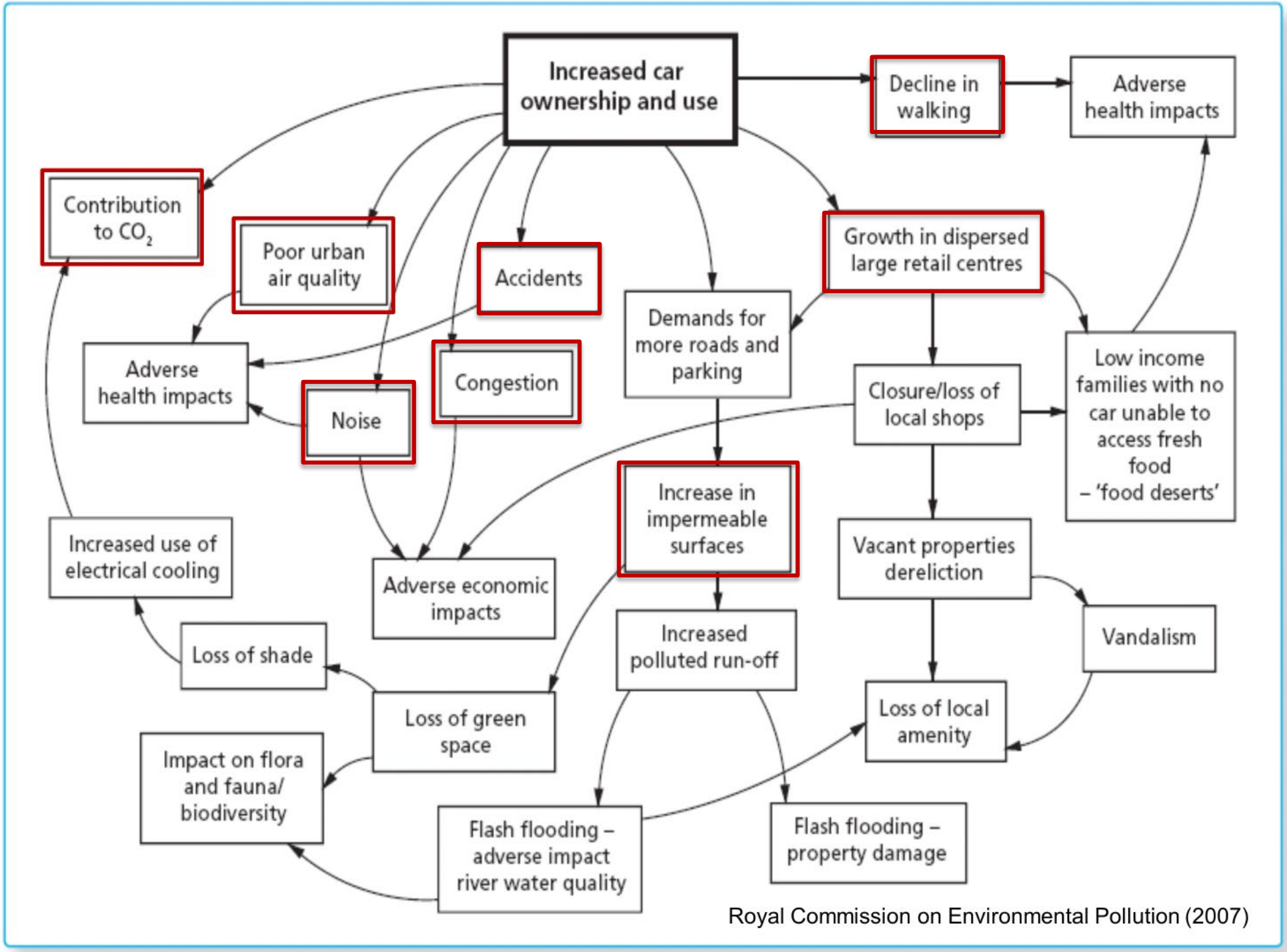
- **Built environment** by:
  - Reducing damage to building infrastructure and cultural heritage

So how do we improve air quality?

- Remove the receptors?
  - Not normally feasible

- Clean up the source?
  - Ok, but dependent on improvements in technology
  - Doesn’t necessarily address climate change or non-exhaust pollutants

- Remove the source?
  - Potentially more difficult, but many more co-benefits!



Royal Commission on Environmental Pollution (2007)

Summary

- Air pollution and the sources of air pollution are highly complex and have health, environmental, societal and economic implications.

- In order to reduce these negative impacts and achieve the widest possible benefits, decision-making needs to be broad, integrated and ambitious!

https://youtu.be/GsQQ8Ujbua4

https://irishcycle.com/wp-content/uploads/2017/12/from-motorway-back-to-canal.jpg