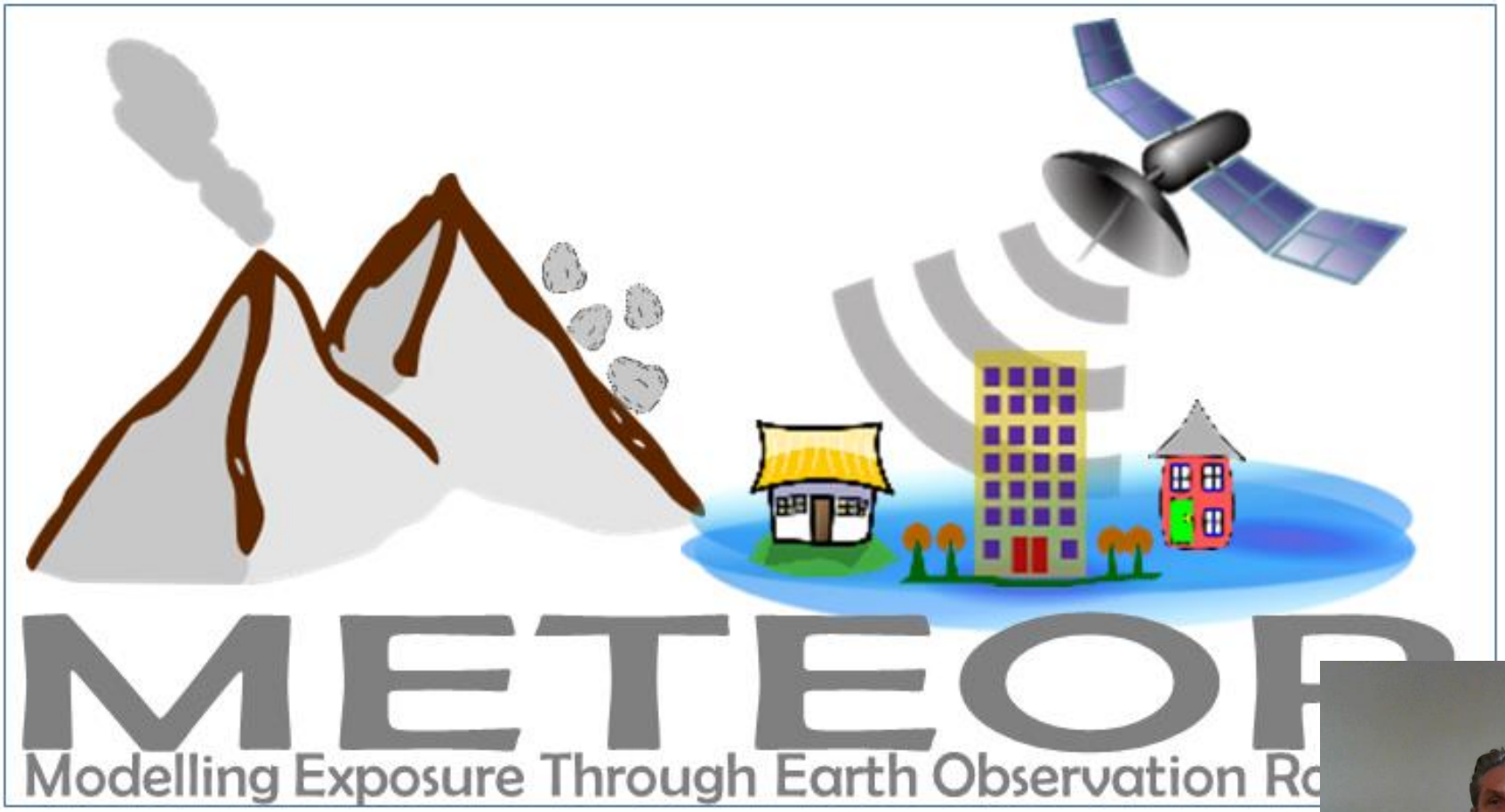

METEOR
Modelling Exposure Through Earth Observation Ro

An Introduction to Exposure

This section will introduce key concepts to the audience, such as resolution of data, the difference between aggregated and building specific data, and what is key for assessing vulnerability.

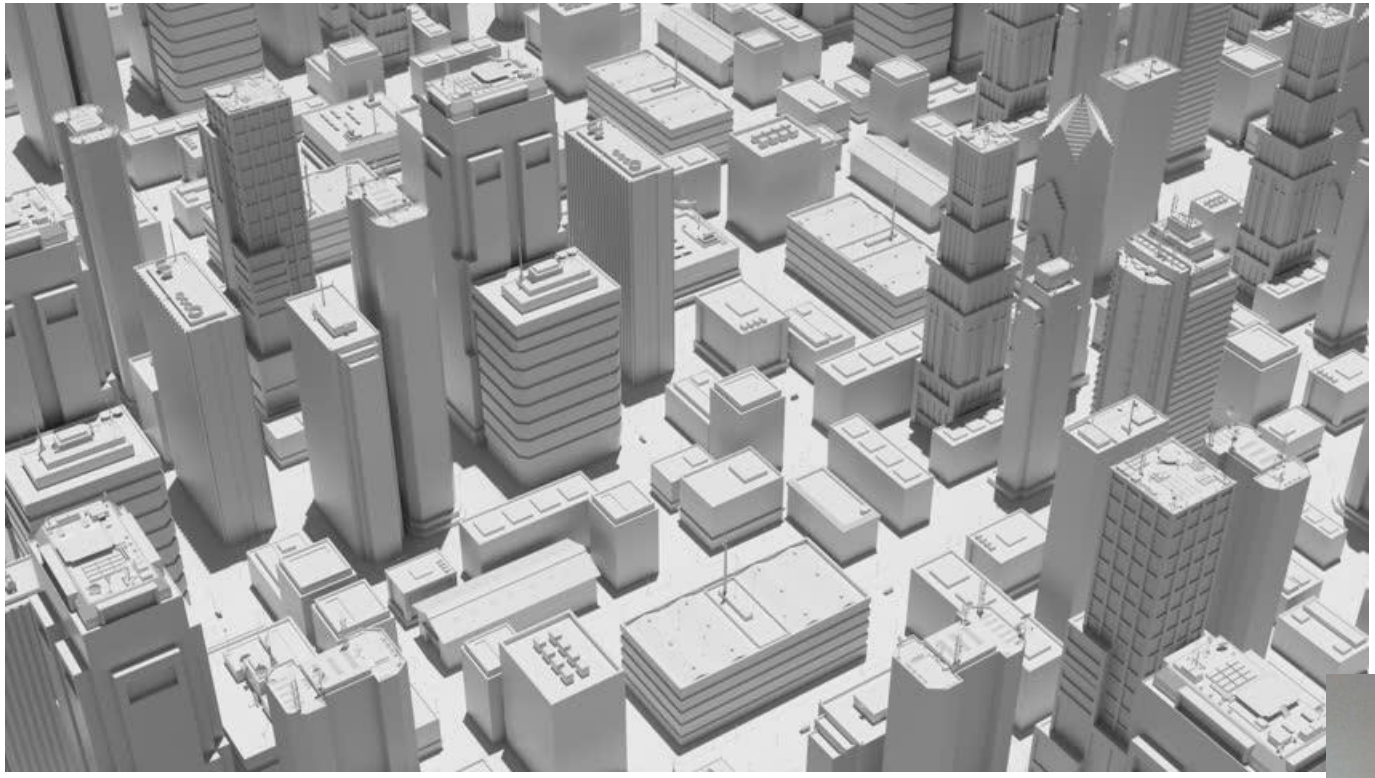
Major “take-aways”

- What is exposure data and how is it used in the loss estimation process?
- The Basic Process of Developing Exposure Data
- The Value of EO Data
- How to check your exposure data and ensure that it is fit for purpose?

