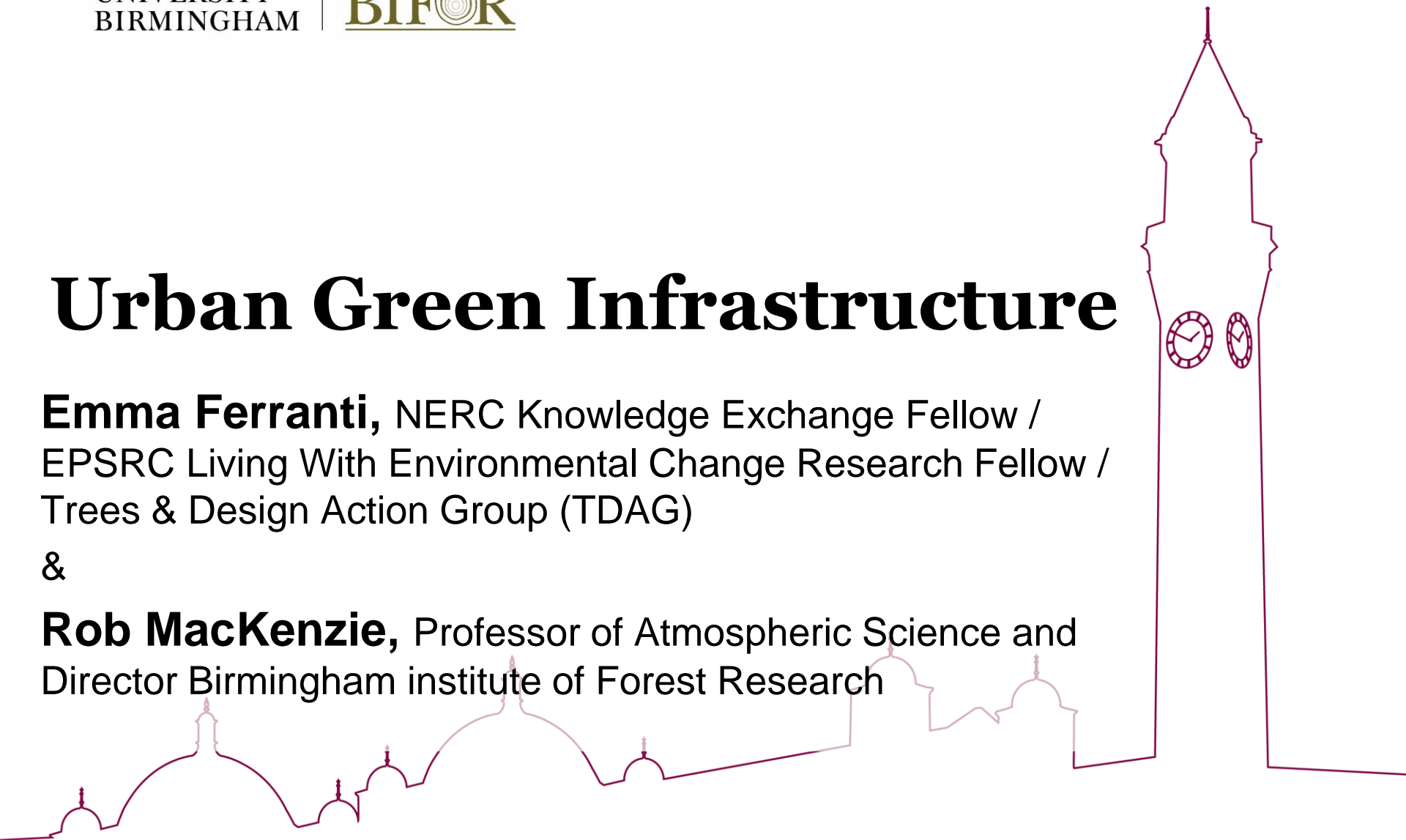# Urban Green Infrastructure

Emma Ferranti, NERC Knowledge Exchange Fellow / EPSRC Living With Environmental Change Research Fellow / Trees & Design Action Group (TDAG)

&

Rob MacKenzie, Professor of Atmospheric Science and Director Birmingham institute of Forest Research

Biophilia - love of nature (Wilson, 1984)

Our innate (genetic) attraction to nature and natural processes developed from living agrarian settings.

