A community-driven approach to developing future land use scenarios at the river basin scale:

An example from the Delaware River Basin

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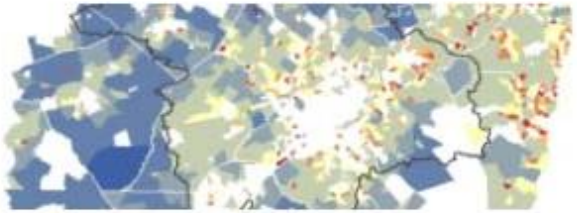
Mapping and modeling land use in the Delaware River Basin

MAPPING

High-resolution LiDAR-based land cover data for all 43 counties in the watershed



MODELING

Connecting models of land cover change, climate change, hydrology, and tree species to explore development and environmental impacts

MONITORING

Feasibility Analysis: establishing a long-term land cover monitoring program

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Delaware River Basin Land Use Dynamics
Shippensburg University

USGS science for a changing world

Grand Challenges

- Many waterways do not meet the “fishable and swimmable” Clean Water Act requirements
- Population growth and associated land cover change are a concern for water supply and quality
- Climate change and sea level rise

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The Delaware River Watershed Initiative

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OPEN SPACE INSTITUTE

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The Delaware River Watershed Initiative

- Extensive monitoring program
- Watershed planning tools
  - Stream reach assessment tool
  - WikiWatershed
  - High resolution land use/land cover data
  - Forecasts of urban development
- Scientific research
  - Delaware Watershed Research Fund

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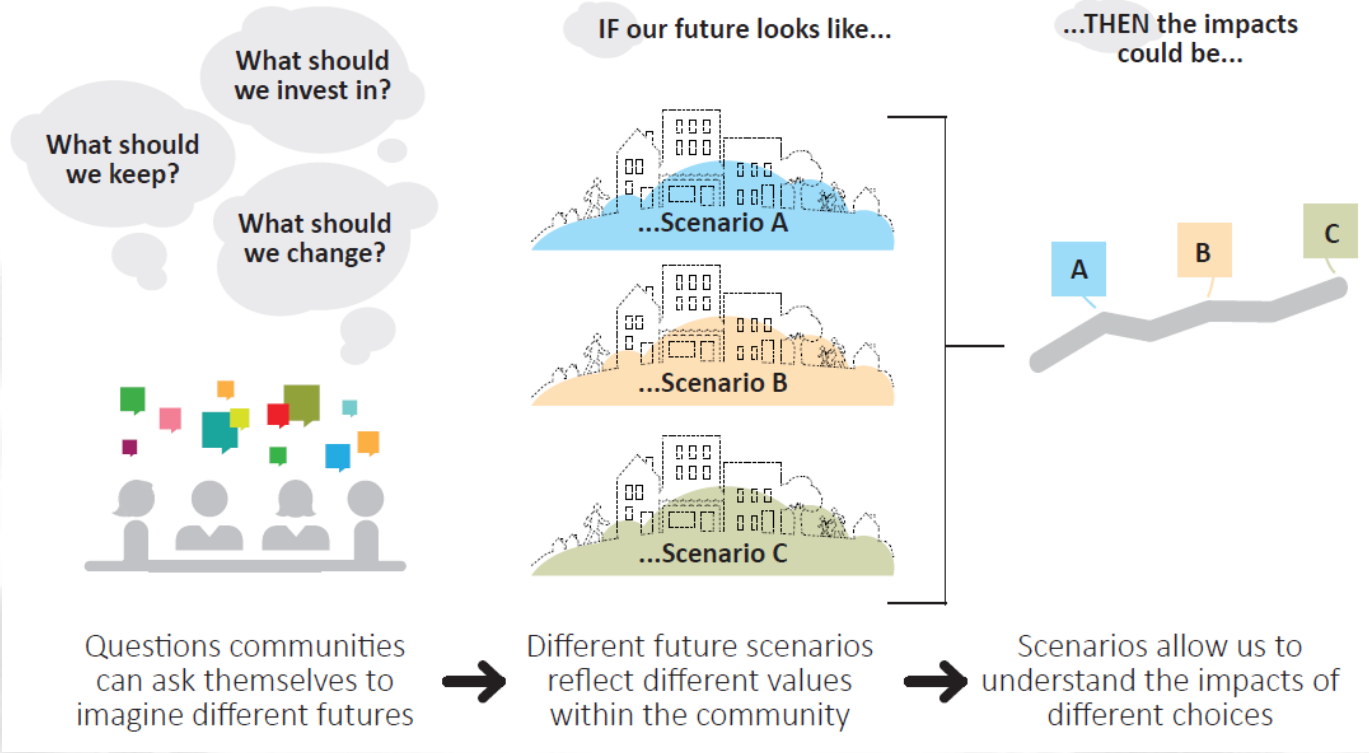
What will the watershed look like in 2070?

