

Mapping Energy Futures: Spatial Analysis to Support Community Energy Planning

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Outline

A. Context

- i. The value-add of mapping systems and mapping services to CEP
- ii. The kinds of mapping systems and mapping services available for CEP in Canada

B. Best practices in local energy resource mapping

- i. Standardized approach to renewable energy resource classification
- ii. Participatory GIS for community engagement
- iii. Rooftop PV mapping systems



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The Value of Mapping Systems & Services

Analysis & Decision Support

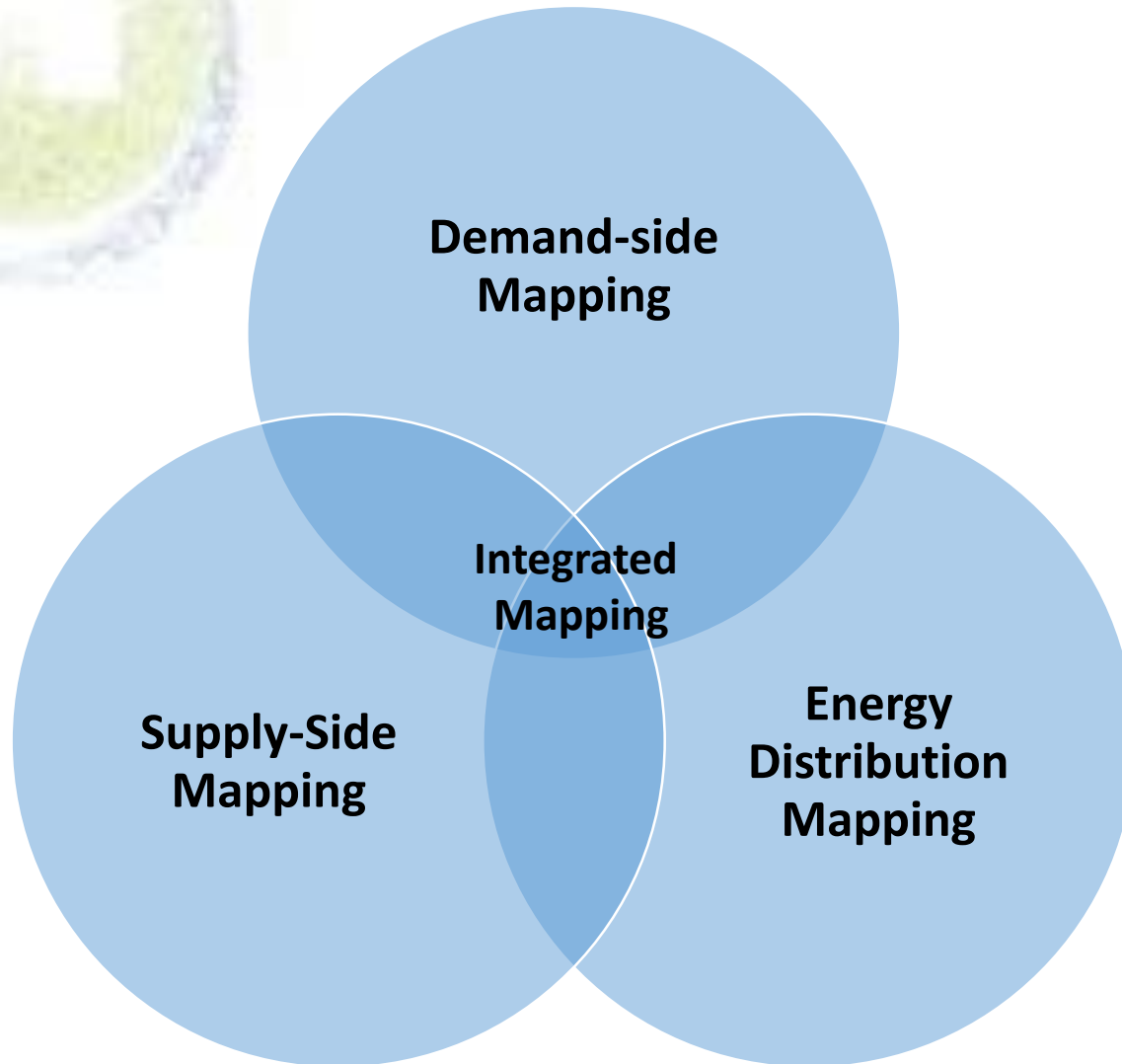
- Asset management
 - E.g., maintenance scheduling and monitoring on electricity infrastructure
- **Planning**
 - **E.g., quantifying resource potential; identifying hot-spots of energy demand/consumption**
- Service provision
 - E.g., informing targeting infrastructure development

