HARMO21

21ST INTERNATIONAL CONFERENCE ON HARMONISATION WITHIN ATMOSPHERIC DISPERSION MODELLING FOR REGULATORY PURPOSES

27-30 September 2022
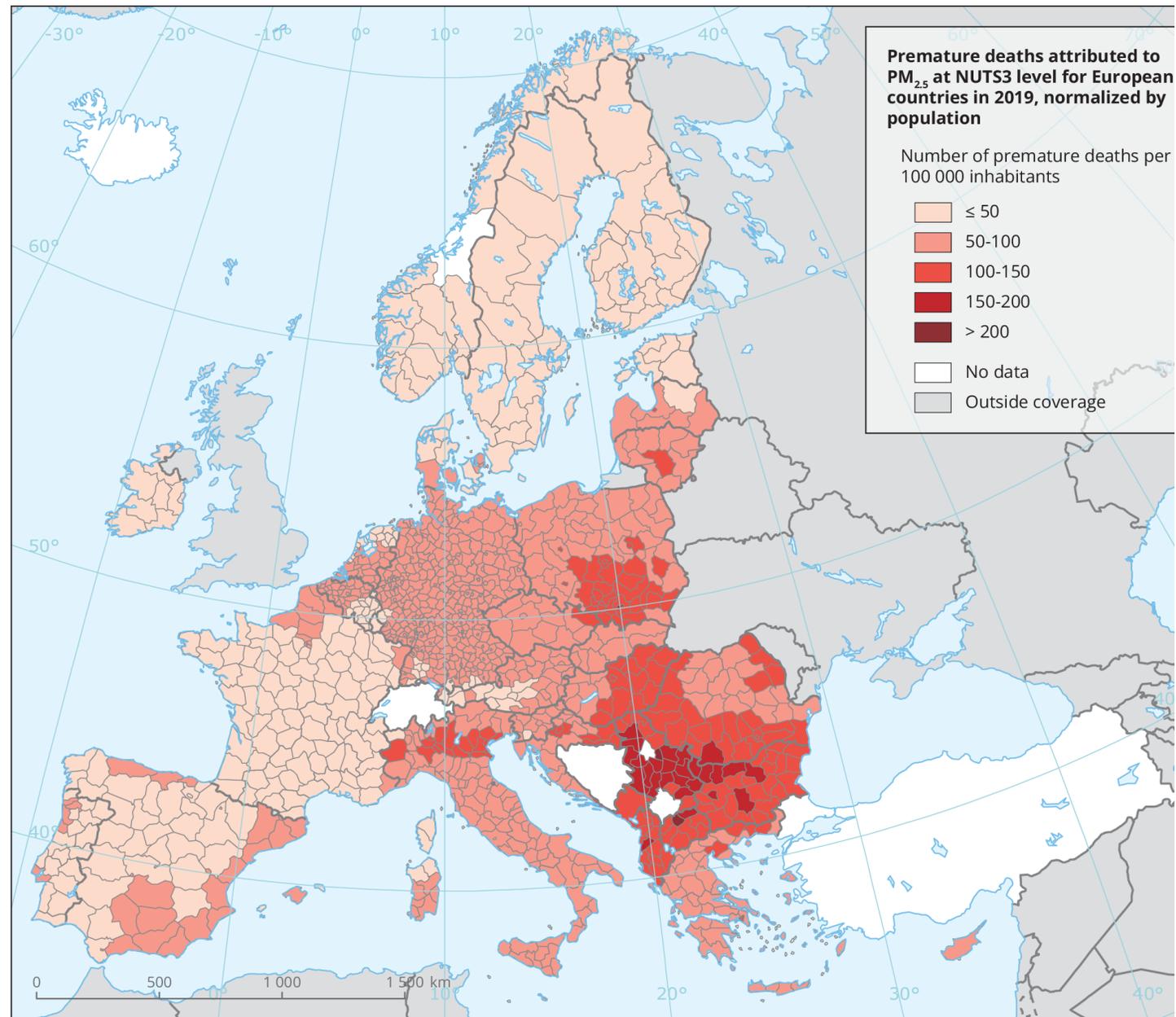Universidade de Aveiro