Delaware River Basin 2070

- **Scenarios** are plausible stories about the possible futures and range of changes that could occur



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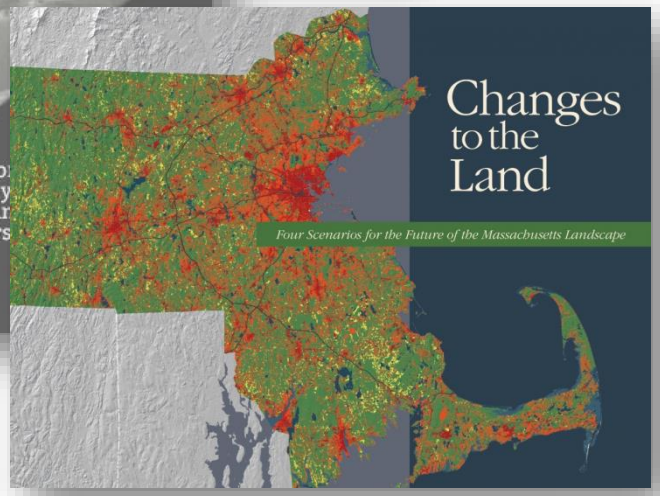
Related efforts



Why use scenarios?

- It is difficult to *predict* future land use

> **Prediction is very difficult, especially about the future.**
>
> *- Humorous Danish proverb*

- Scenarios can *guide decision making*
  - Evaluate effects or impacts of decisions or events

> **The future cannot be predicted, but futures can be invented.**
>
> *- Physicist Dennis Gabor, 1963*

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Our iterative scenarios approach

Quantitative

- Collect best available ***population*** and ***employment*** projections
- Model ***socio-economic*** and ***environmental*** drivers of land change
- Integrate ***climate and sea level change*** projections

Qualitative

- Develop ***community feedback*** about the present and future
- Integrate feedback into ***storylines***
- Using data, translate storylines into ***future land use scenarios***

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DRB2070 scenarios

Baseline/business as usual

- *"Recent trends" with storm surge and sea level rise*

Alternative 1- growth along corridors

- "Sprawl" with greenfield development

Alternative 2- growth in historic centers

- "Conservation" with infill and land protection

www.drbproject.org/products

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DELAWARE RIVER BASIN
Land Use Dynamics
SHIPPENSBURG UNIVERSITY