The Value of Mapping Systems & Services

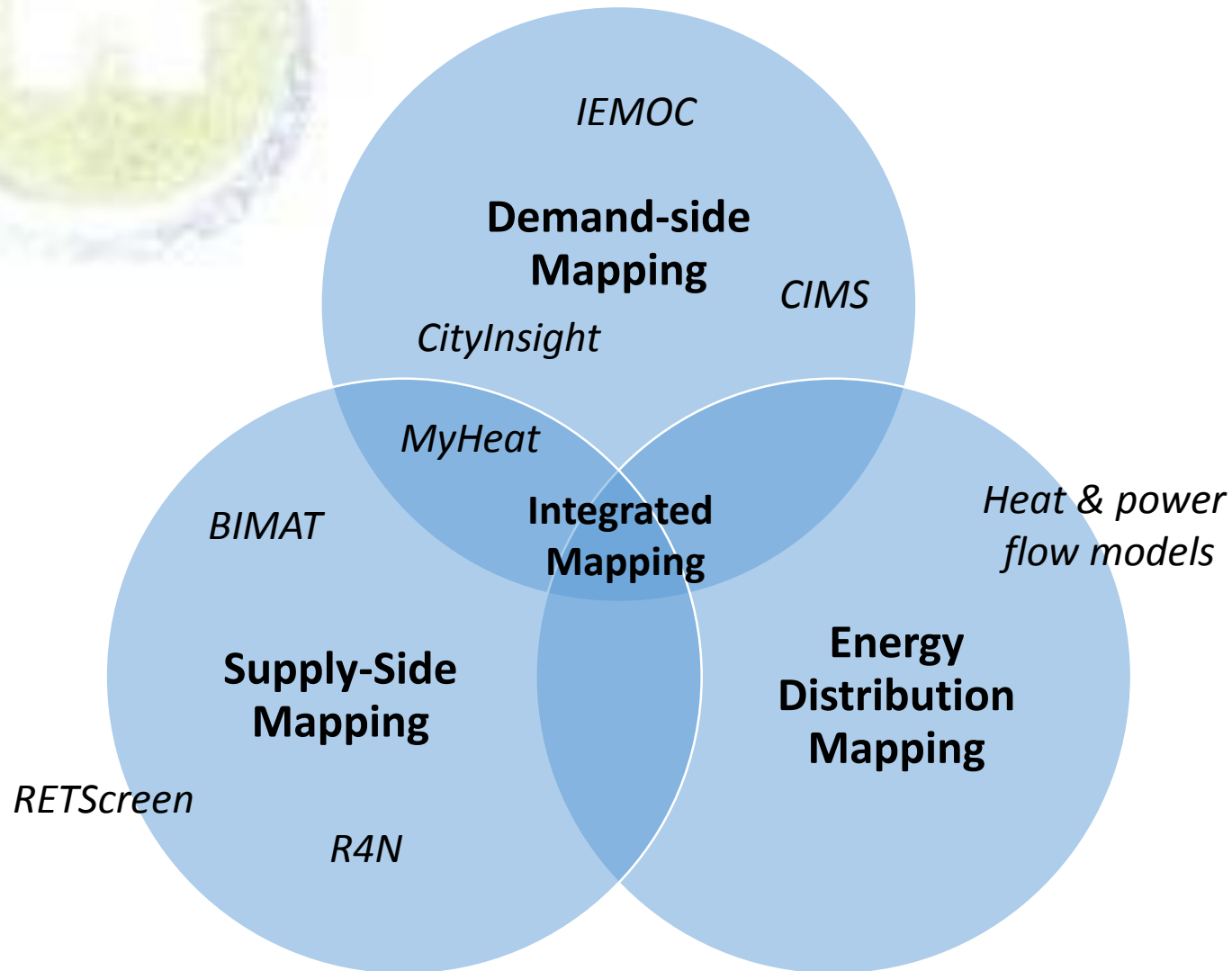
Communication & Community Outreach

- Raising awareness of opportunities / impacts
- Facilitating dialogue across stakeholder groups
- Incorporating community voices into planning process

