Bridging Innovation and Regulation: High-Resolution Spatial Mapping of Sewage Connectivity for Refined Exposure Modelling

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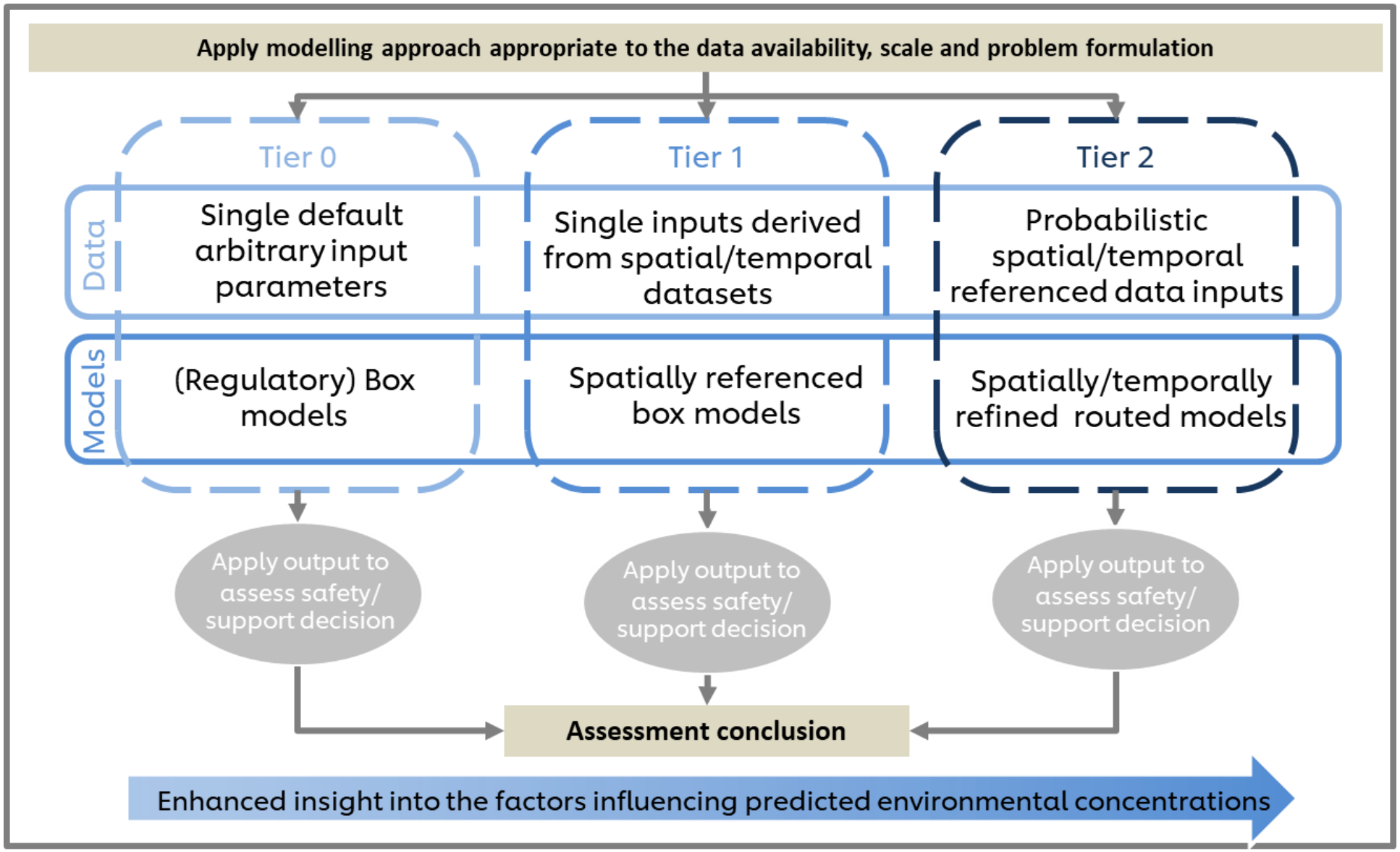
Exposure Modelling Framework



Regulatory (Tier 0) STP connectivity

- Connection rates in databases are typically at the national/regional level
  - resulting in coarse data that lack fine resolution and spatial heterogeneity.
- EUSES model uses a value of 80% connectivity
- China REACH and selected a value of 50% within the parameters of their models
- This work looks at the applicability of that value using a data driven approach

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Aims

1. Utilise a sewershed and moving windows methodology to calculate Tier 1 and Tier 2 STP connectivity estimates across China