USGS
science for a changing world

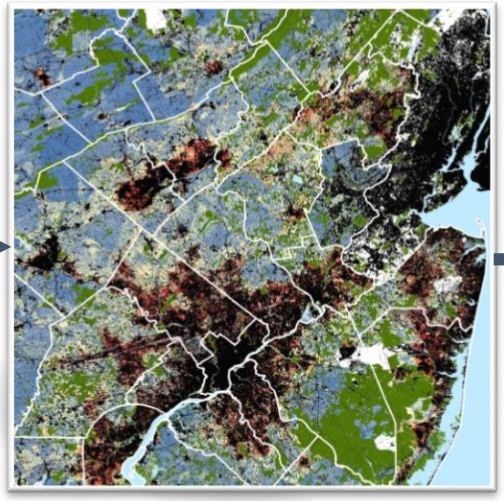
Modeling Framework

Delaware River Basin 2070

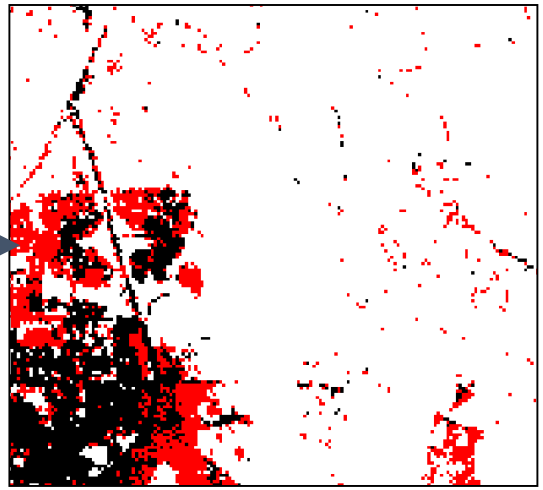
- Socio-economic
- X
- Accessibility Model
- X
- Physical Factors
- X
- Restrictions or incentives
- X
- Exclusion / protection

Demand for new urban land

Suitability layer



Cellular automata



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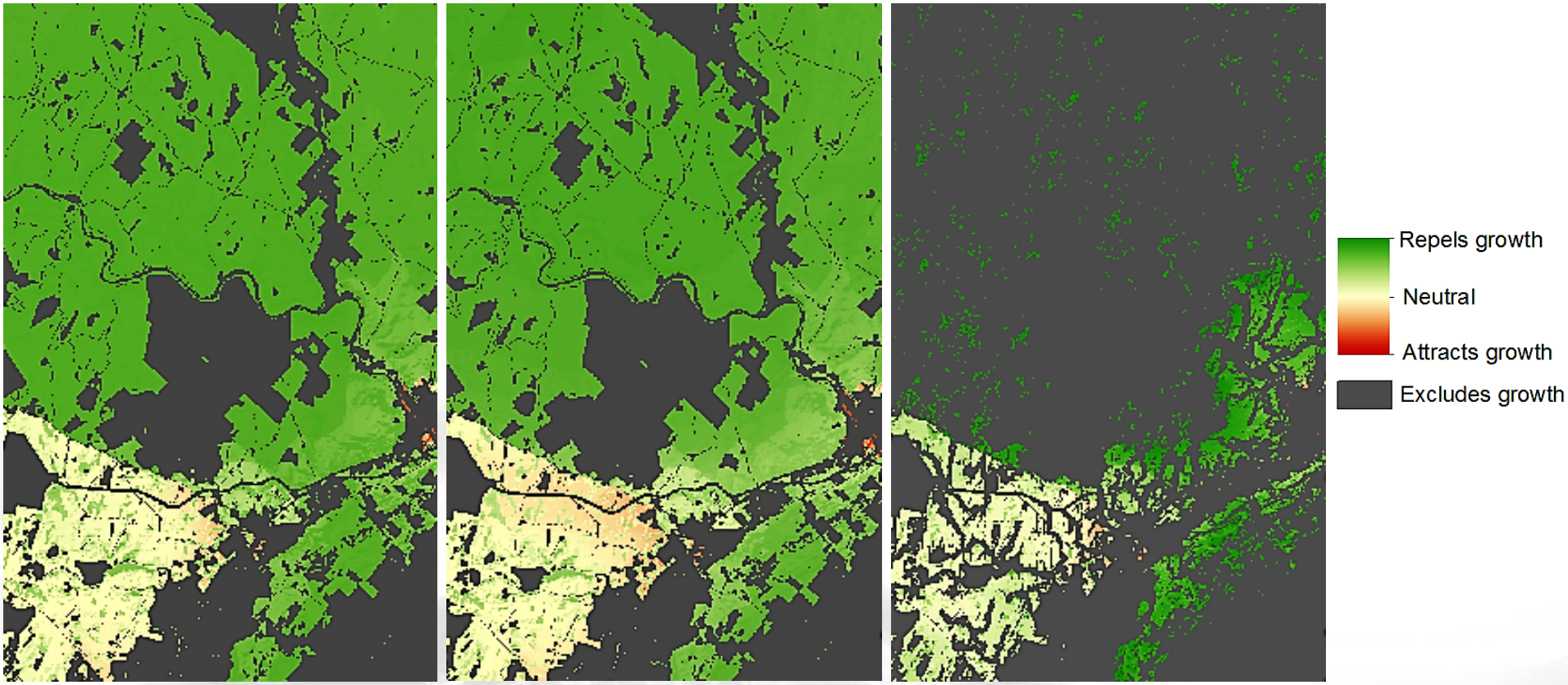
Exclusion/attraction layers