A Typology of Mapping Systems and Services Available for CEP



An Inventory of Mapping Systems and Services Available for CEP





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A. Context

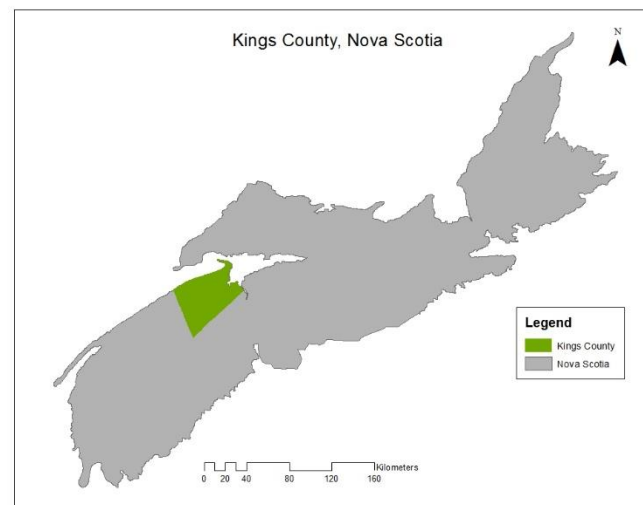
- i. The value-add of mapping systems and mapping services to CEP
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B. Best practices in local energy resource mapping

- i. Standardized approach to renewable energy resource classification**
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- iii. Rooftop PV mapping systems**

Standardized approach to renewable energy resource classification

Lead: Phil Teri, MA Candidate,
Department of Geography
University of Guelph



Mapping Renewable Energy 'Reserves'

Area-based resource classification system

Cumulative Production	IDENTIFIED RESOURCES		UNDISCOVERED RESOURCES		
	Demonstrated		Inferred	Probability Range (or)	
	Measured	Indicated		Hypothetical	Speculative
ECONOMIC	Reserves		Inferred Reserves		
MARGINALLY ECONOMIC	Marginal Reserves		Inferred Marginal Reserves		
SUB- ECONOMIC	Demonstrated Subeconomic Resources		Inferred Subeconomic Resources		