ASSESSING THE IMPACTS OF GREEN INFRASTRUCTURES ON URBAN AIR QUALITY

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Urban areas' sustainability is alarmingly threatened by **air pollution** and **extreme weather events**

In 2019, 307000 **premature deaths** resulted from **exposure to fine particulate matter**

Premature deaths attributed to $PM_{2.5}$ at NUTS3 level for European countries in 2019, normalized by population

Number of premature deaths per 100 000 inhabitants

- ≤ 50
- 50-100
- 100-150
- 150-200
- > 200
- No data
- Outside coverage

Reference data: ©ESRI

'Air quality in Europe 2021'
EEA report Nº 15/2021

Impact on the Sustainable Development Goals

GOAL 11
Make cities and human settlements inclusive, safe, resilient and sustainable
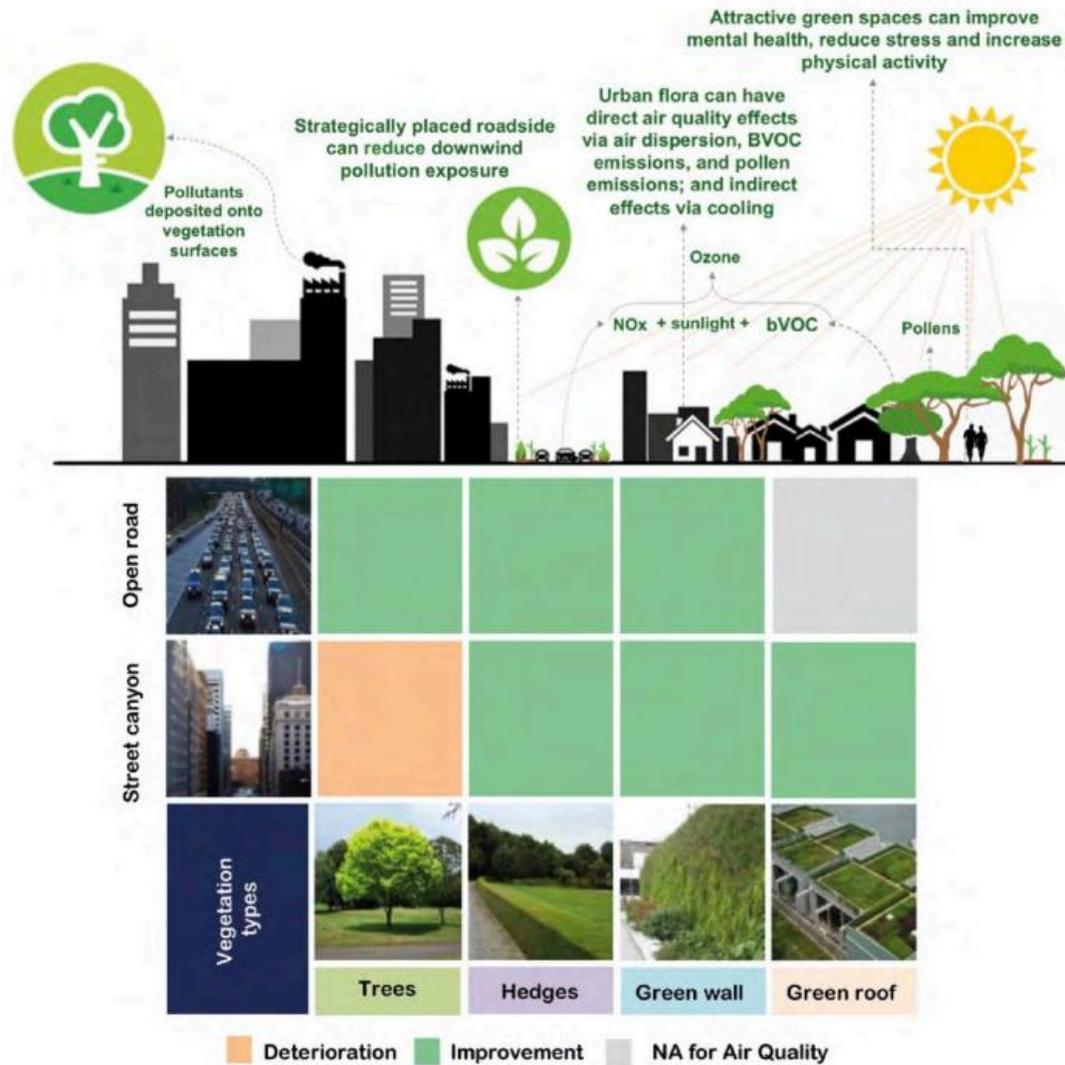
GOAL 13
Take urgent action to combat climate change and its impacts