2. Analyse spatial differences in STP connectivity across China

3. Understand the influence of key parameters used within the methodology

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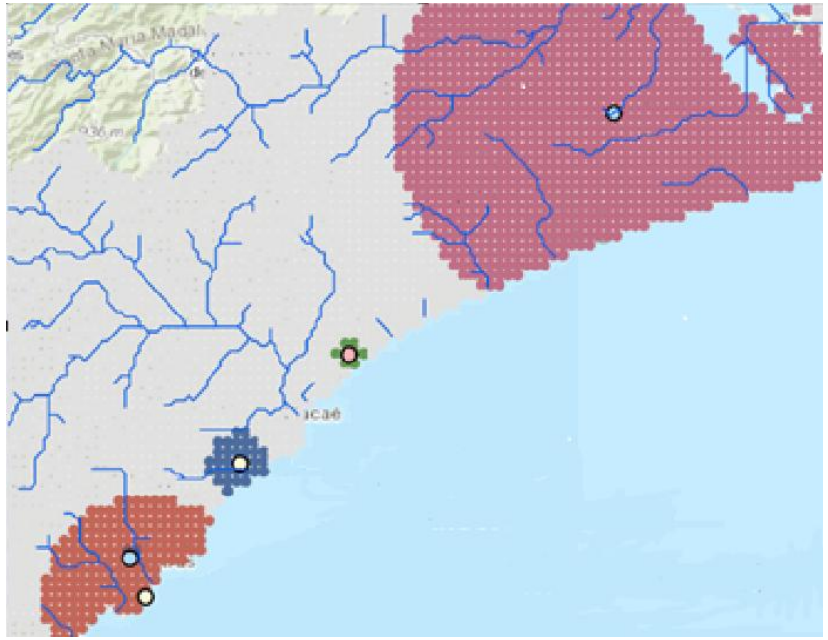
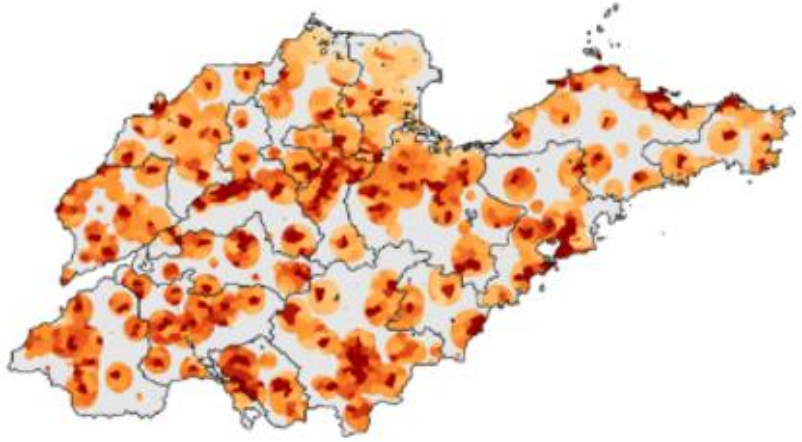
Methodology - Sewersheds

- Maps individual connections of population to specific STPs.