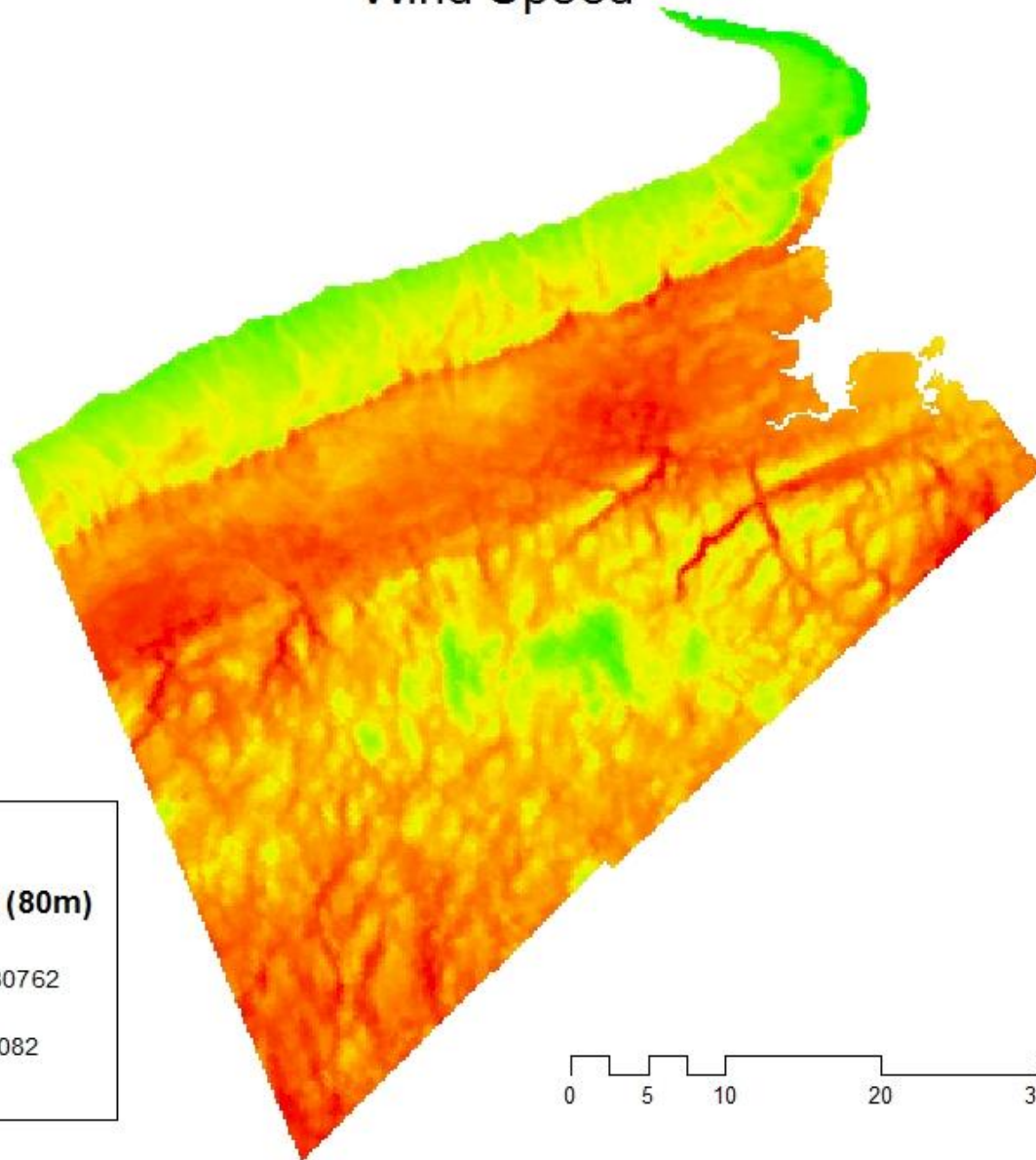
Mapping Renewable Energy 'Reserves'

Area-based resource classification system

Theoretical Resources

Measured or modeled energy potential across a geographic area

Wind Speed



Legend

Wind Speed (80m)

Value



High : 8.80762

Low : 5.4082



Mapping Renewable Energy 'Reserves'

Area-based resource classification system

Theoretical Resources

Measured or modeled energy potential across a geographic area

Recoverable Resources

Accessible using reasonable engineering solutions for system siting or resource harvesting, and which can be converted into useful energy by prevailing technologies

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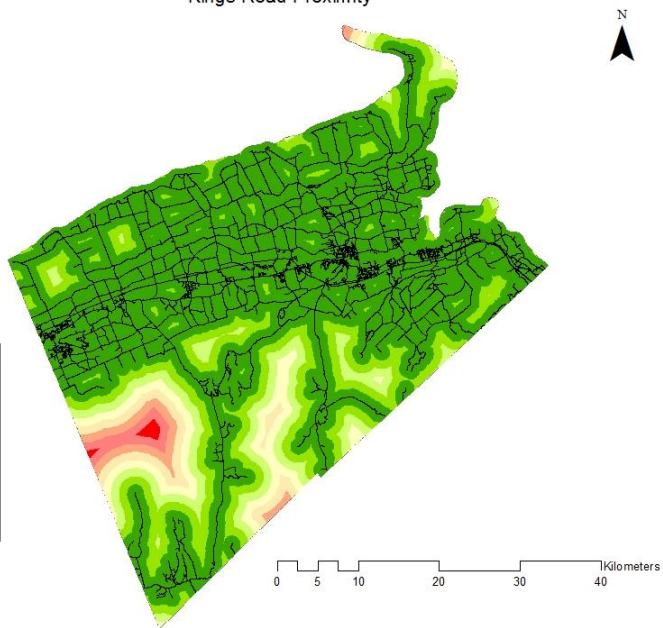
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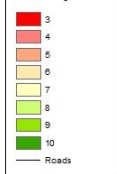
Economical Reserves