What is exposure data and how is it used in the loss estimation process?

- What is exposure data
- Levels of Exposure data
- Spatial resolution
- Building vulnerability attributes
- Replacement costs
- Vintage
- Challenges
- Expectations

What is exposure data?



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Exposure modelling is the art of distributing inventoried people into buildings

- Given the number of people, how many households
- Given households, how much dwelling area?
- Given how much area of dwelling, how many buildings? How does this change in space?

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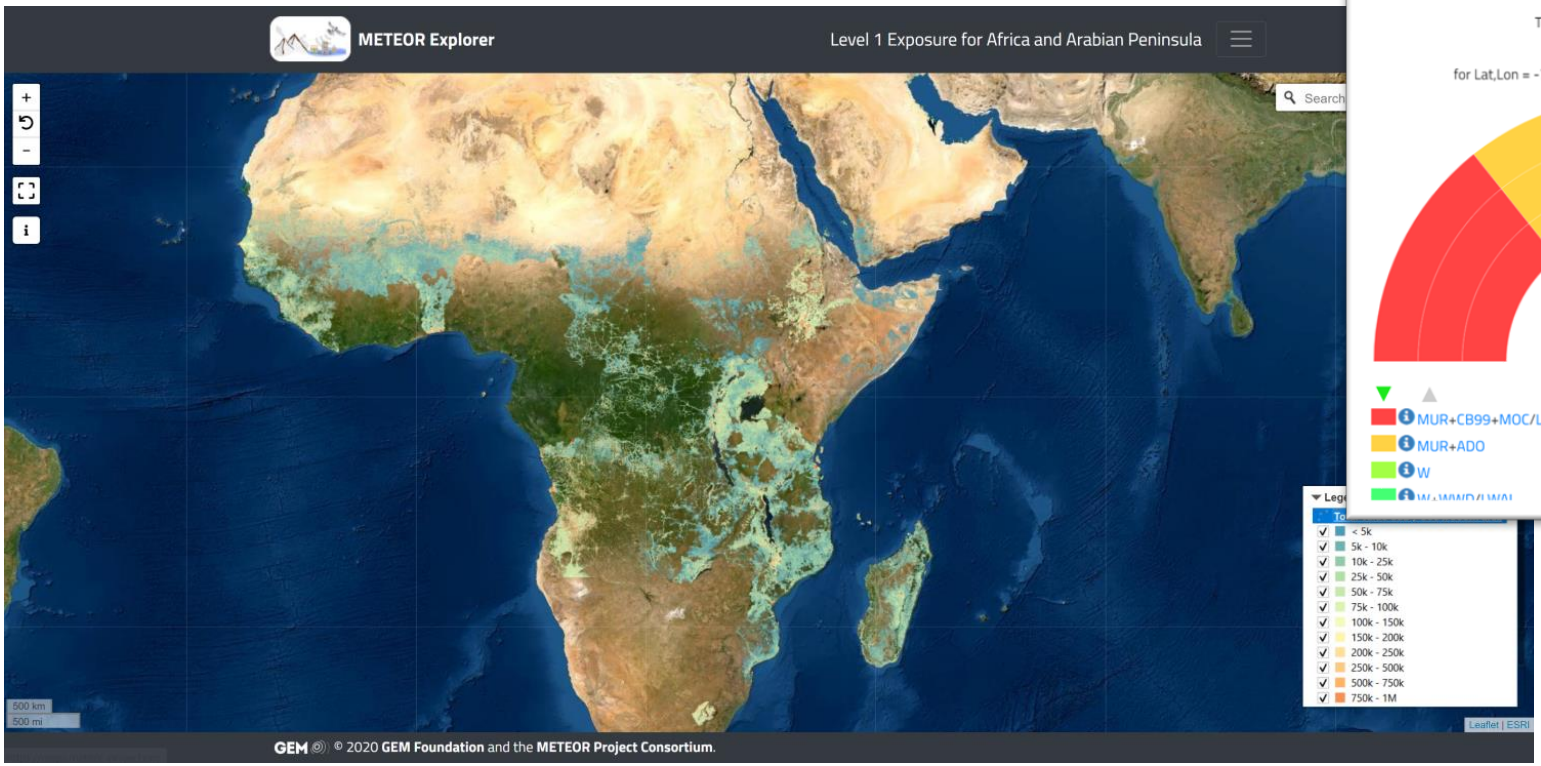
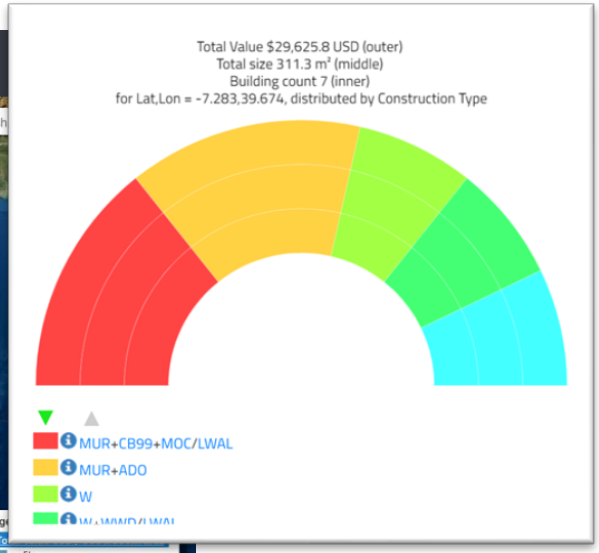
Risk Assessment: Exposure