"Baseline" "Sprawl" "Conservation"

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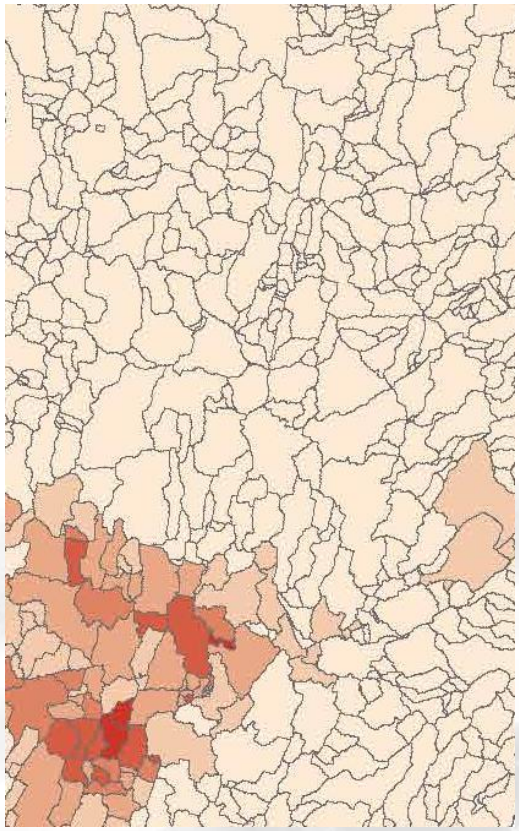
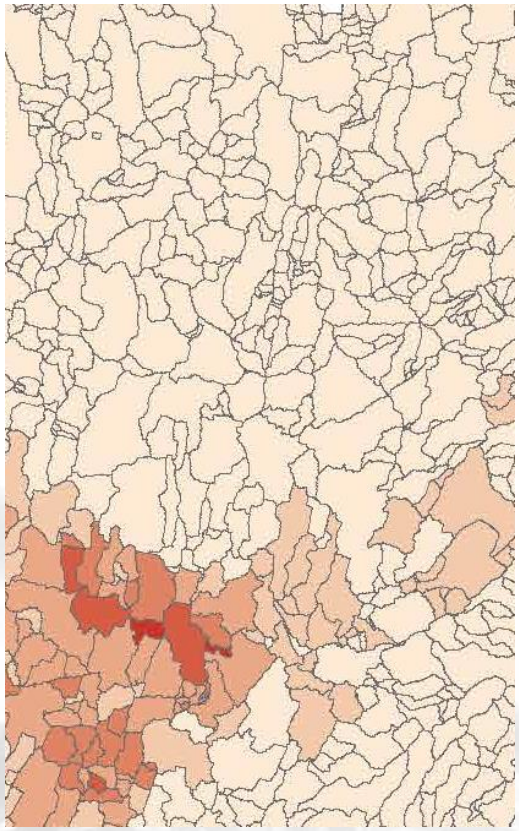
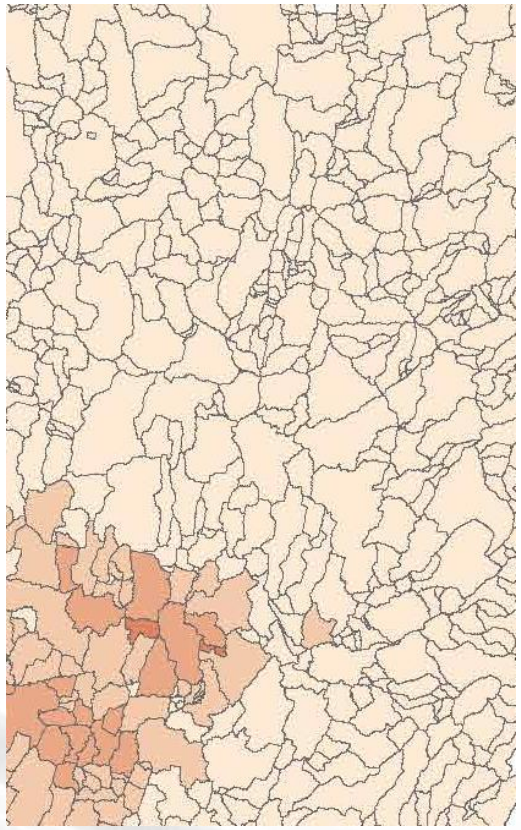
Modeled land use in 2070