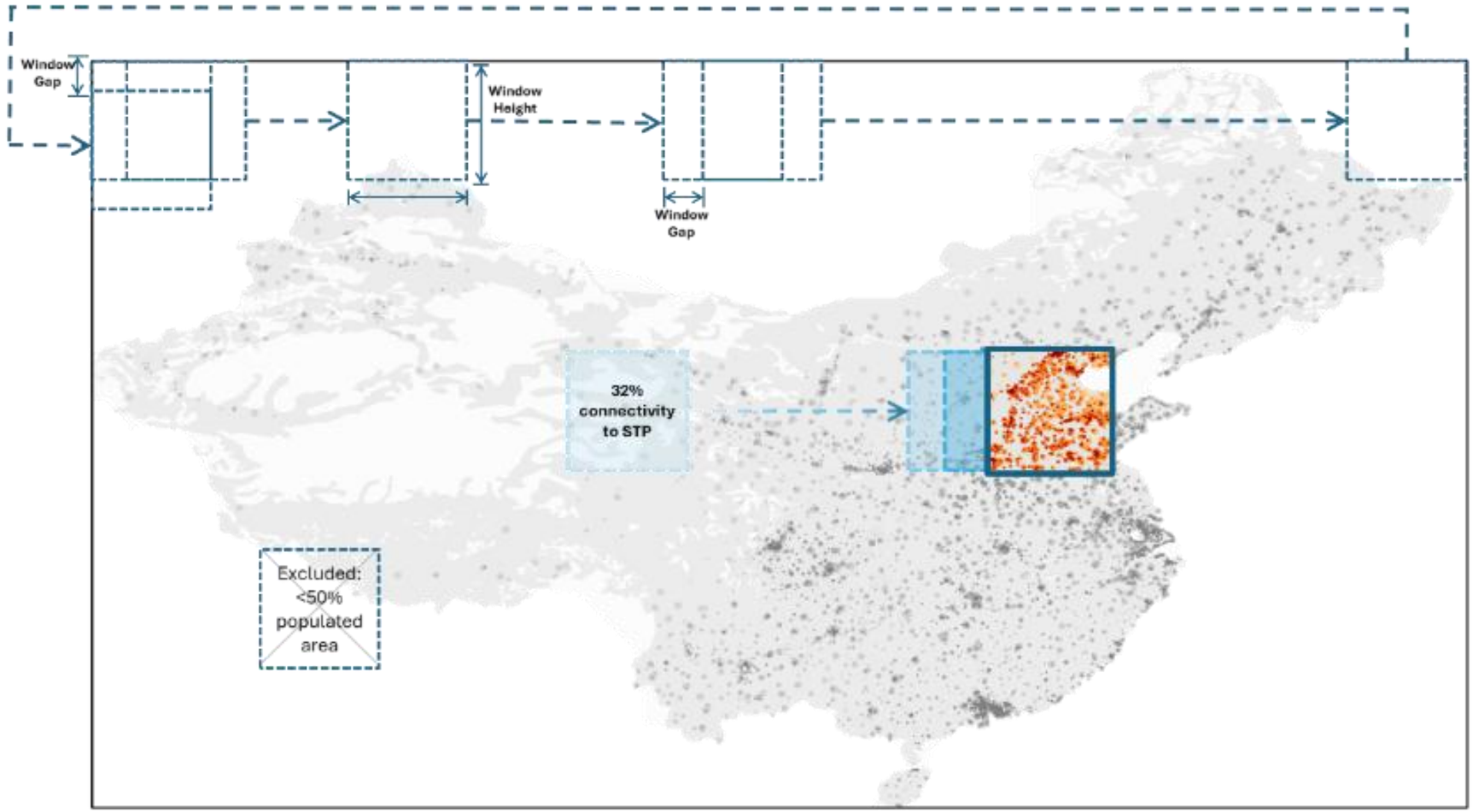
- A population by 1 km by 1 km grid cell was used. NASA Socioeconomic Data and Applications Center (SEDAC) 2020 dataset.

- Mapping the location of the STP to a grid cell, which defines the central point of its sewershed.



- Population to each STP is allocated through an iterative radial expansion method .