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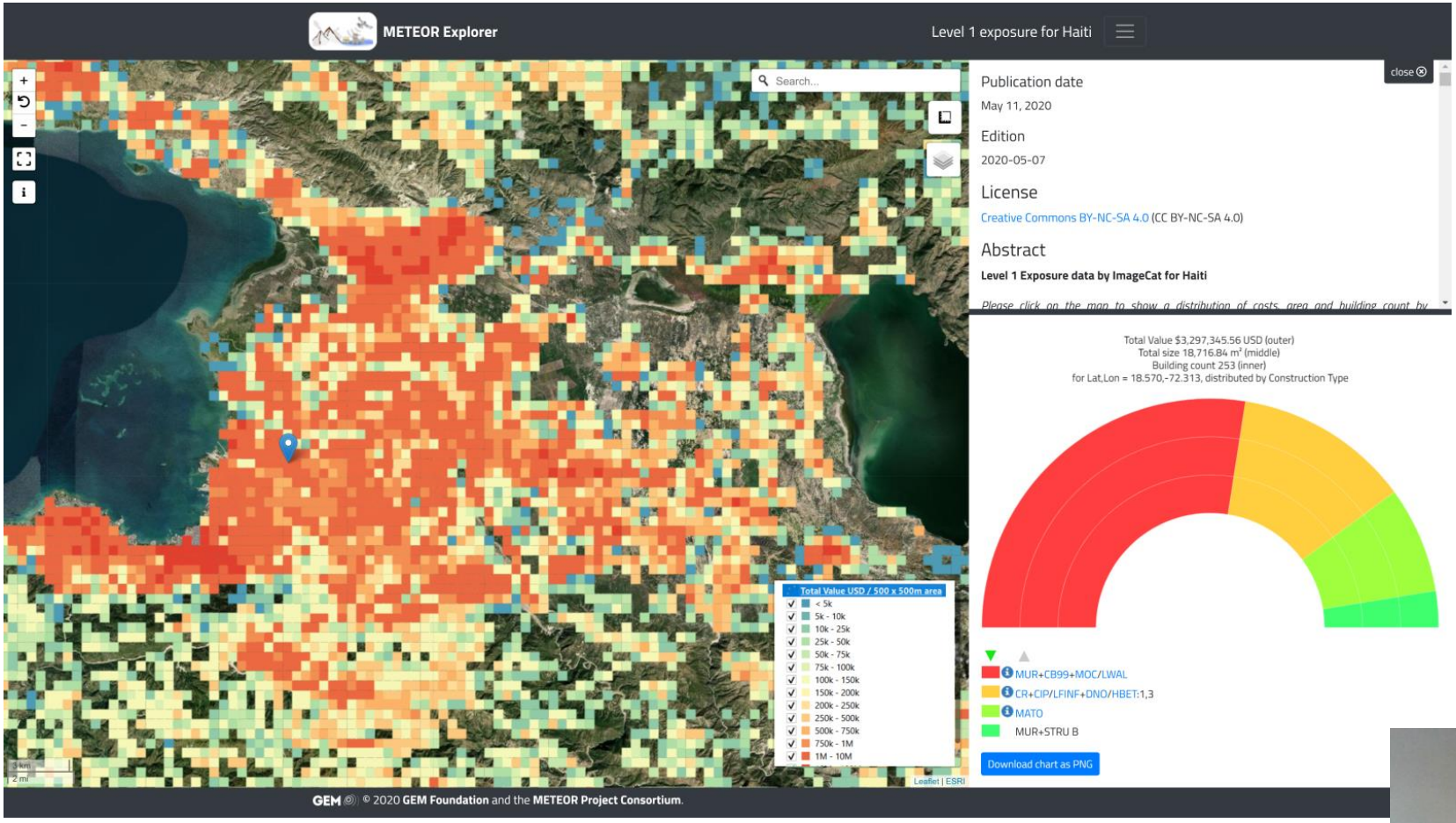