GOAL 3
Ensure healthy lives and promote well-being for all at all ages

Nature-based solutions

Understanding the symbiosis between **urban planning,** including **green spaces, air quality and human exposure,** is a needed step towards **healthier and sustainable cities**

EU research roadmap on NBS

- **Knowledge gap:** The links between air pollution mitigation and human health are not yet clear and conclusions tend to vary from study to study

European Commission. Directorate General for Research and Innovation., 2020. Nature-based solutions: state of the art in EU funded projects. Publications Office, LU

The project GENESIS

- Cost-benefit analysis of green roofs and green walls

- Model for balancing environmental, economic and social benefits

- Underlying extra costs

- Life cycle perspective

https://www.projectgenesis-ist.com/

CFD model ENVI-met

- RANS approach
- K-ε turbulence closure scheme
- inflow data
- morphological data
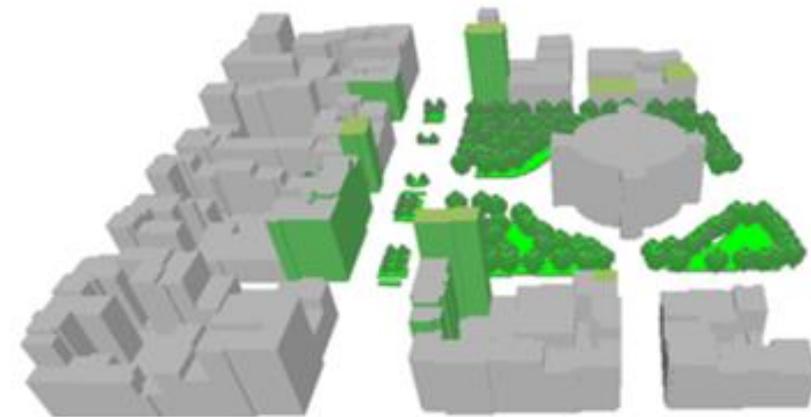- computational domain
- emissions configuration
- emission rates

Case study | Avenida da República, Lisboa
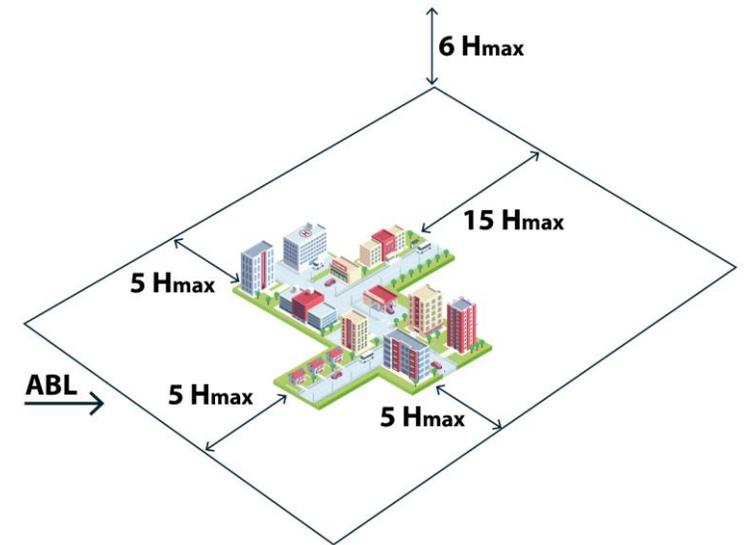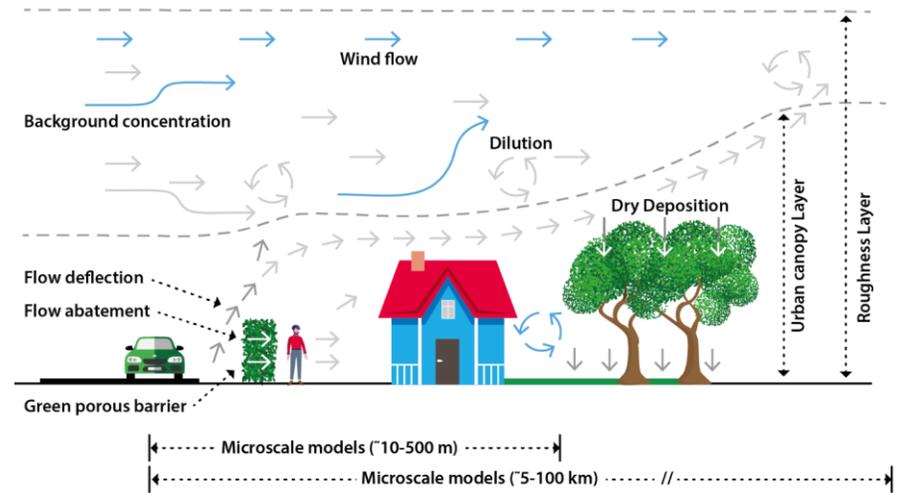
Assessing the effectiveness of GI