Methodology - Moving Window



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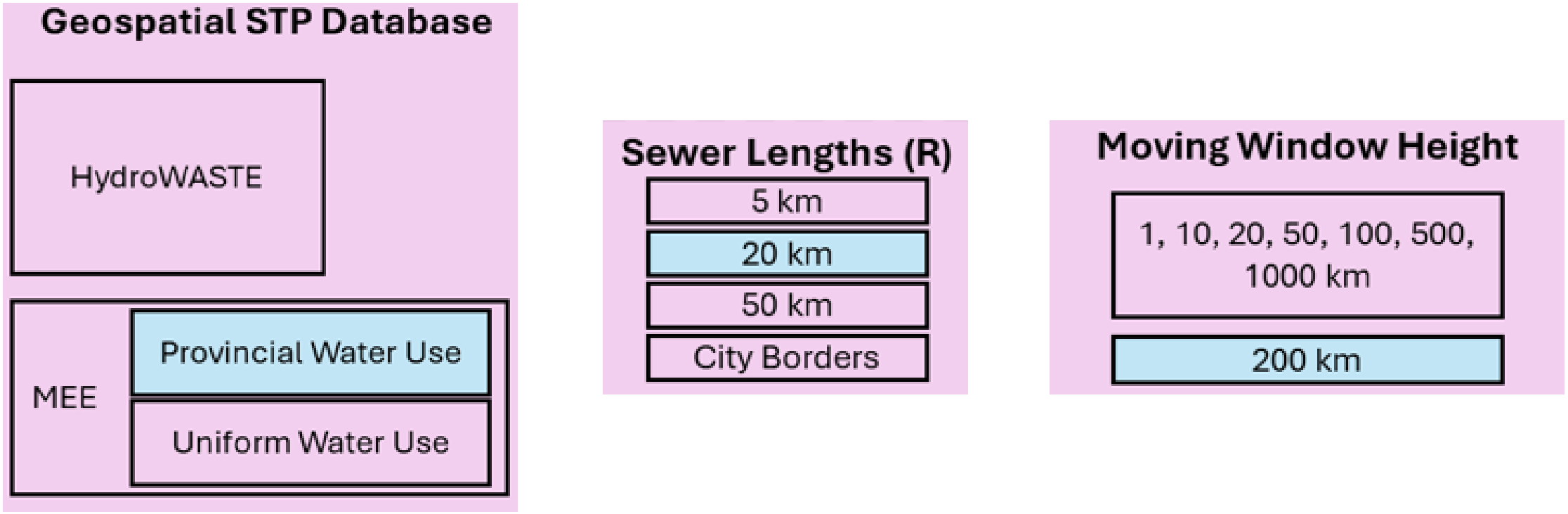
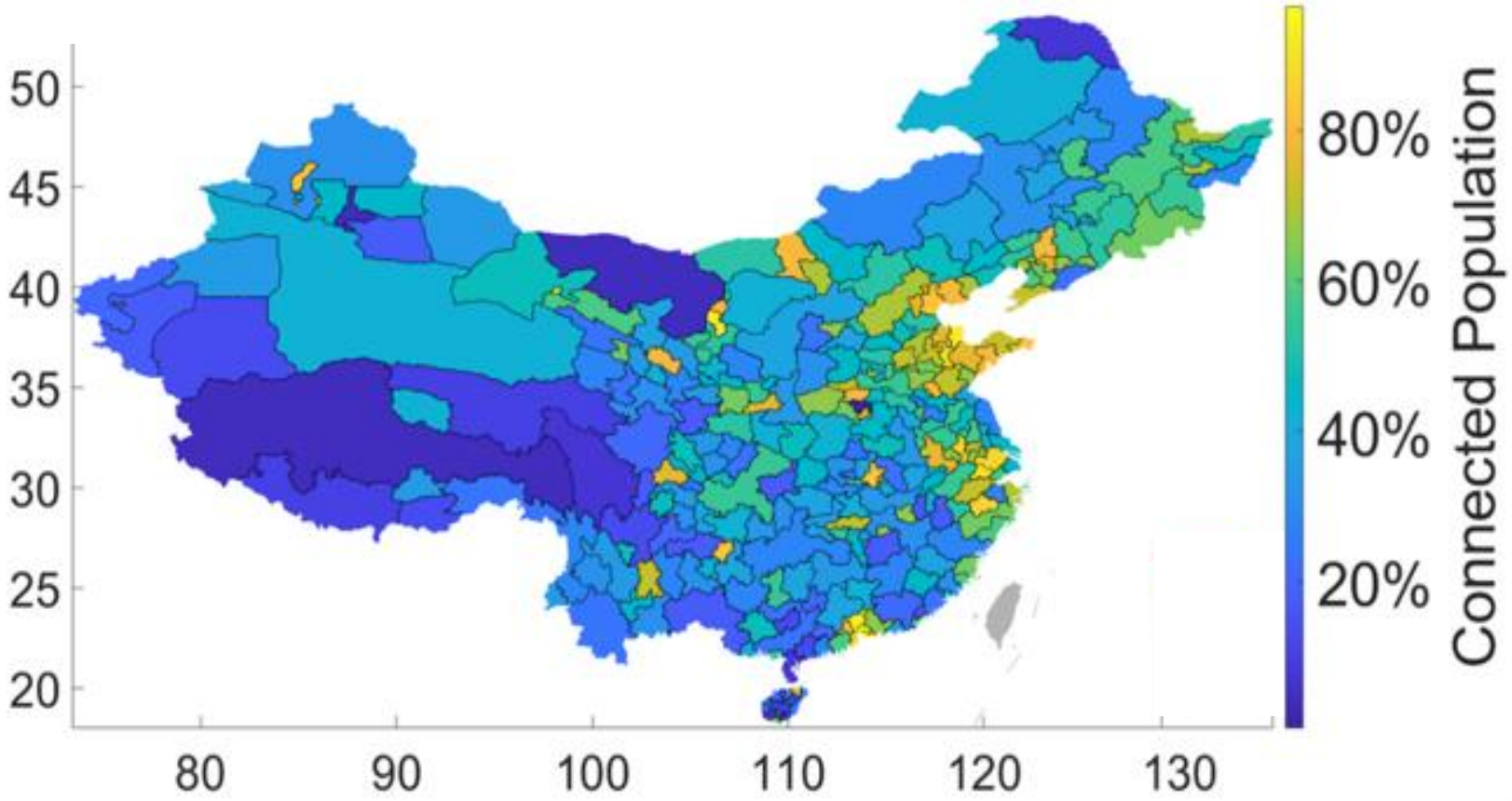
Methodology - Input variables



