

GREEN INFRASTRUCTURES

A sustainable future for our cities?

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1. THE FUTURE & ITS CHALLENGES FOR CITIES

URBANISATION

TODAY 2050

55% → 70%

Global population living in cities

+ IMPERVIOUS AREAS **+** POPULATION DENSITY

Elga et al. 2015; UN 2018

CLIMATE CHANGE

+ CHANGES IN PRECIPITATION PATTERNS

+ EXTREME EVENTS

Eckhart et al. 2017; IPCC 2018

WATER CYCLE ALTERATIONS

Adapted from Arnold & Gibbons 2001

WATER QUALITY ALTERATIONS

+ POLLUTANT GENERATION – Pathogens, nutrients, toxics (heavy metals – pesticides) & debris.

+ SEDIMENTS

+ PEAK DISCHARGES IN RECEIVING WATERS

Arnold & Gibbons 2001



VS.



2. GREEN INFRASTRUCTURES (GI): A SUSTAINABLE SOLUTION?

TYPES OF GI PRACTICES

STRUCTURAL

- Green roofs
- Swales
- Permeable Paving
- Rainwater harvesting
- Detention basins
- Wetlands

NON-STRUCTURAL

- Ordinance development
- Watershed planning
- Integrating stormwater management in the design processes
- Sustaining hydrologic balance
- Institutional & regulatory controls

susDrain 2019; Taylor & Wong 2002

BENEFITS

- Water quality management
- Flood risk management
- Biodiversity
- Amenity
- Air Quality
- Prevention Island effect

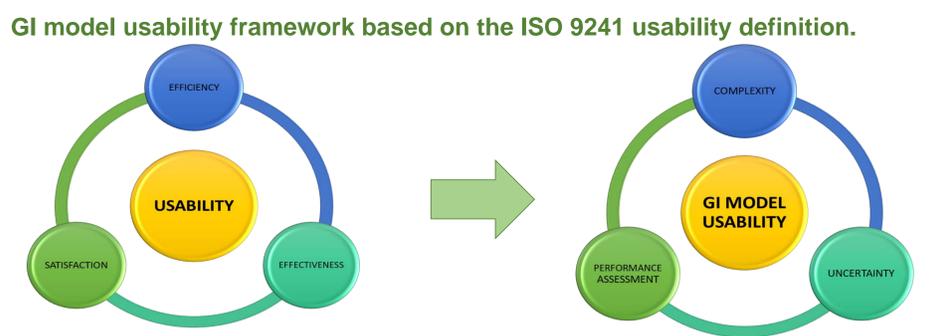
Adapted from susDrain 2019

CHALLENGES

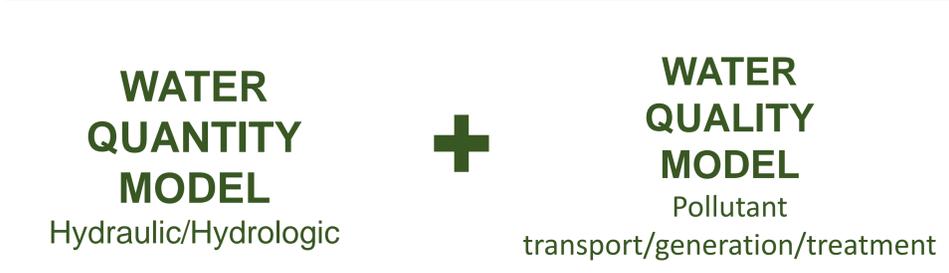
- LONG-TERM PERFORMANCE
- EMERGING POLLUTANTS
- GI MODELLING
- UNCERTAINTY
- PERFORMANCE ASSESSMENT
- COMPLEXITY

3. METHODOLOGY

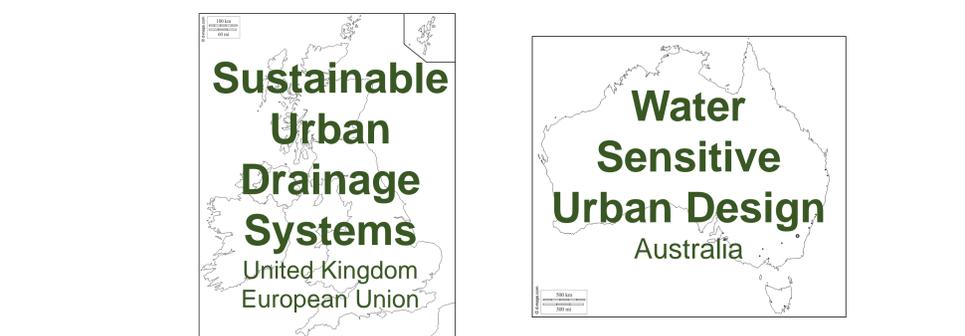
3.1 MODEL USABILITY



3.2 INTEGRATED MODELLING



3.3 URBAN PLANNING POLICIES



4. WHAT'S NEXT?

4.1 SELECTION OF SOFTWARE & TOOLS

GI usability framework & Objectives

SUSTAIN SEWEX
HEC MIKE
CADDIES SWMM

4.2 SELECTION OF PERFORMANCE ASSESSMENT INDICATORS

Challenges & Objectives

Resilience
Key pollutants
Sustainability

4.3 DATA COLLECTION

Case-studies UK & Australia

UKCP18 GI
Digital performance
elevation data
model Land-use
Rainfall Stormwater
quality

4.4 DEVELOPMENT OF WATER QUANTITY AND QUALITY MODELS

Impact of urban planning policies UK & Australia

4.5 ADAPTATION STRATEGIES BASED ON THE SIMULATION RESULTS

Strategies for wastewater services and sewer infrastructure

5. FURTHER INFORMATION

This project is funded by the *QUEX Institute*, a joint agreement between the University of Exeter & the University of Queensland. For more information, please refer to: <https://www.exeter.ac.uk/quex/>

For more information about the research, contact Mayra Rodriguez (mr604@Exeter.ac.uk). All questions and suggestions are welcome.

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