(a) developable at relatively low capital cost and high operating revenue; (b) energy is a more valuable use of the land/resource

Kings Road Proximity



Suitability Score

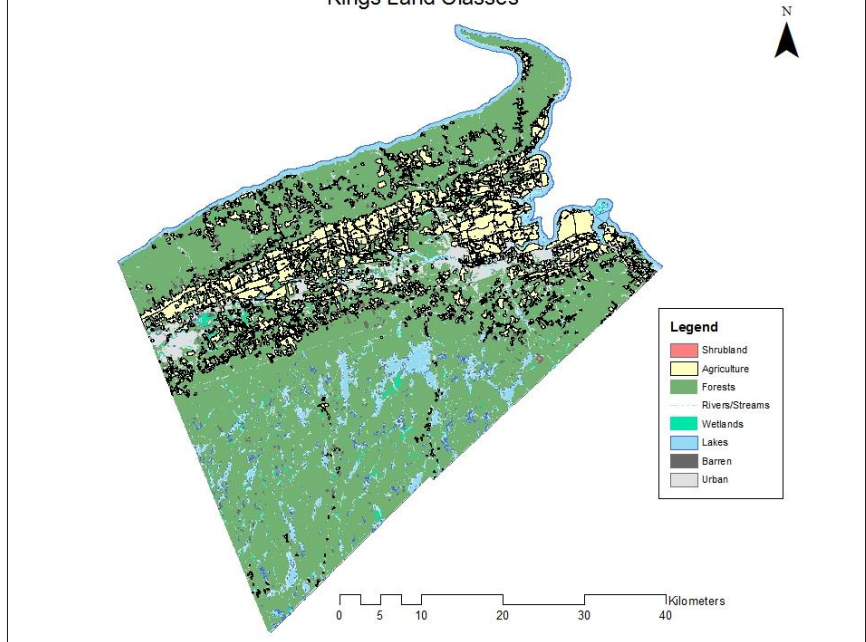


*Higher is better

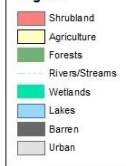


vab

Kings Land Classes



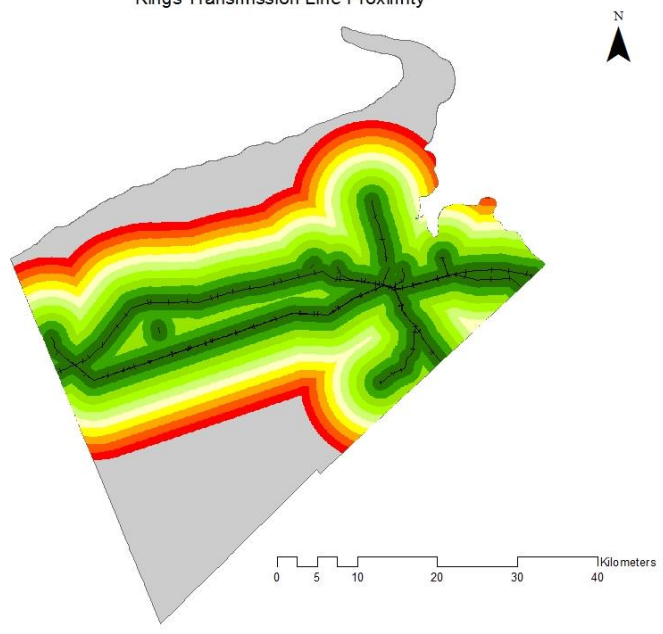
Legend



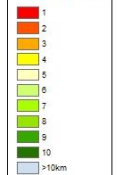
Accessible using reasonable engineering solutions for system siting