Green Roofs

Green Walls

- **Baseline scenario**

- **Green walls scenario**

- **Integrated scenario**
  green roofs and green corridors

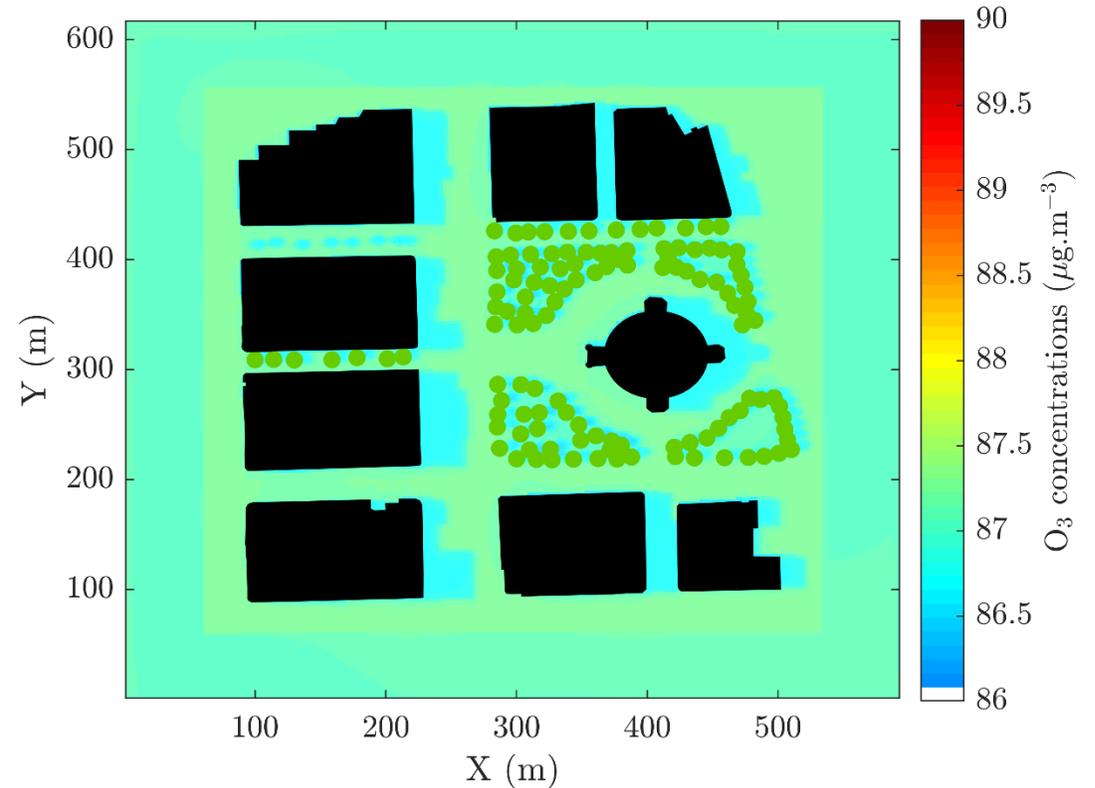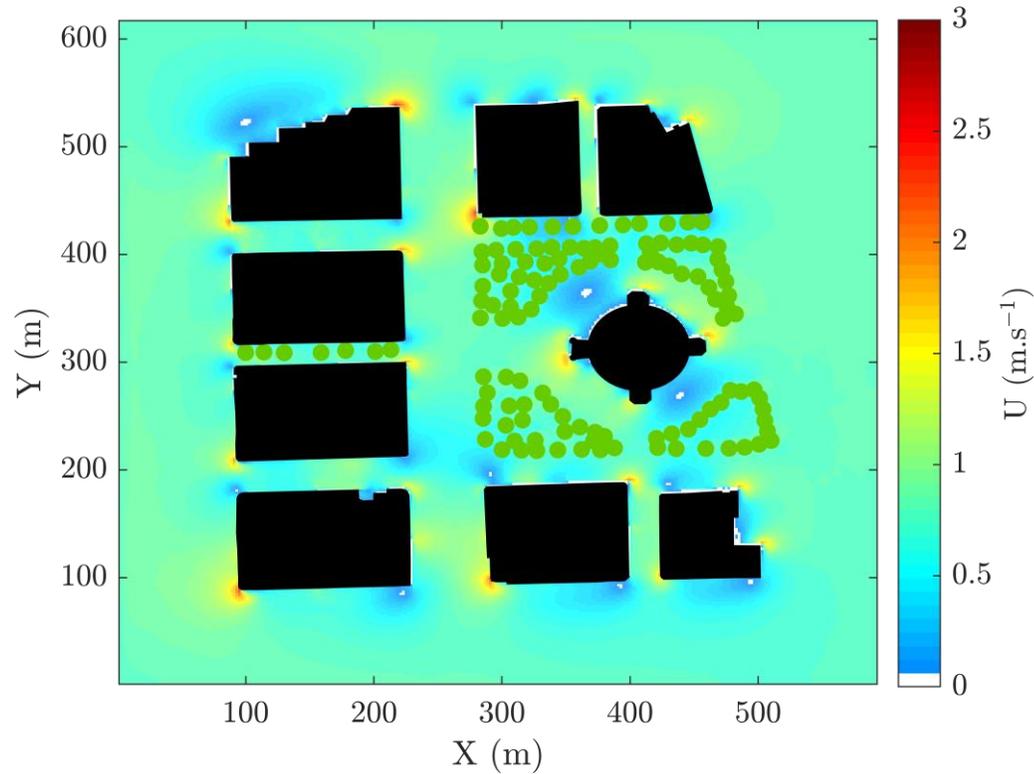Integrated scenario