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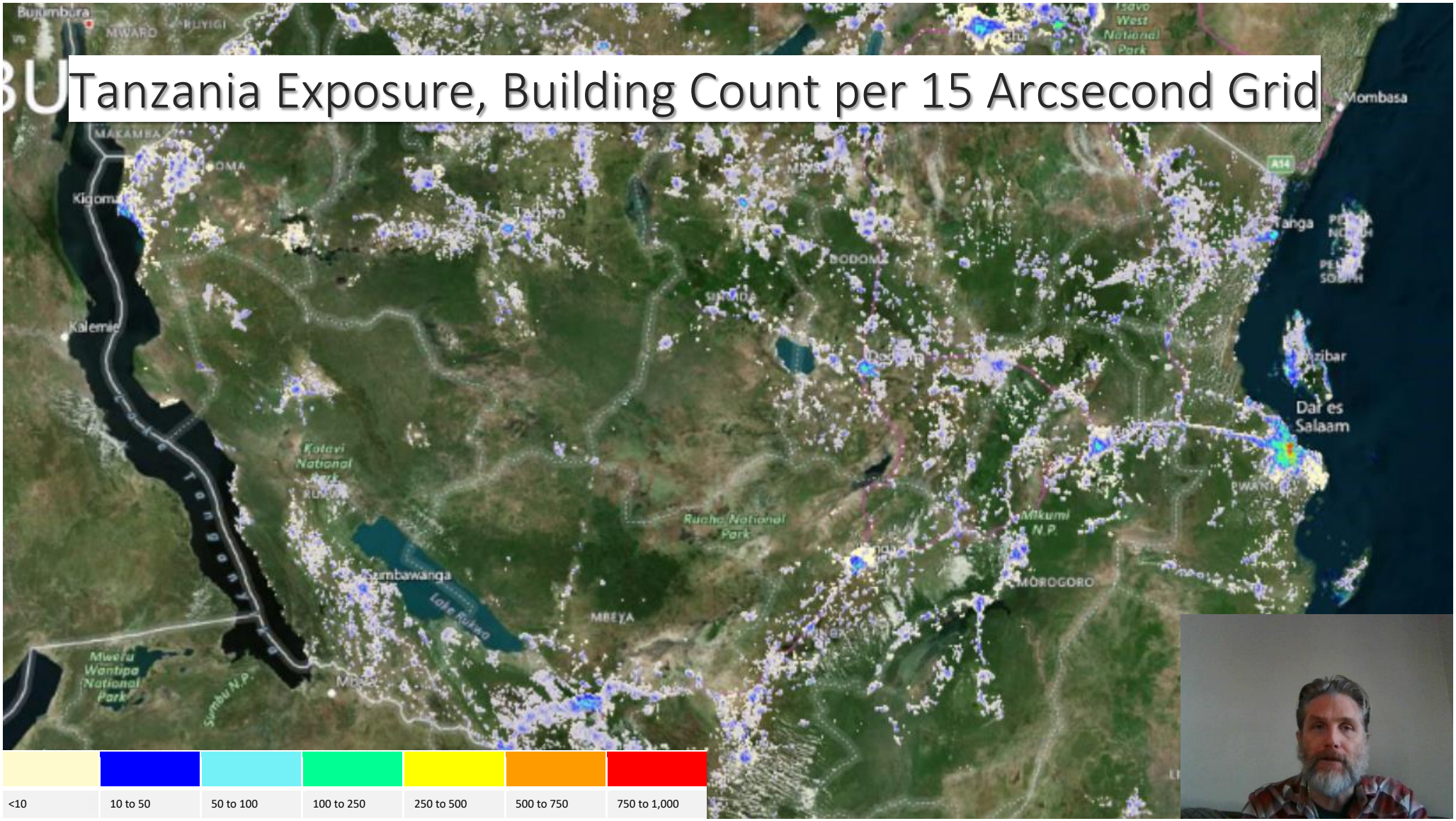
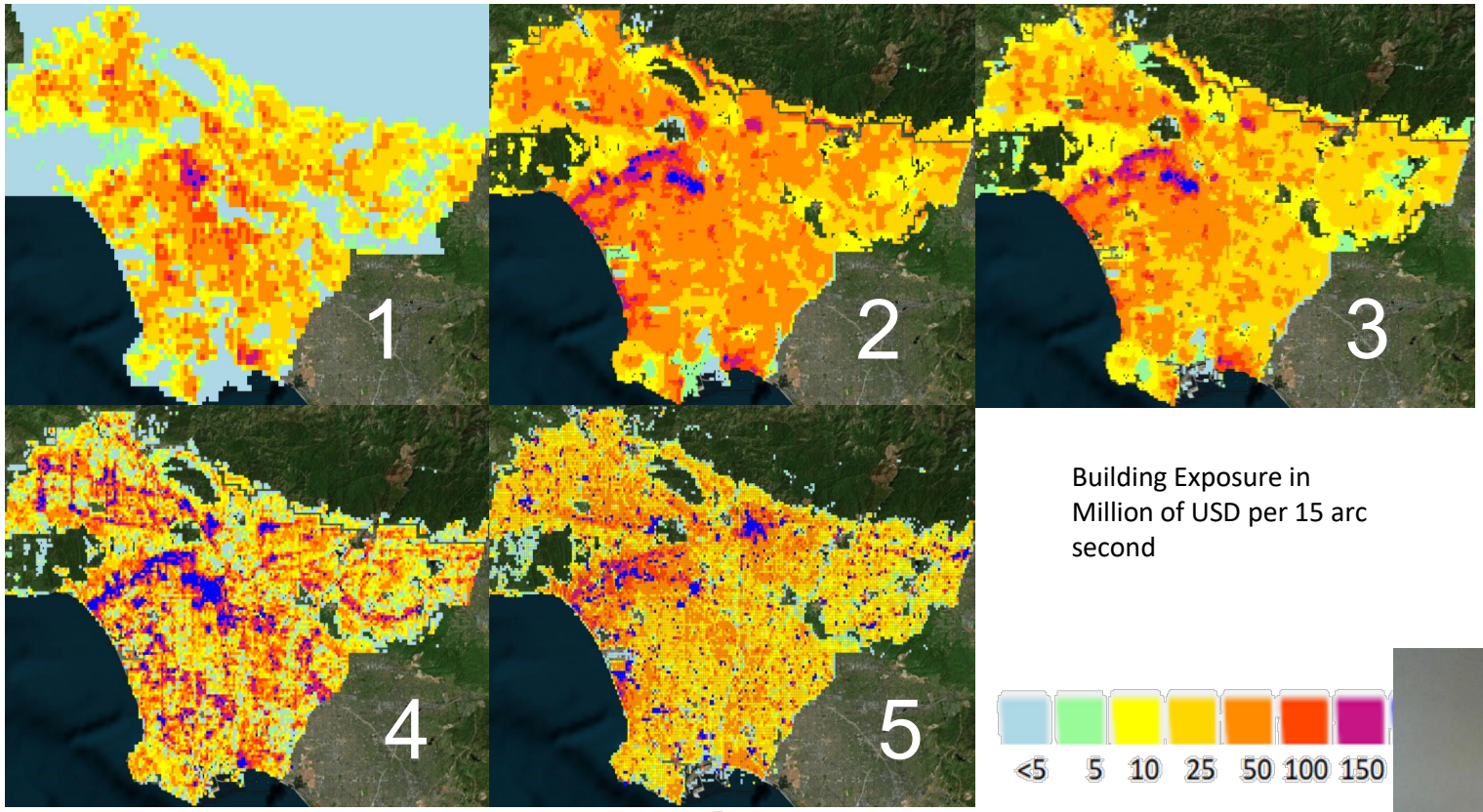
Tanzania Exposure, Building Count per 15 Arcsecond Grid



Levels of Exposure data, and scale



Building Exposure in Million of USD per 15 arc second

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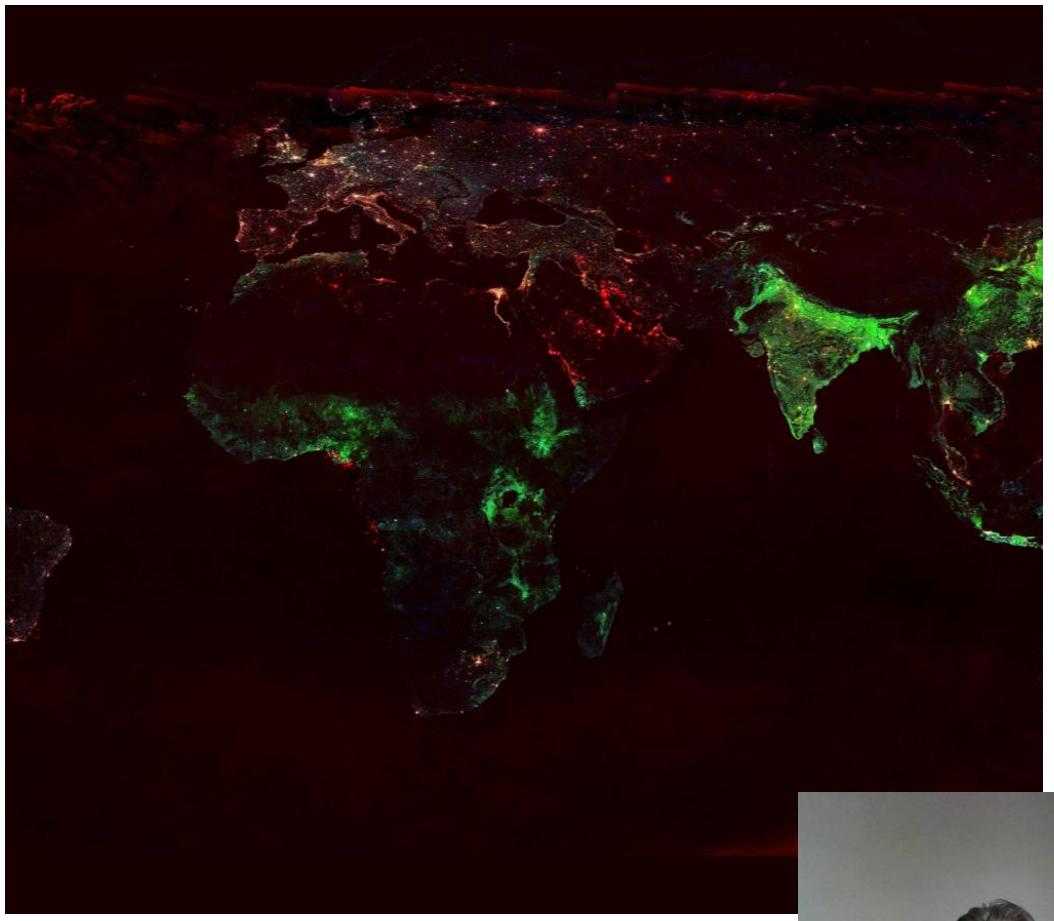
Level 1- Global data