Urban green infrastructure

Green infrastructure – ecosystem services

climate resilience

Source: TDAG http://www.tdag.org.uk/trees-in-the-townscape.html

biodiversity

recreation

health

"If GI was a pill, every GP in the country would be prescribing it"
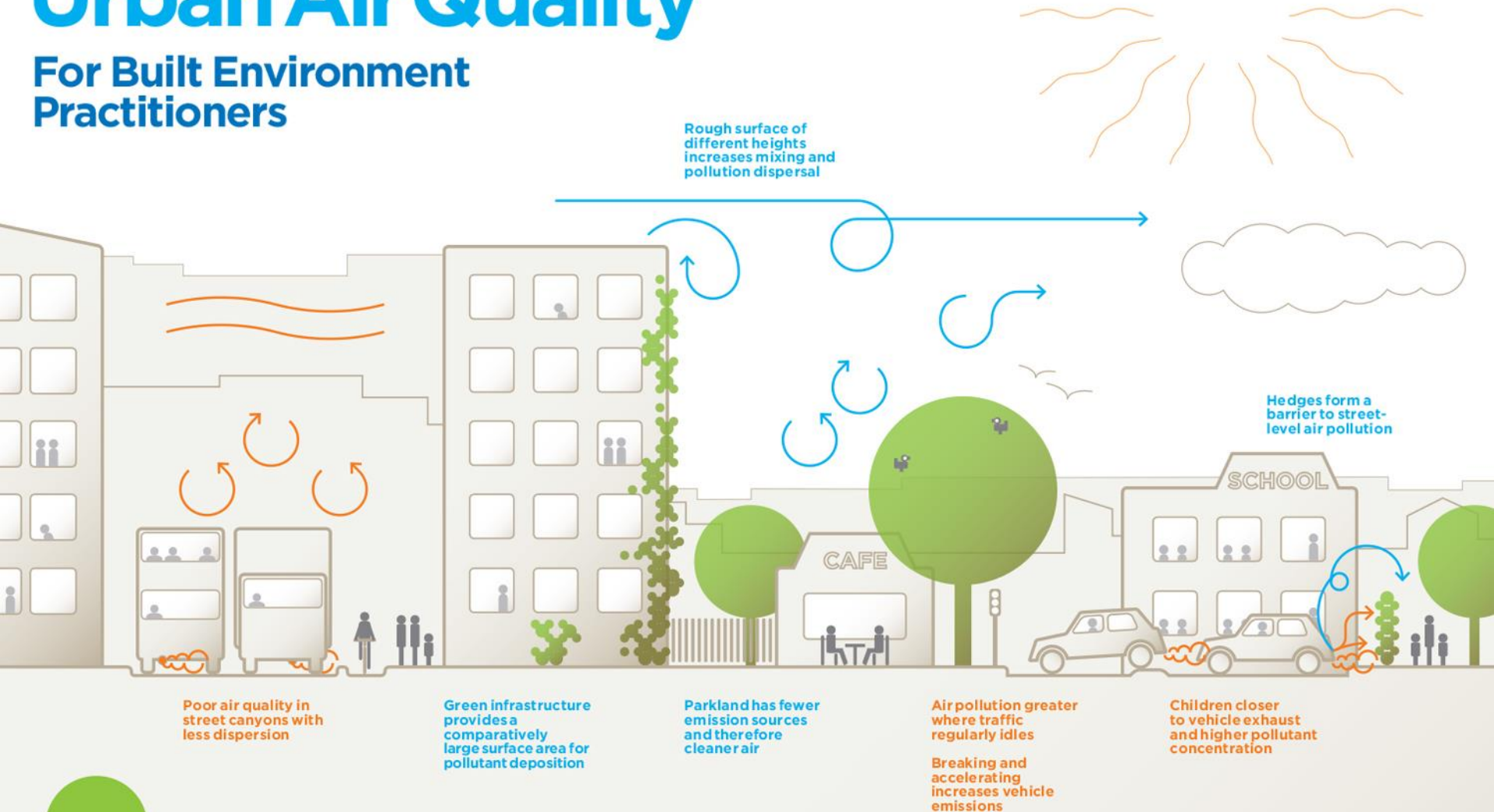