CFD results baseline scenario

Hotspots of NO₂ concentrations over the main roads
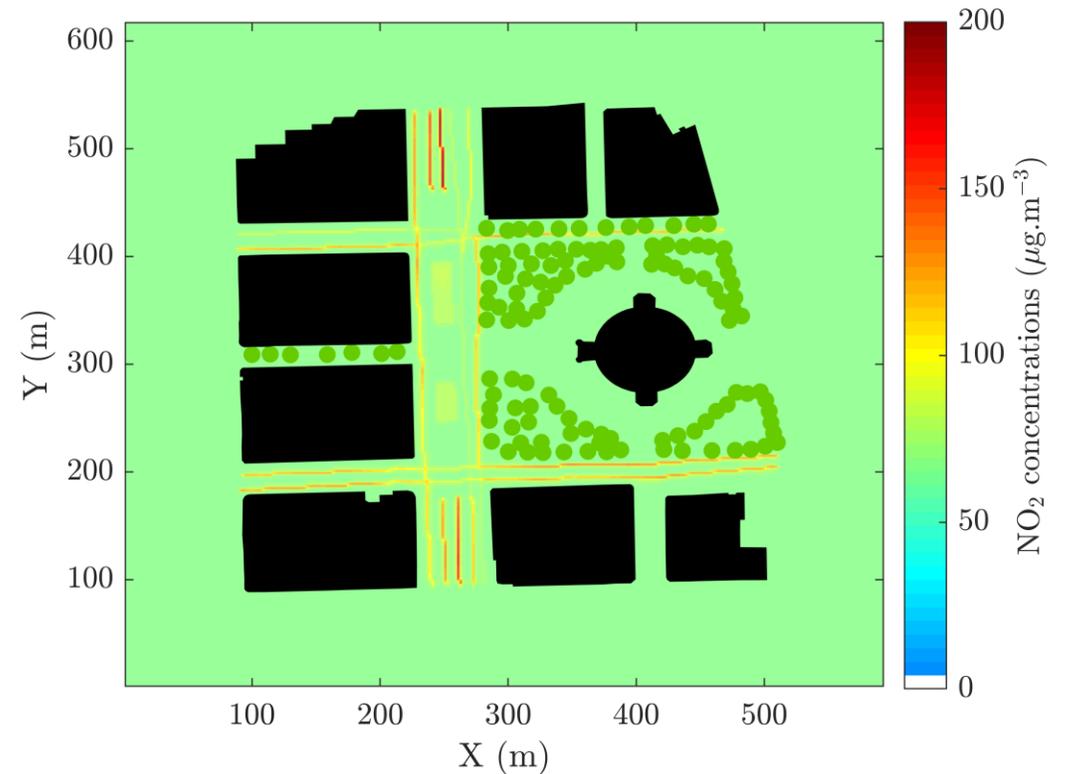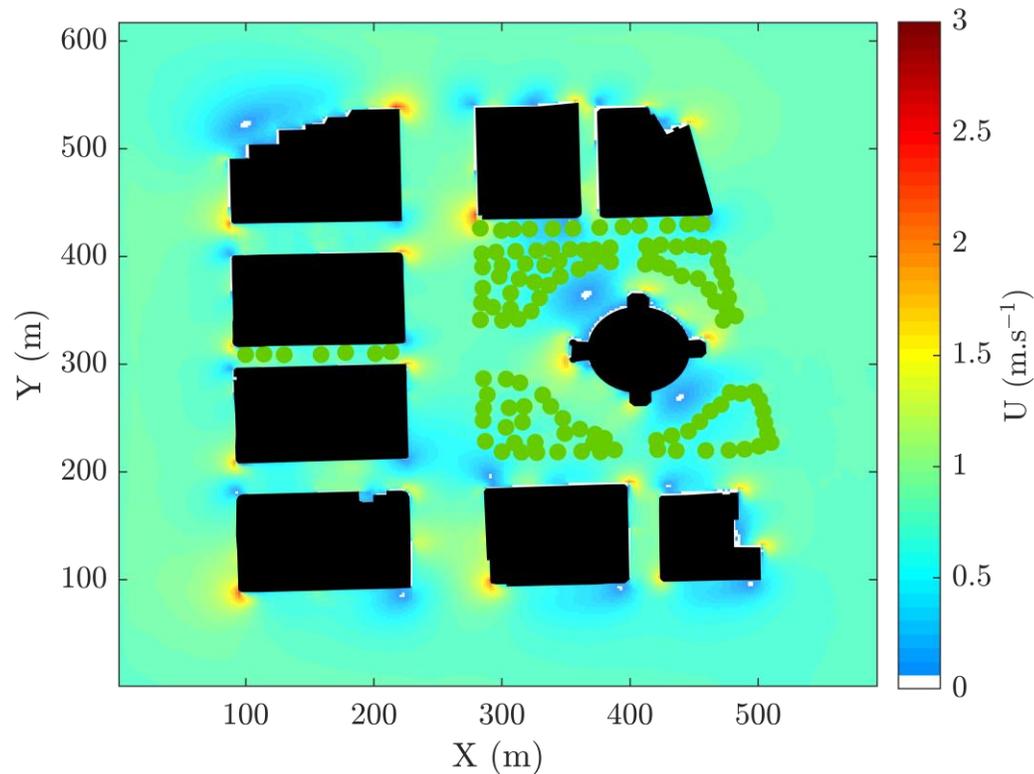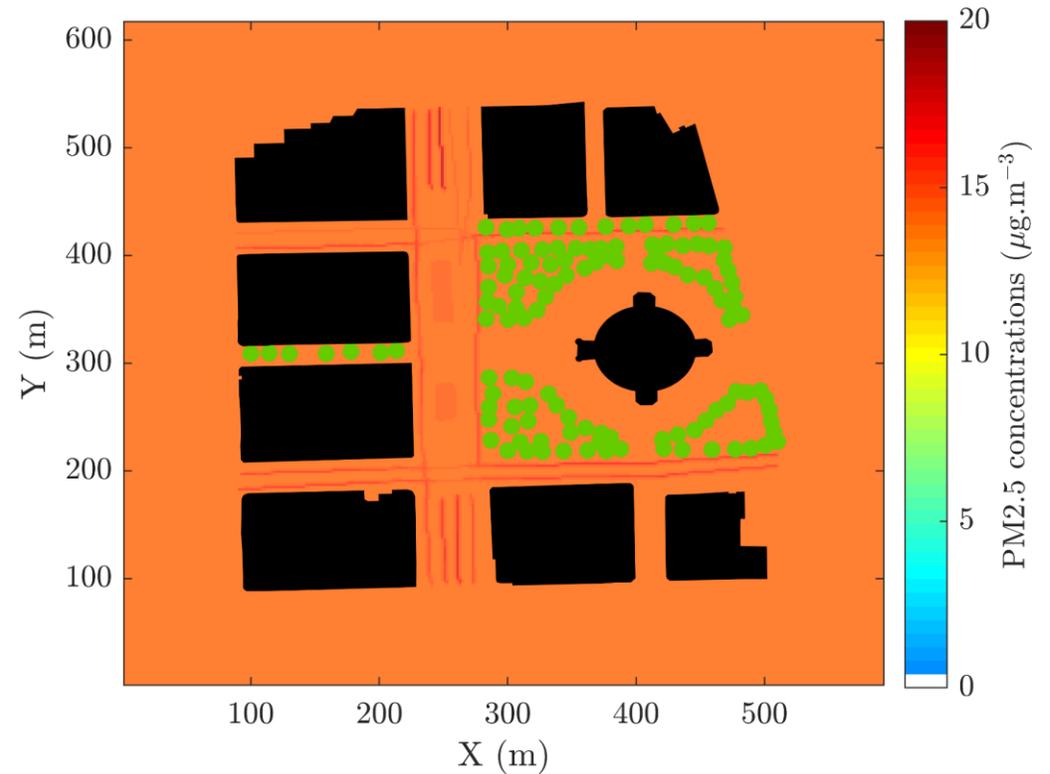