Typically global but can be continental or regional

Country-specific information minimal

Aggregate of aggregates



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Level 2- Country-level exposure data

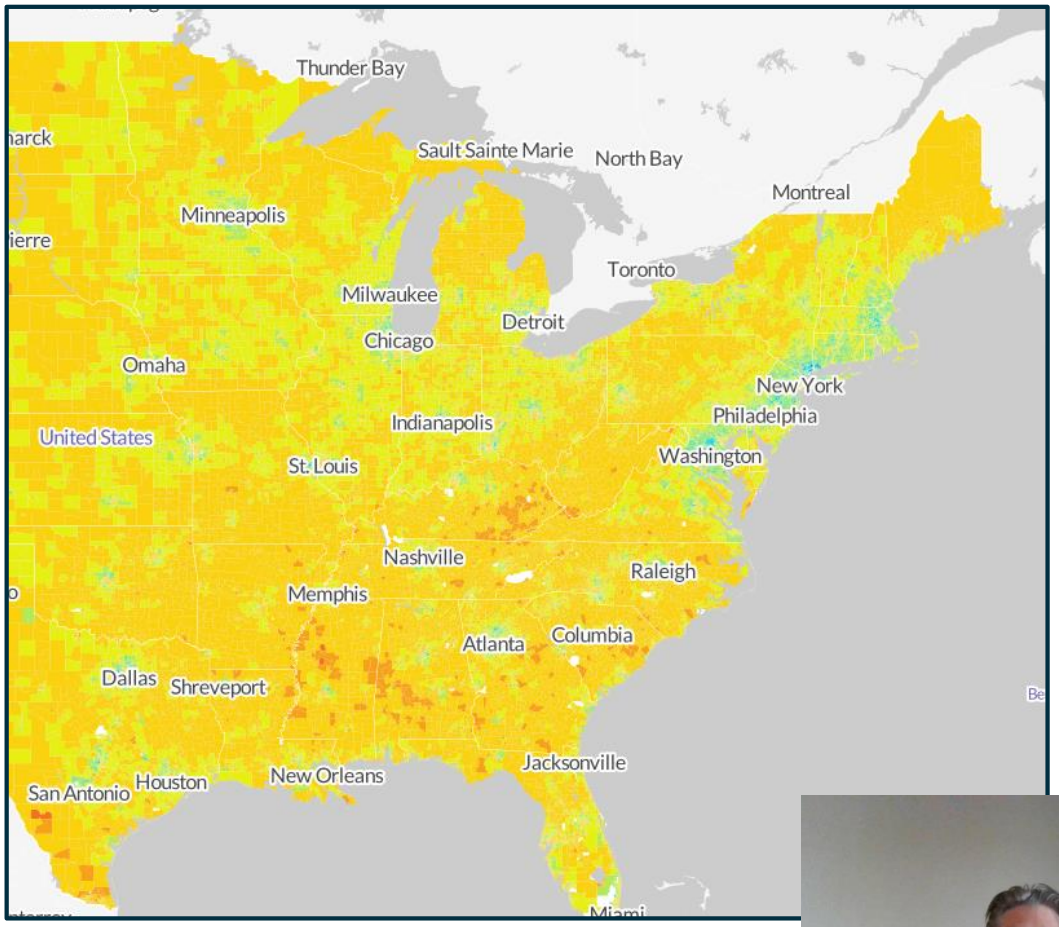
Exposure data has been collected and reviewed at a national level

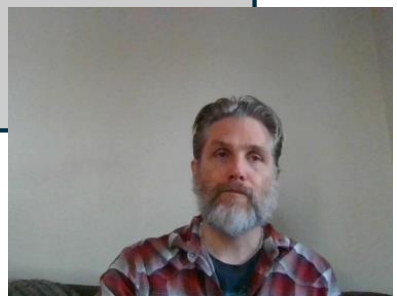
Structure type distributions

Number of people per household

Household size

Building replacement cost per square meter





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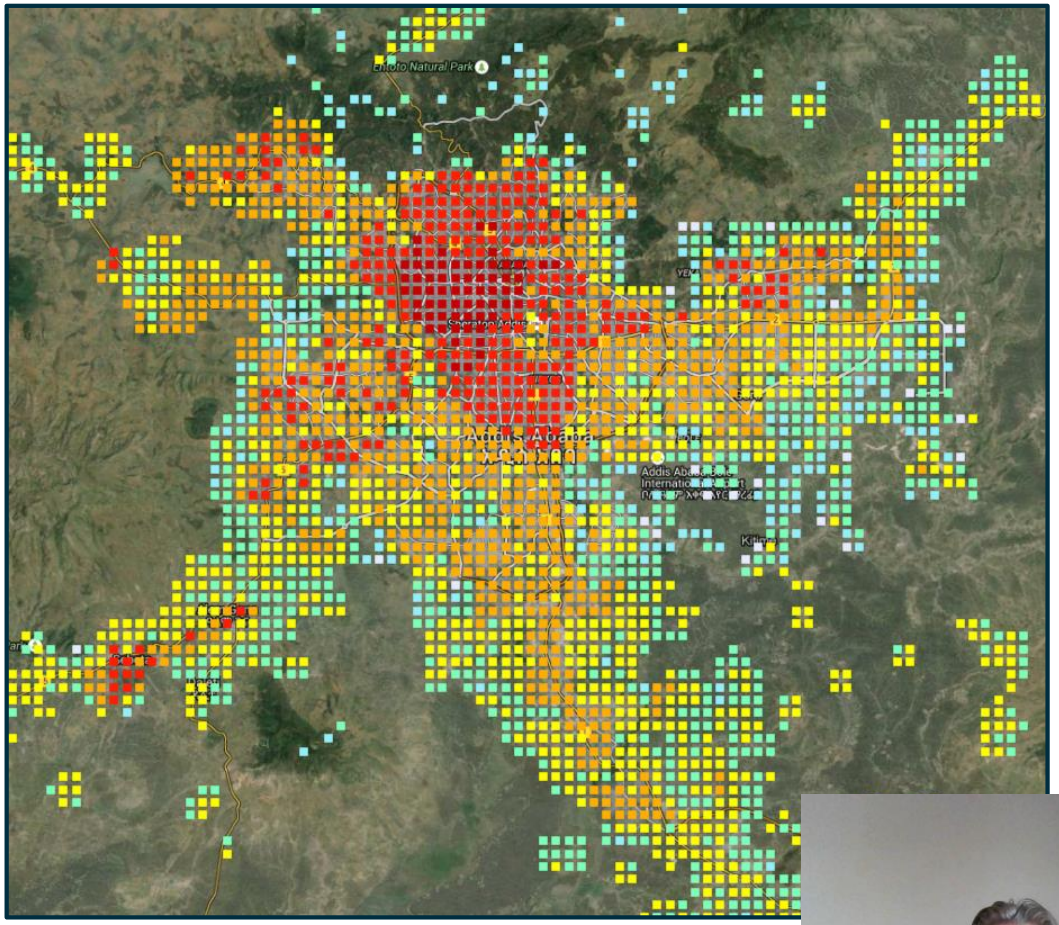
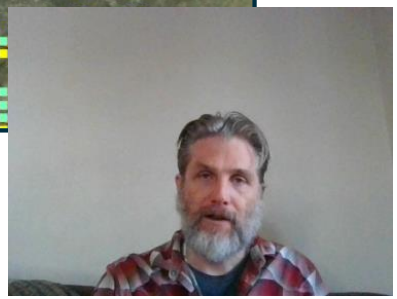
Level 3- Data improvement at the sub-national scale