Tier 1 Results

- National average result is 52% population connected
- City connectivity ranging from 0.4% to 99.9%, with the average of 46%
- 39% of cities achieved connectivity exceeding 50%
- Generally, economically developed cities exhibited higher connectivity



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Tier 2 Results

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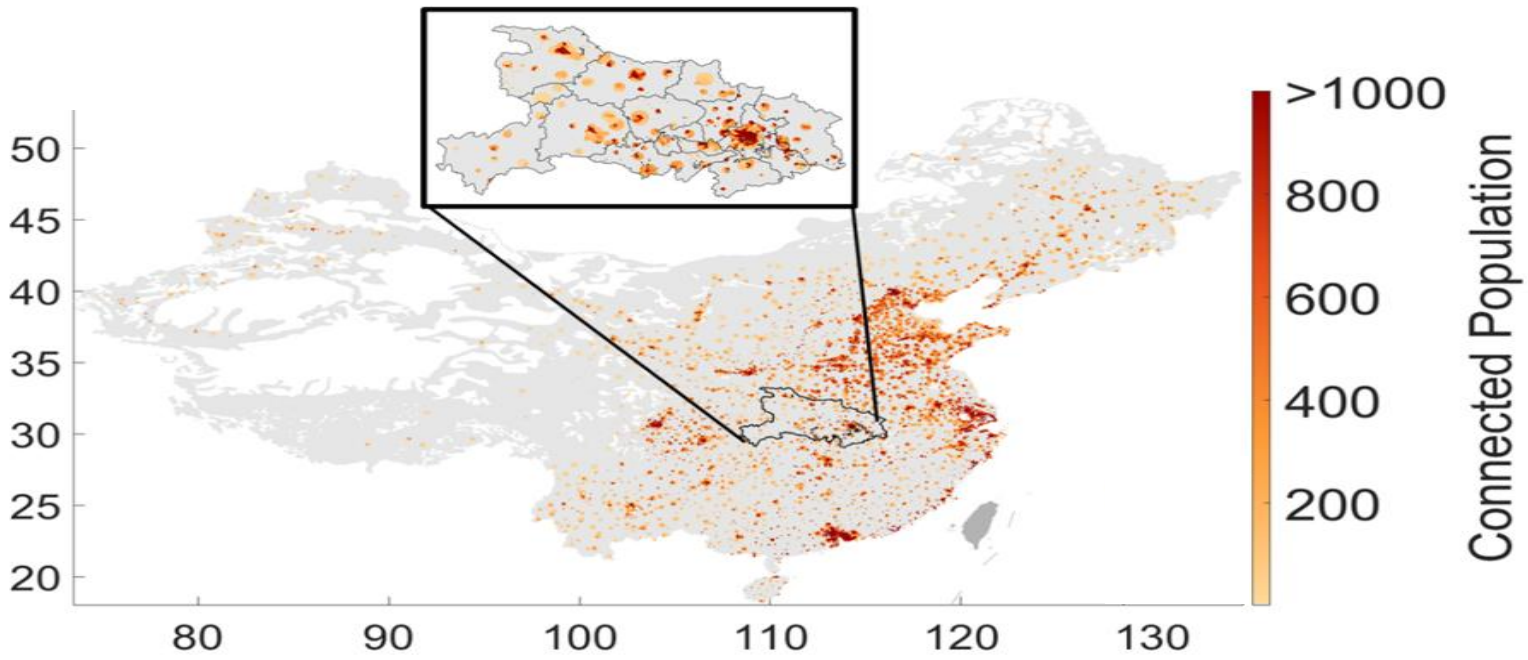