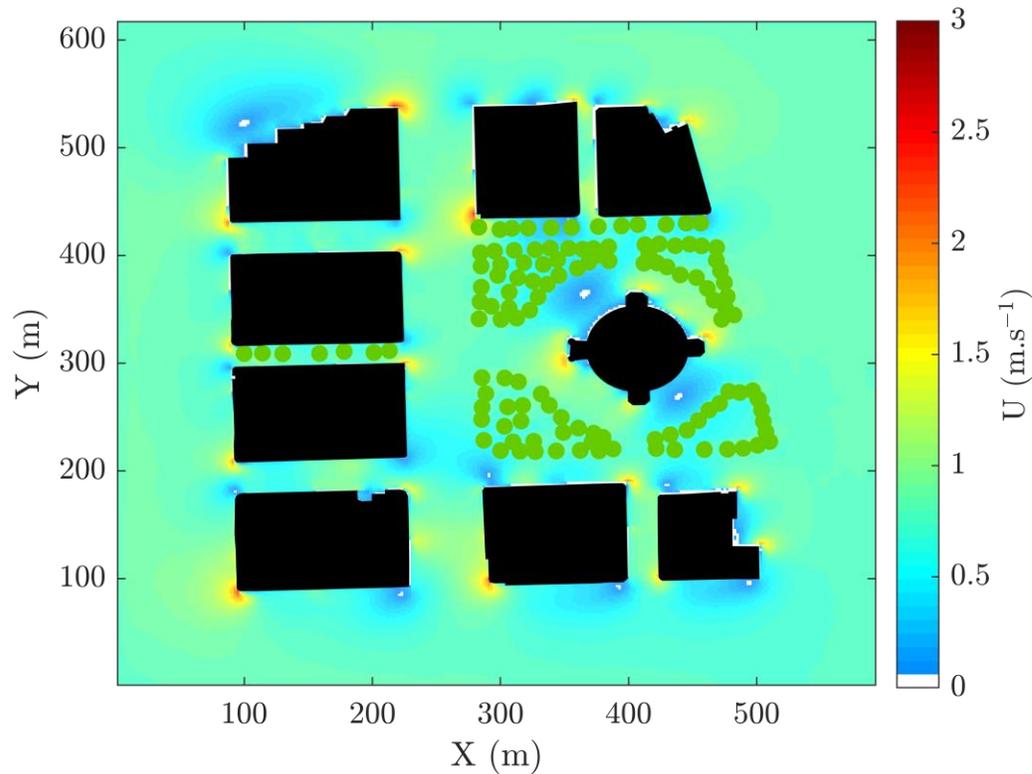
CFD results
baseline scenario