Examples:

1. Subdividing the country by climate or cultural regions to reflect construction patterns
2. Identifying major urban areas and enhancing building counts or structural mapping schemes in these areas





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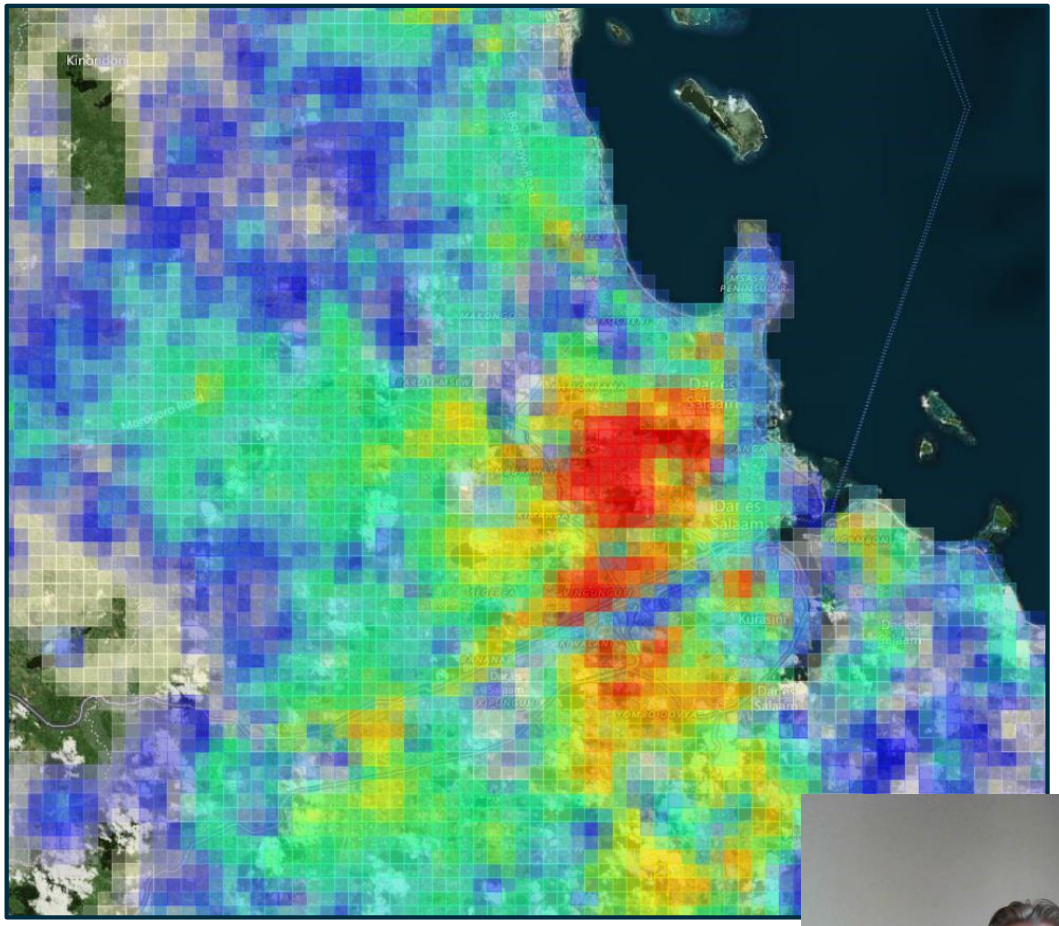
Level 4- Aggregated building specific data

Advantage: Aggregating the data allows for structural and occupancy distribution, height distribution and other attributes will not be mistaken for point-specific data

Disadvantage: spatial accuracy is lost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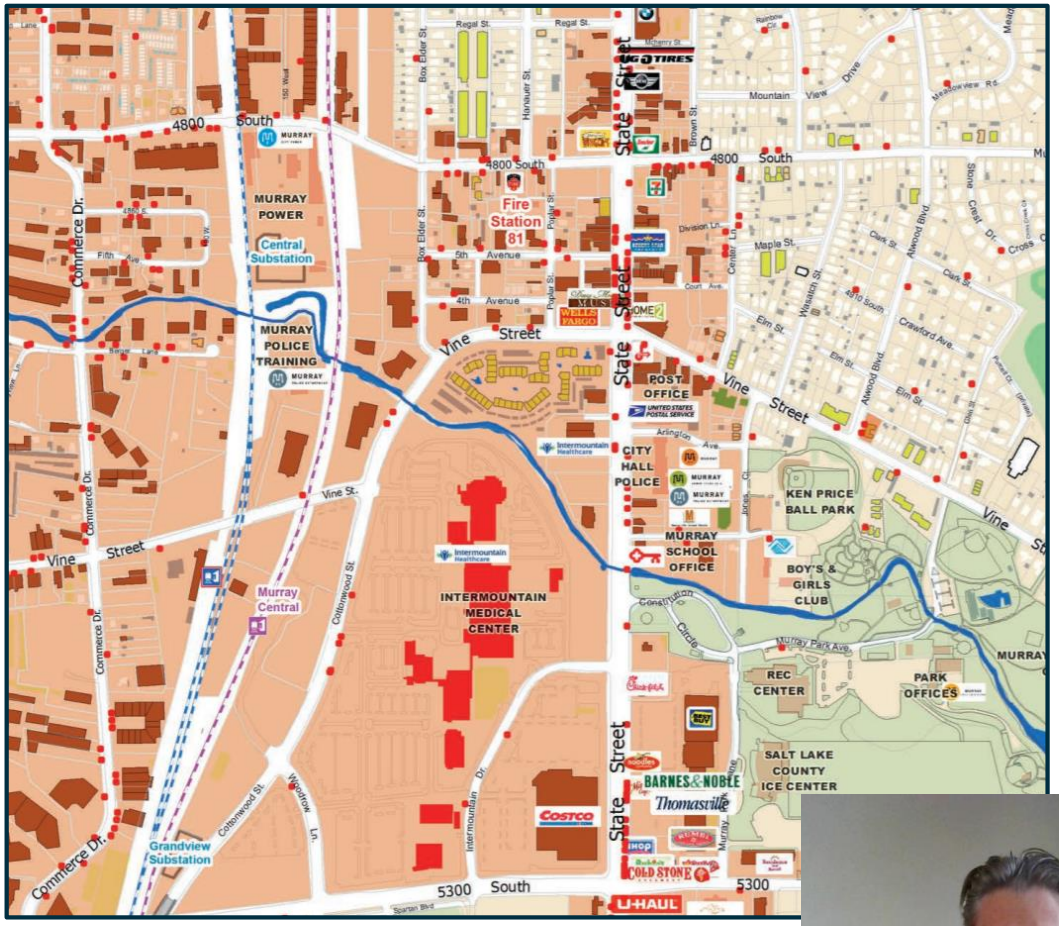
Level 5- Site-specific data