UNIVERSITY OF BIRMINGHAM | BIFOR

Dr Ann Marie Connolly

Deputy Director,

Health and Wellbeing,

Public Health England

First Steps in Urban Air Quality

For Built Environment Practitioners

http://epapers.bham.ac.uk/3069/

Rough surface of different heights increases mixing and pollution dispersal

Hedges form a barrier to street-level air pollution

SCHOOL

CAFE

Poor air quality in street canyons with less dispersion

Green infrastructure provides a comparatively large surface area for pollutant deposition

Parkland has fewer emission sources and therefore cleaner air

Air pollution greater where traffic regularly idles

Breaking and accelerating increases vehicle emissions

Children closer to vehicle exhaust and higher pollutant concentration

Trees & Design Action Group

UNIVERSITY OF BIRMINGHAM | BIFOR

Lancaster Environment Centre | Lancaster University

Air pollution in UK

☐ Air pollution causes 50,000 early deaths/year in UK[1]

☐ Road transport main source urban air pollution

☐ Key pollutants:
- NOx gases
- PM (PM_{10}, $PM_{2.5}$, $PM_{0.1}$),
- Ozone (NOx + VOCs + ☀️

Image: British Heart Foundation

Image: University of Manchester

UNIVERSITY OF BIRMINGHAM | BIFOR

1: Landrigan, et al 2017; The Lancet

Health impacts of air pollution

☐ Better air quality = better cardiovascular health

☐ Effects across a lifetime from gestation to older age

☐ The most vulnerable suffer the most harm

e.g. live in areas higher levels of air pollution

e.g. pre-existing medical conditions.

Royal College of Physicians

RCPCH
Royal College of
Paediatrics and Child Health
Leading the way in Children's Health

Every breath
we take
The lifelong
impact of
air pollution

Report of a working party
February 2016

UNIVERSITY OF BIRMINGHAM | BIFOR

Air Quality and Green Infrastructure

☐ Green infrastructure is not the solution to air pollution **emissions controls are essential**

☐ To improve air quality:
  ○ **Reduce** emissions
  ○ **Extend** distance between people & pollution source
  ○ **Protect** most vulnerable people

☐ Good urban design can use **green infrastructure** to **Reduce, Extend, Protect**

Green infrastructure: Reduce & Extend

E.g. High Line, New York

- 2.3km linear park

☐ GI to reduce emissions by encouraging people to walk or cycle

☐ GI to extend the distance between roadside pollution source and human receptor

UNIVERSITY OF BIRMINGHAM | BIFOR

GI to Extend

GI to Protect

Urban form and surface roughness

Buildings and GI of different height create a rough surface and more mixing of air

Street canyons of similar sized buildings with less roughness and less surface mixing

Fig. 2 **The tree canopy and street-level air**

Pollution source outside tree canopy: a dense tree canopy protects street-level air from more polluted air aloft

Pollution source inside tree canopy: a dense tree canopy risks trapping more polluted air at street level

Thank you – and over to James

e.ferranti@bham.ac.uk
@BIFoRUoB
http://epapers.bham.ac.uk/3069/

UNIVERSITY OF BIRMINGHAM | BIFOR

Green infrastructure: Reduce & Extend