% Urban
(difference 2011)

- ≤1%
- 1.01% - 5%
- 5.01% - 10%
- 10.01% - 15%
- 15.01% - 20%
- 20.01% - 25%
- >25%

"Baseline" "Sprawl" "Conservation"

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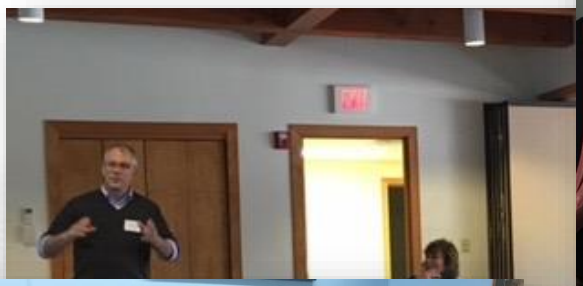
Applications

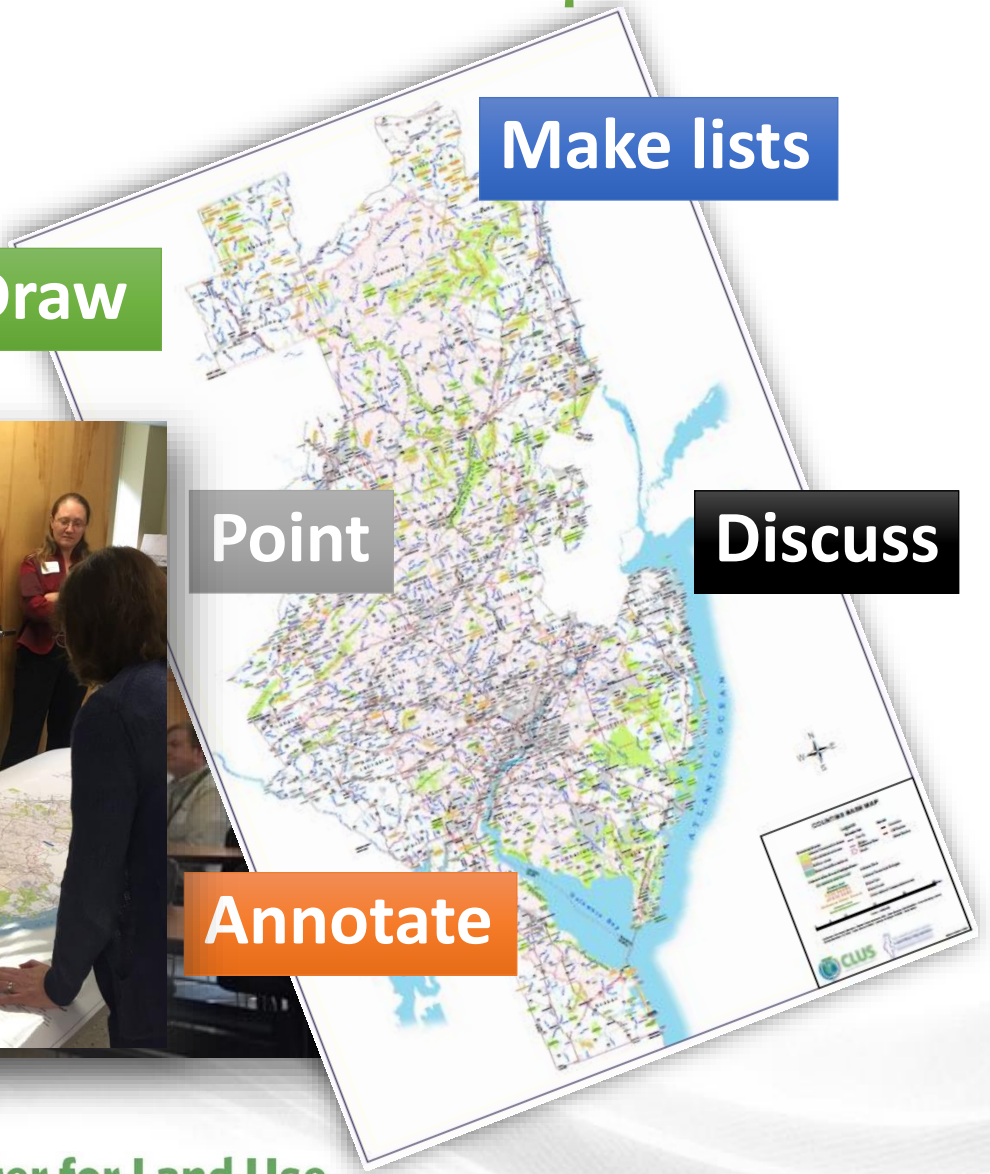
- Visually and quantitatively compare forecasted development across scenarios
- Identify/quantify potential impacts (i.e. on water quality, open space, etc.)
- Prioritize when/where to take action