All data provided at the site level



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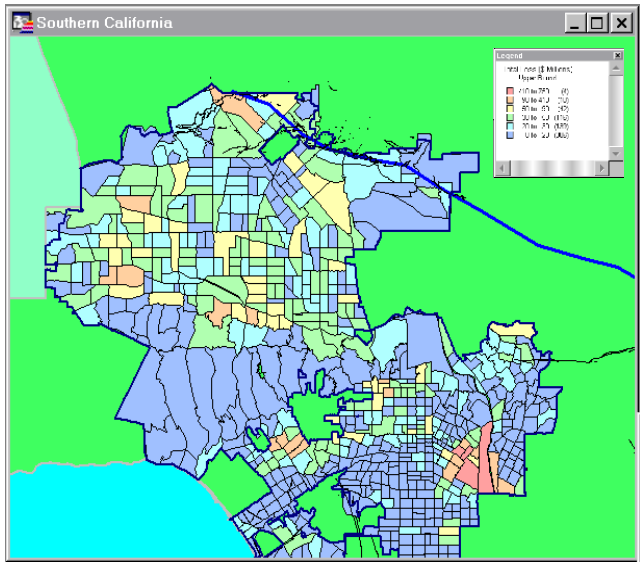
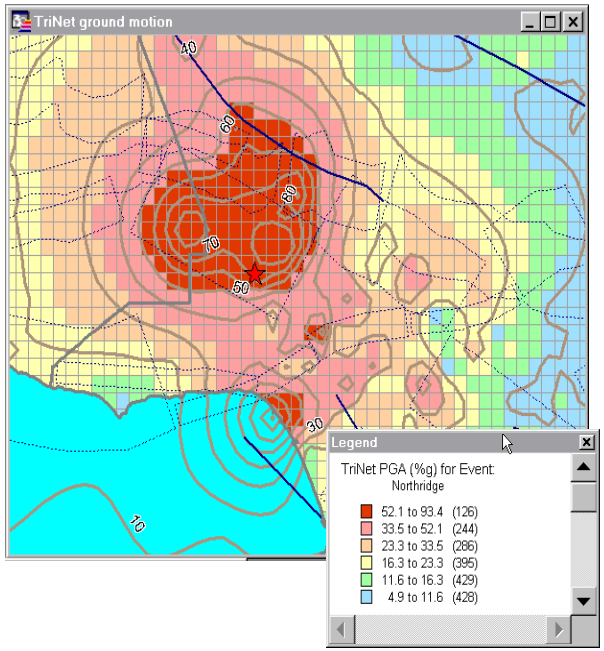
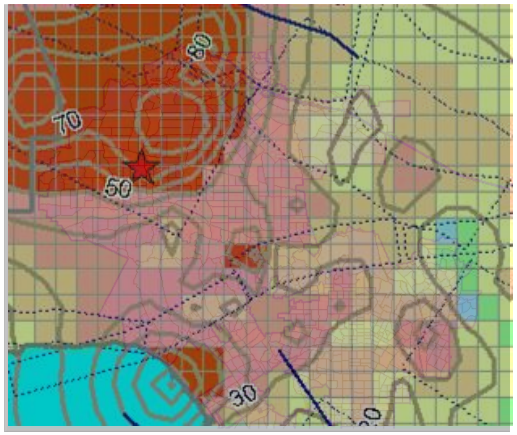
Spatial resolution







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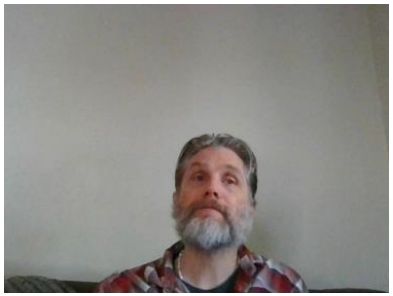
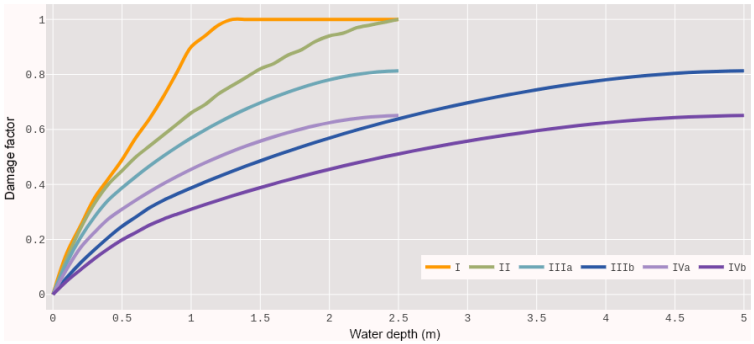


Building vulnerability attributes

- Number of stories
- First floor elevation
- Structural materials
- Lateral force resisting system
- Retrofits
- Nail density
- Distance between buildings



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Replacement costs

- What is it?
- Typical
- Tricky
- Not always meaningful
- Can correlate with income

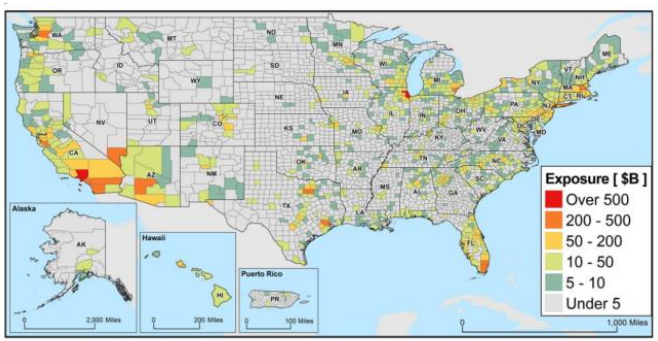
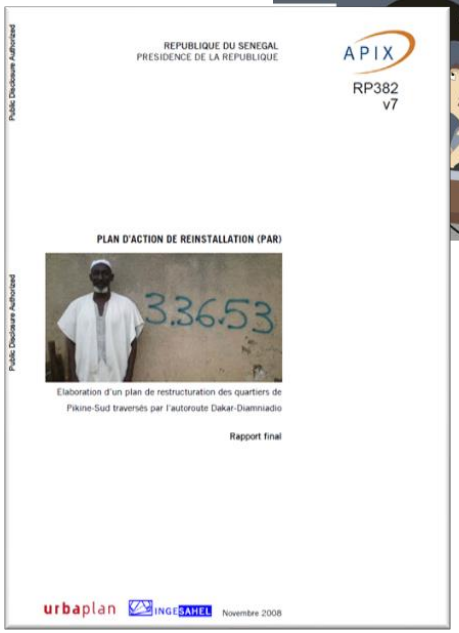
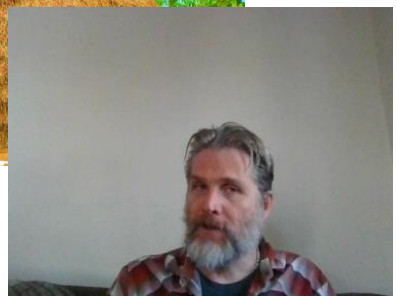