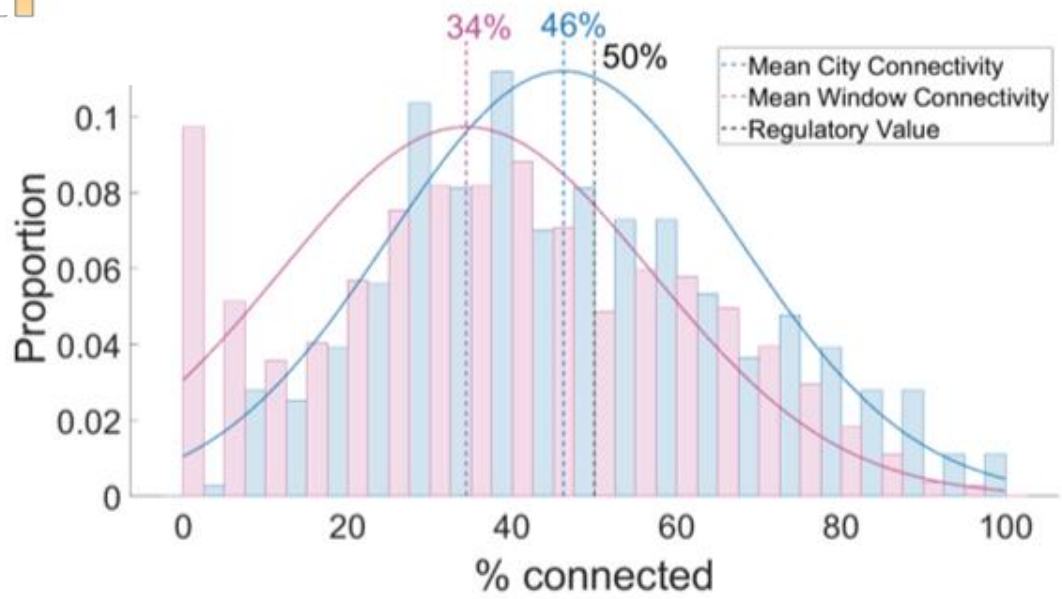

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