Recoverable Resources

Kings Transmission Line Proximity



Suitability Score

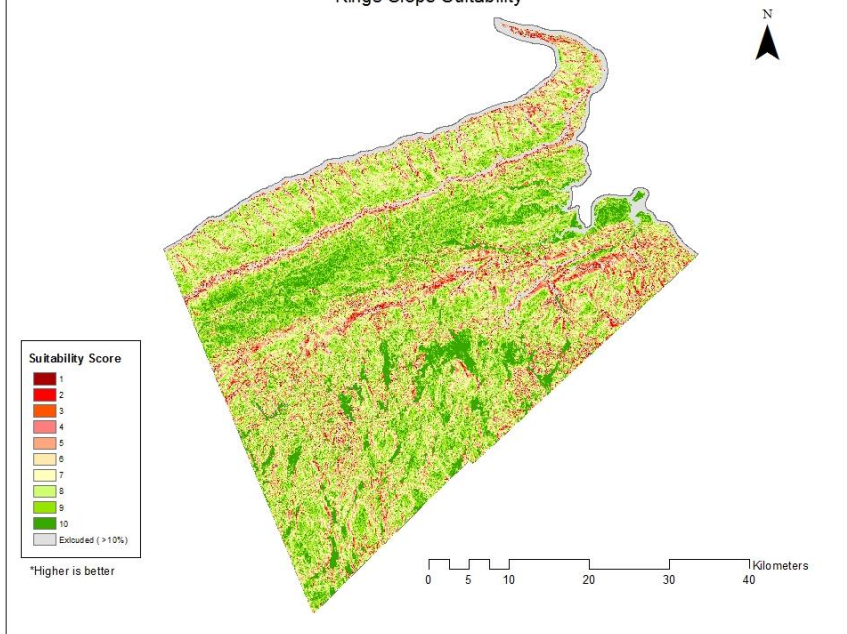


*Higher is better



(a) c
reve

Kings Slope Suitability



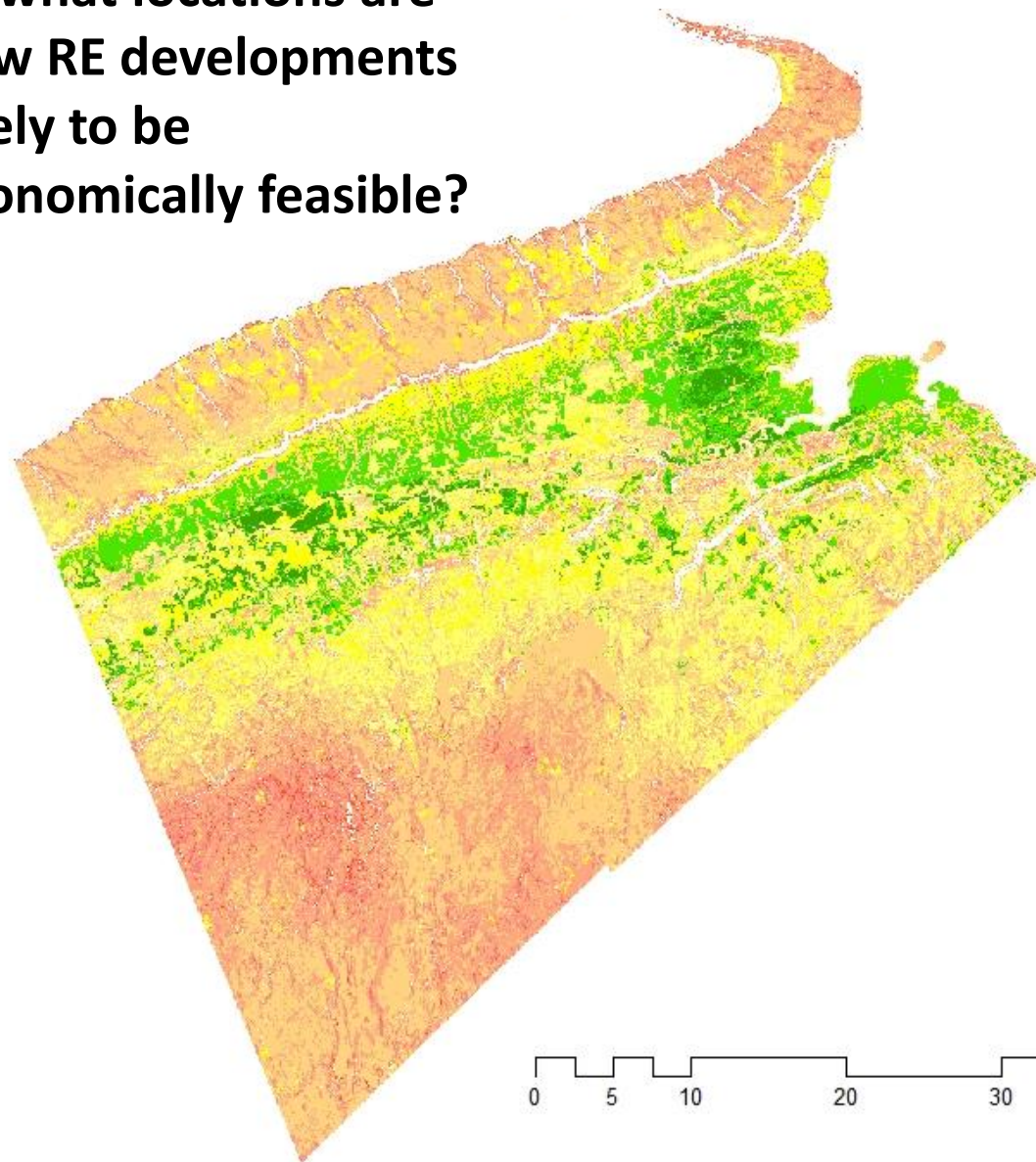
Suitability Score



*Higher is better



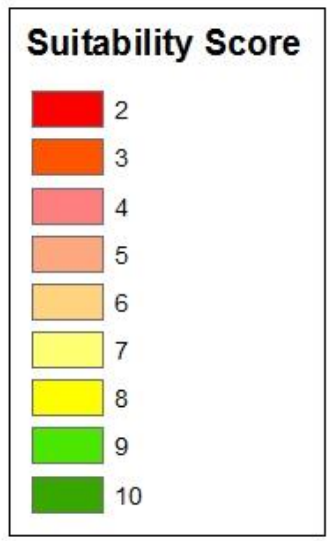
At what locations are new RE developments likely to be economically feasible?



system



Kilometers
40



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Measured or modeled energy potential across a geographic area

Recoverable Resources

Accessible using reasonable engineering solutions for system siting or resource harvesting, and which can be converted into useful energy by prevailing technologies

