Response to Land Cover and Water Quality Models

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Questions

• Quickly review the scenarios that we try to model.

• Are we using the right kind of tools to address the scenarios we try to analyze? Are we missing tools?

• Do we work at the appropriate level of spatial, temporal and contextual resolution? Are our models reasonably well designed to address these scenarios?

• Do you know of alternative ways to either model or analyze these scenarios? Can you share any experience, which tools worked well and which didn’t work in specific applications?
Land Cover Model

• CBLCM: evolved from SLEUTH and GAMe into independent CA model
  – A hybrid of rule-based and pattern-based

• Similar to other widely used approaches for land cover change modeling.
  – Like similar models, it is heavily dependent on existing patterns
Land cover model

• Aggregated countywide jobs and household projections from SILO model
  – Allocated to 30 m X 30 m pixels (an artifact of Landsat/NLCD)

• Excludes protected lands, areas zoned for agricultural or forest conservation use, steep slopes (> 21%), highways and existing developed areas, and wetlands from future growth
  – + variations by scenarios

• Provides inputs to nutrient loading model
  – Is this the only purpose? Extend the findings to show agricultural, fishery implications.
  – Consider growth management, groundwater, heat island, public health, etc.
Modeling approach

- Jobs and households projections converted into land demand
  - In input data; varies by urban/rural. Is that sufficient?

- Infill/Redevelopment? Yes. Spatial variability based on underlying density
  - Limiting for creative scenarios?

- Policy levers: density, accessibility, protected areas
  - Variable zoning?
Input data
- Household and Employment Projections
- Scale of Projections (e.g., county, TAZ, or zoning districts)
- Infill/ Redevelopment Rates
- Housing and Employment Densities
- Excluded Areas (reflecting zoning, land conservation, ordinances, etc.)

CBLCM parameter
- Densification rates per time step
- Magnitude of path dependence, i.e., the degree to which new development influences the probability of growth in surrounding areas

County-level control totals means zonal-level inconsistency with SILO and MSTM
Top-down and Bottom up variation
How does boundary selection affect the validity of the findings of your models?
  How do you deal with edge/boundary effects?

Is it possible to use more disaggregated variables?
Aggregation seems to be informed by the needs of the water quality models
Losing the socio-economic variability of SILO outputs
  High density (lower incomes) and low density households? Retail and Industrial?
Questions about Land Cover Model

• Infill and density characteristics based on existing patterns? What would prompt new centers to grow?

• For time-step runs, are you using time-wise projections from SILO or developing your own?
  – Did you include transportation model runs (congestion patterns) in assessing accessibility?

• How did you validate the model runs? How many time periods?
  – How well does planning capacity and allocation rules capture the market tendencies (model validation?)

• Will there be an advantage of going higher resolution? QuickBird (0.5 m)
Do the variations in model specifications matter?

Vary total projection to land demand conversion rates by each scenario

Consider non-land based variations in scenarios (higher value for road proximity?)

If some scenarios are leading to more efficient buildings and other construction technology, that should matter for land cover change
Water Quality Model

- Assess the impact of development on nutrient and sediment runoff
- Uses development, topographic, soil, and rainfall data
- Typically run at the watershed level
Questions about Water Quality Model

- Can it handle different types of residential and commercial uses?
- Was this done using county boundaries or watershed boundaries (8 or 16 digits)?
- Can you provide some benchmarks or make these numbers meaningful (cost of treatment, effect on fish health, relative change etc.).
- How are you operationalizing changes in per building level environmental impacts (by each scenario)?
Broader questions and additional goals

• How closely should SILO, MSTM, and LCM be coupled? Can LCM provide feedback to MSTM/SILO?
  – Step-wise runs?

• What are the scenarios implications in the LCM and WQ models?
  – Households to housing units conversion rate
  – Housing units to land demand conversion rates
  – E.g. Green infrastructure services in RoN scenario

• Consider recreating socio-economics characteristics from land cover to connect the findings back to heat island, public health, etc.
Scenarios: general comments

• Capturing the existing relationships
  – Empirical/logical/speculative
• Predicting changes to these relationships
• Imagining new conditions and relationships

• Communicating scenario stories
  – Meaningful and evocative
  – Do not need to be all encompassing
  – Do not lose the big picture

• What would it take scenarios?
  – 40% cut in emissions