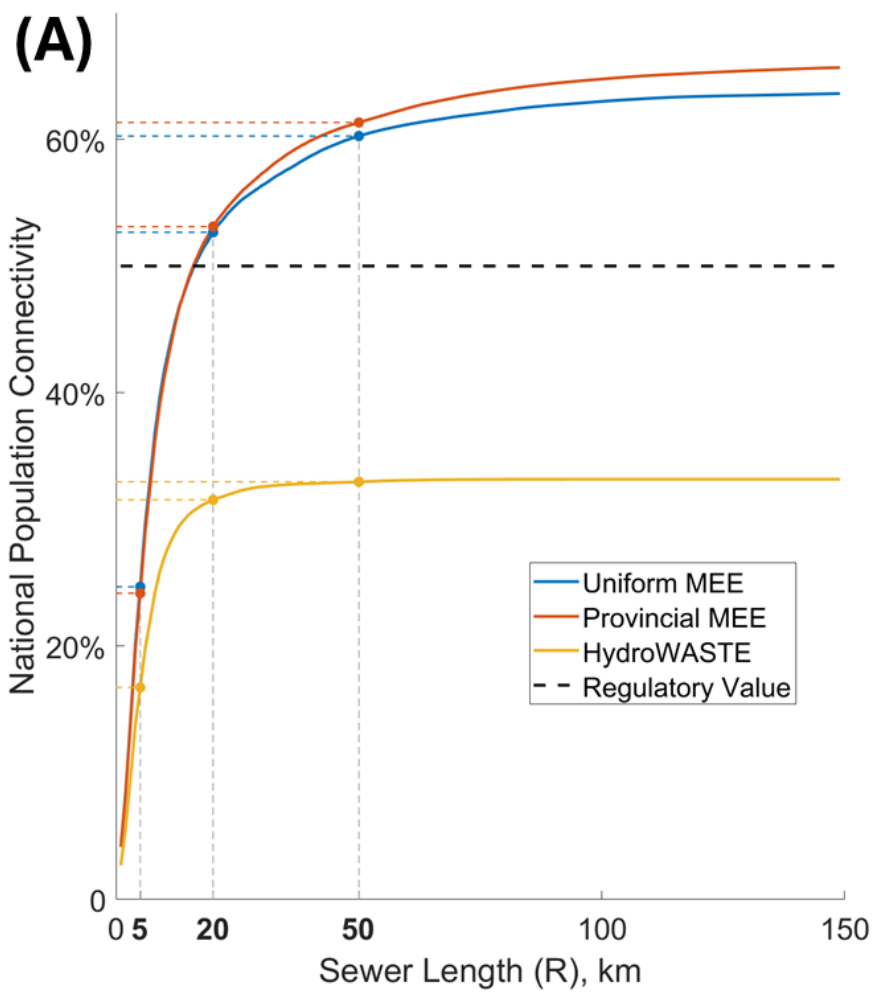
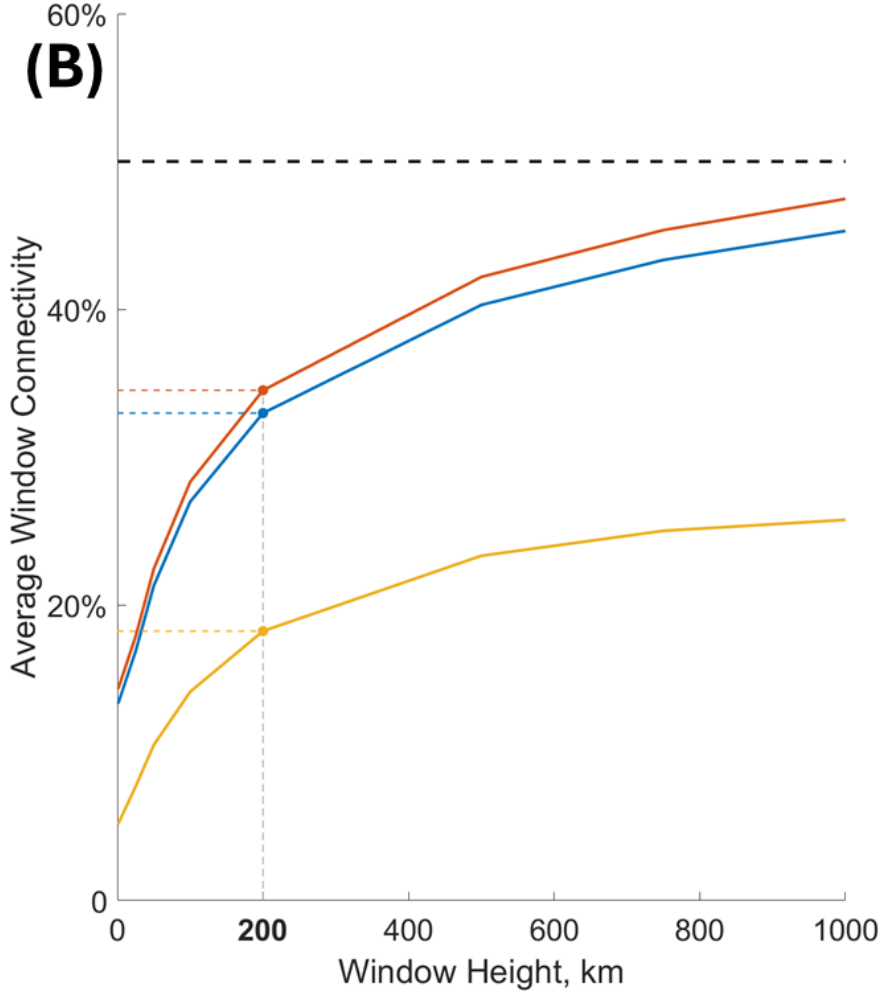
Sensitivity Analysis