Lesson learned: Imagining the future is difficult

Multimedia courtesy of Dr. Scott Drzyzga, Shippensburg University

Lesson learned: The process is as important as the products





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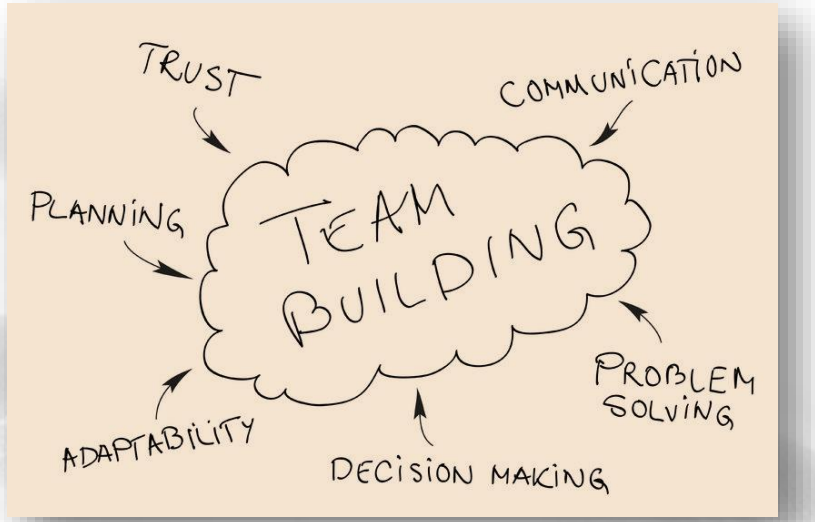
Engaging with stakeholders/end users/decision makers

- We all develop a deeper knowledge about the system we are modeling and the modeling tools
- You have a voice
- Networking and teambuilding



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Thank you!