O_3 **concentrations** are lower near the east-side buildings façades
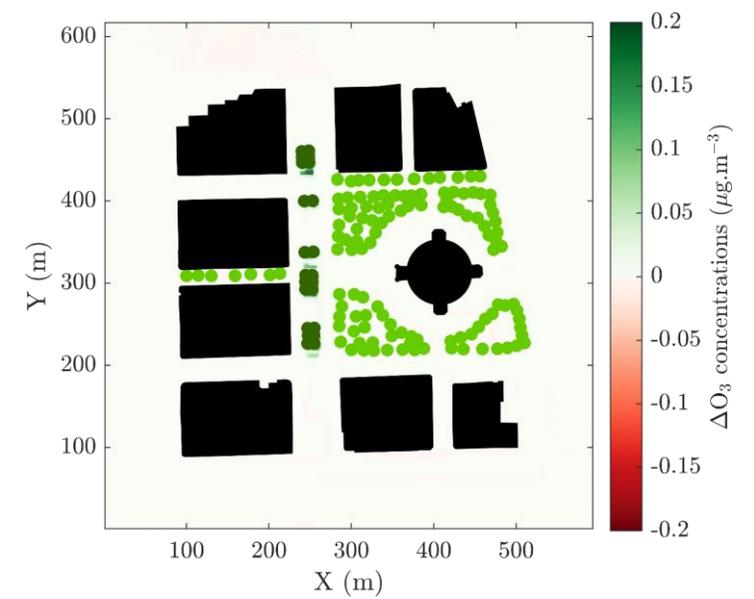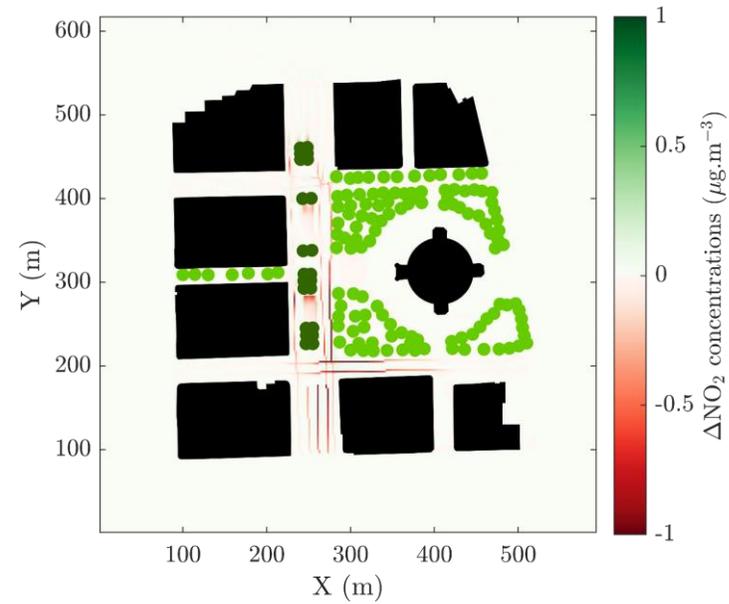
Δ 1 µg.m^{-3}

CFD results baseline scenario

Link between road traffic emissions and **accumulation of PM2.5 concentrations**

Impact of the green cenarios

... integrated scenario

Conclusions

Air quality may be improved locally by the presence of GI within the street canyon

- Potential benefits on O_3
- Variable effects on NO_2
- Low impact on PM

How to disseminate the **GI effects** amongst the **decision and policy makers?**

Further research on the interlinks between **NO$_2$ and O$_3$ concentrations** and the **potential impacts of green infrastructures**

Benefits of Green Infrastructures on Air Quality in Urban Spaces

Guest Editors

Dr. Vera Rodrigues, Dr. Sandra Rafael

Deadline

01 May 2023

Special Issue

Invitation to submit

Thank you!

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