Figure 2-4. Replacement Value of Hazus 3.0 Building Inventory by County





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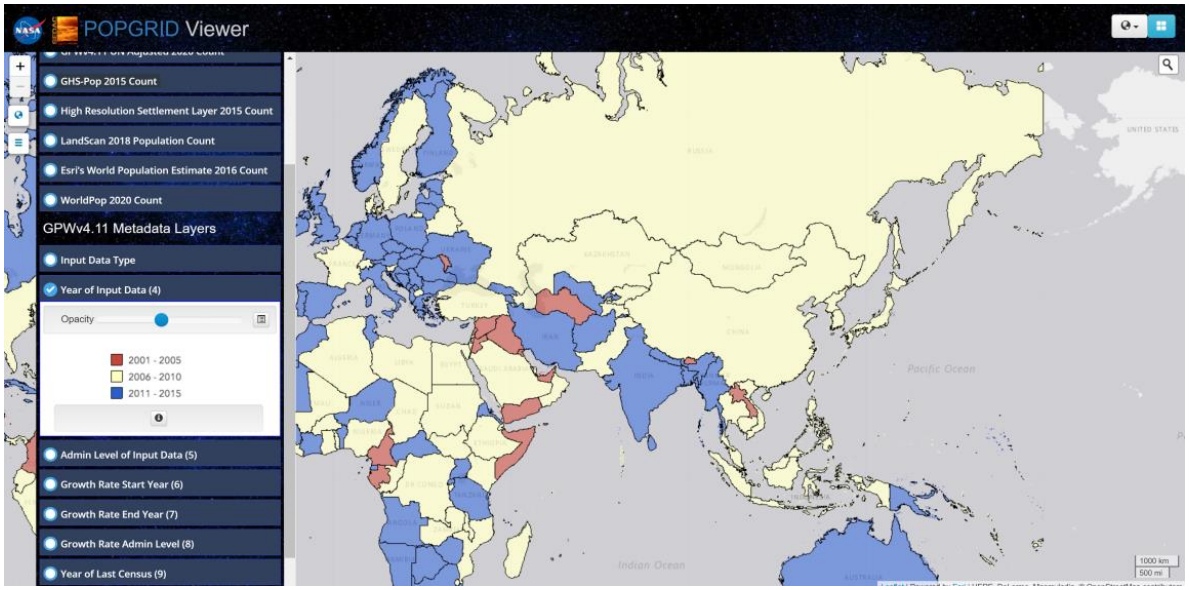
Vintage

- Often ignored
- Can lead to issues in areas with lots of growth
- May not be a big deal if results are “relative”



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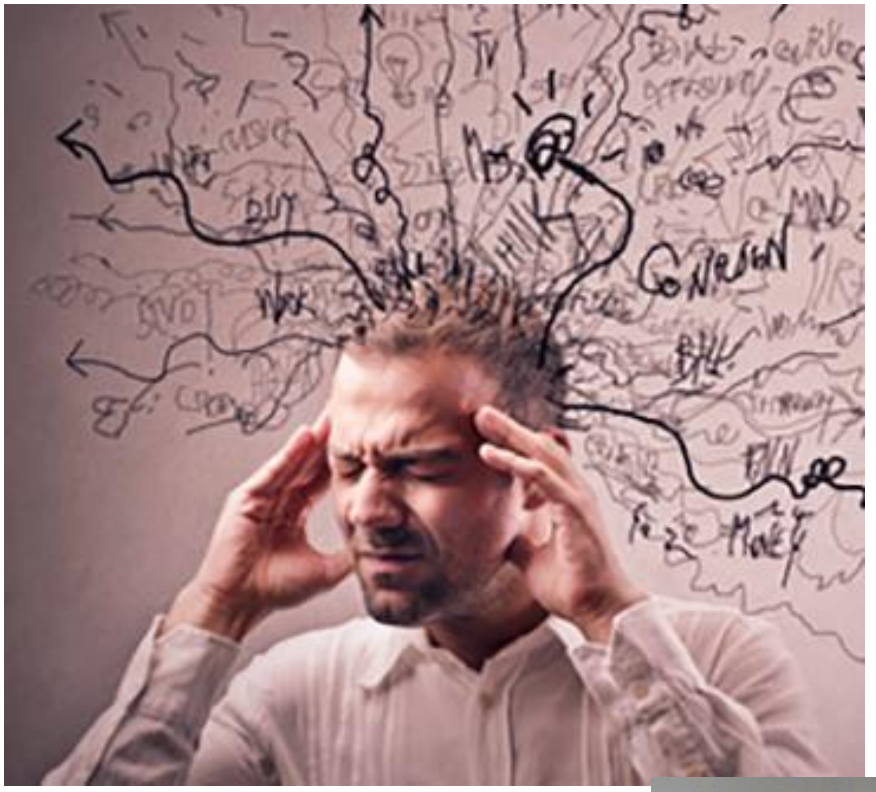
Challenges

- Data Availability
- Permissions
- Processing challenges
- Bias
- Human error
- Data gaps
- Misperception
- Accuracy
- False precision
- Explaining the data with clarity
- Inappropriate legacies
- Turnover
- Obsolescence
- Advancing technologies (AI, UAV, additional sensors)



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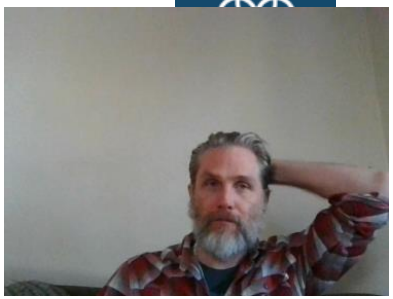
Expectations

- Cannot typically expect accurate number of buildings at the cell level – count is approximate
- Can expect more accuracy than in the original base data sets
- Cannot expect to always capture small unmapped rural areas
- Challenges in remote sensing that will impact results (low lights, cloud cover, tree canopies etc.)
- Can not repurpose the data for civic purposes such as address-specific information for tax purposes