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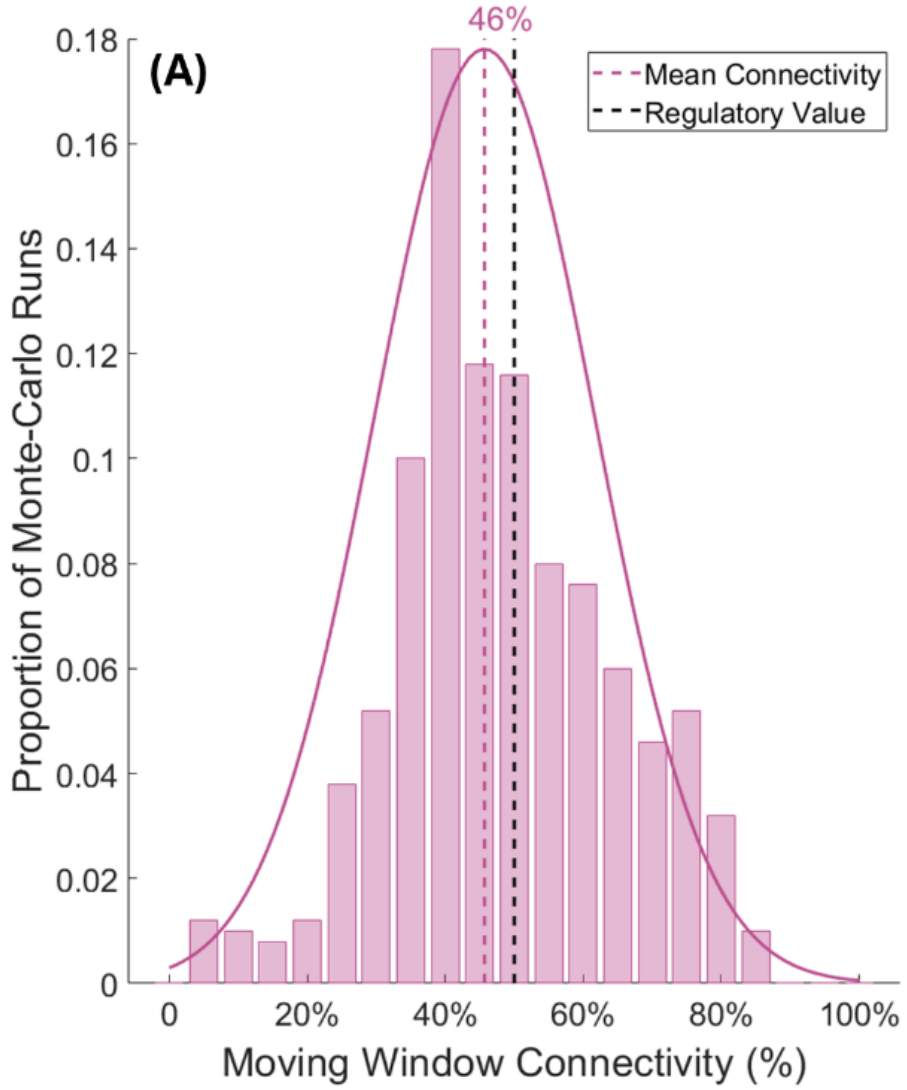
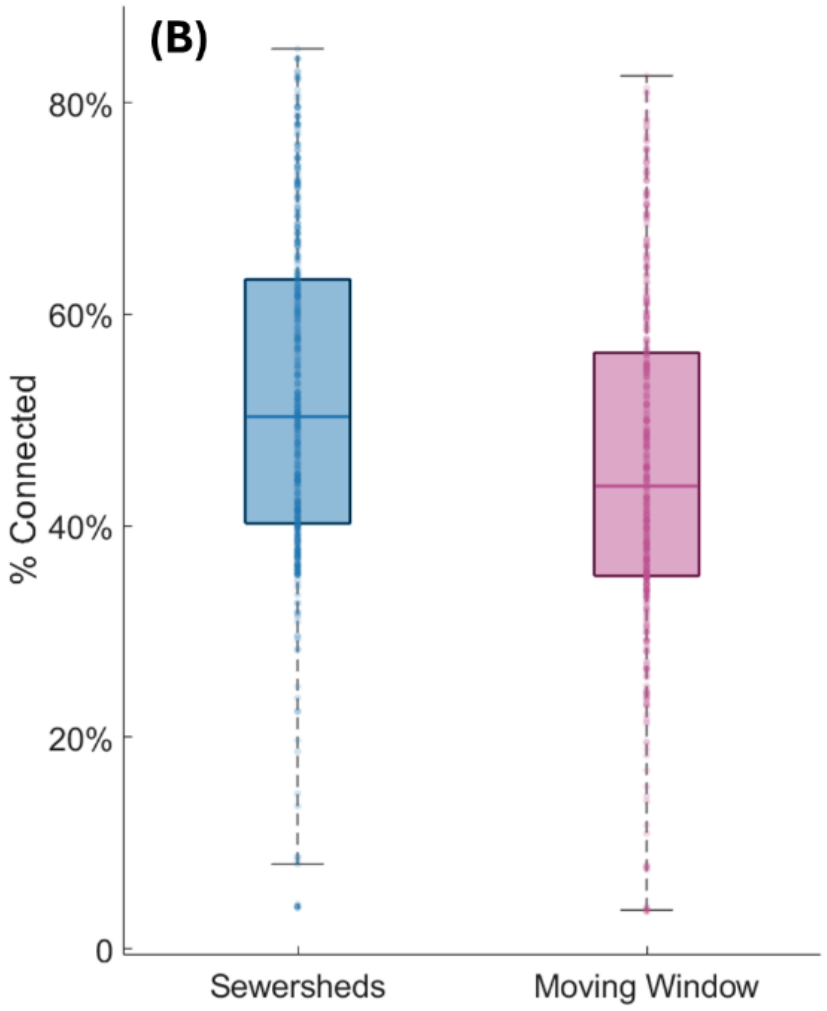
Monte Carlo Analysis





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Conclusions

- We developed a framework for estimating STP connectivity using data driven approaches - sewershed and moving-window methodologies.

- We generated Tier 1 and Tier 2 STP connectivity values and compared them to a Tier 0 value.

- High variability is seen across for China therefore choosing an appropriate single value for Tier 0 modelling is a process requiring significant consideration and understanding of the dataset.

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Thank you for listening

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