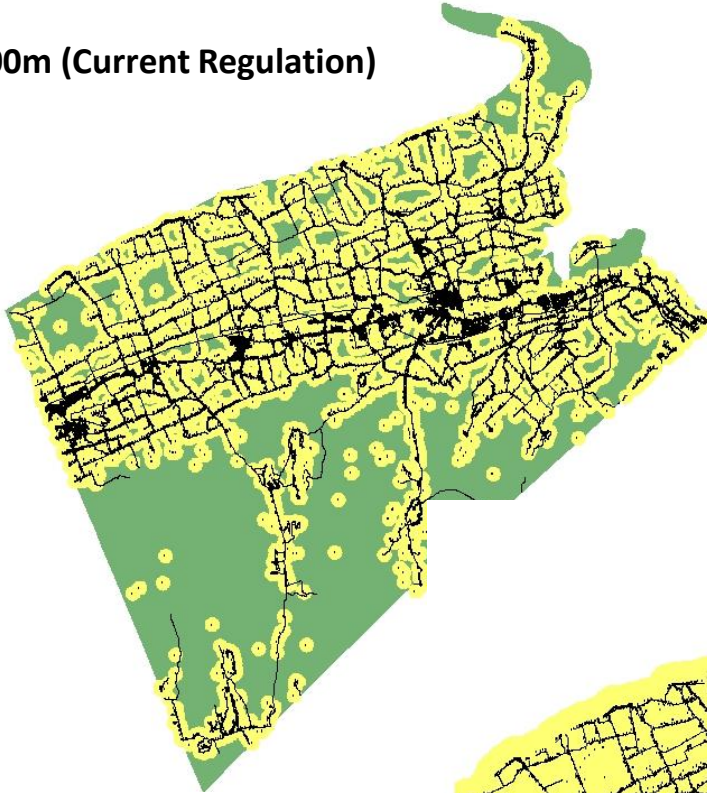
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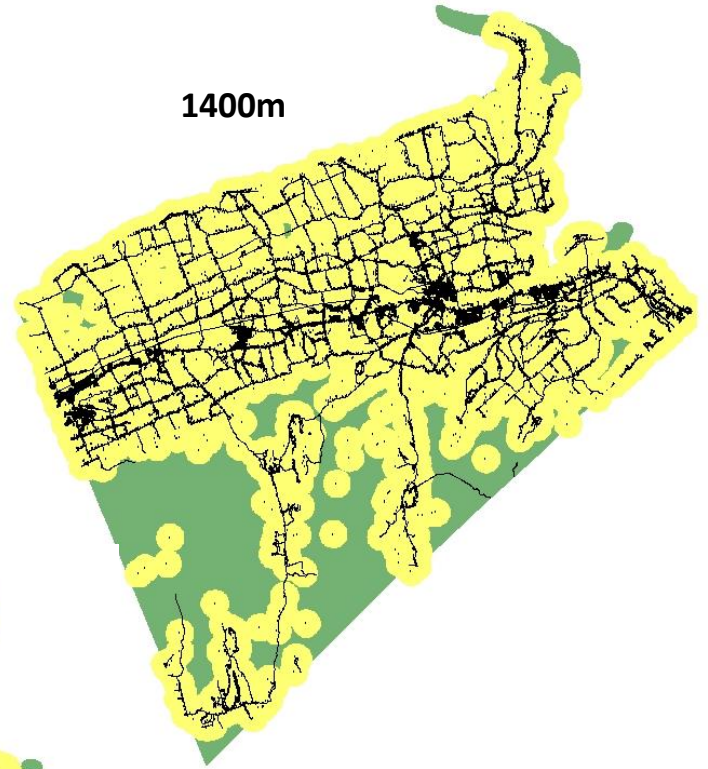
Regulated
Reserves

Accessible without violating regulations related to land-use or resource development

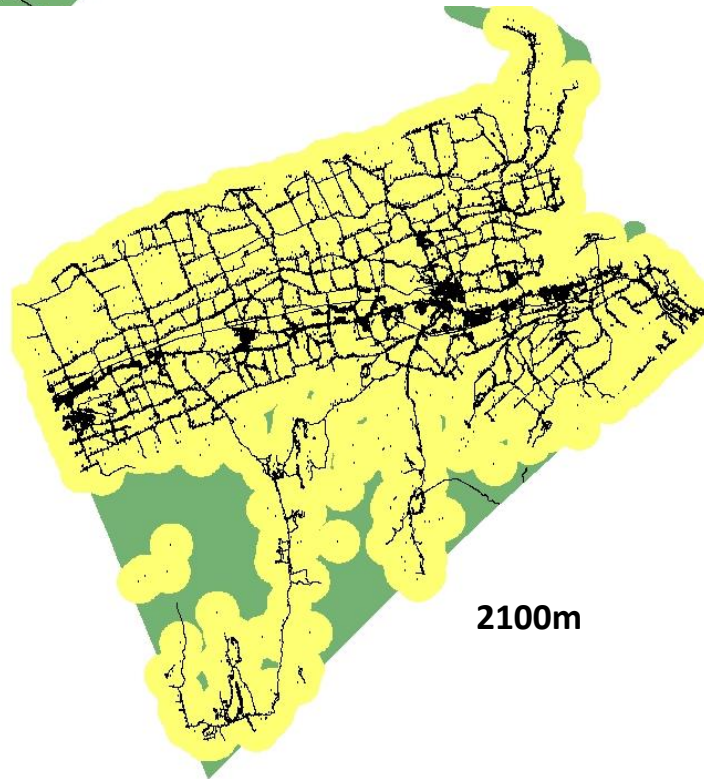
700m (Current Regulation)



1400m

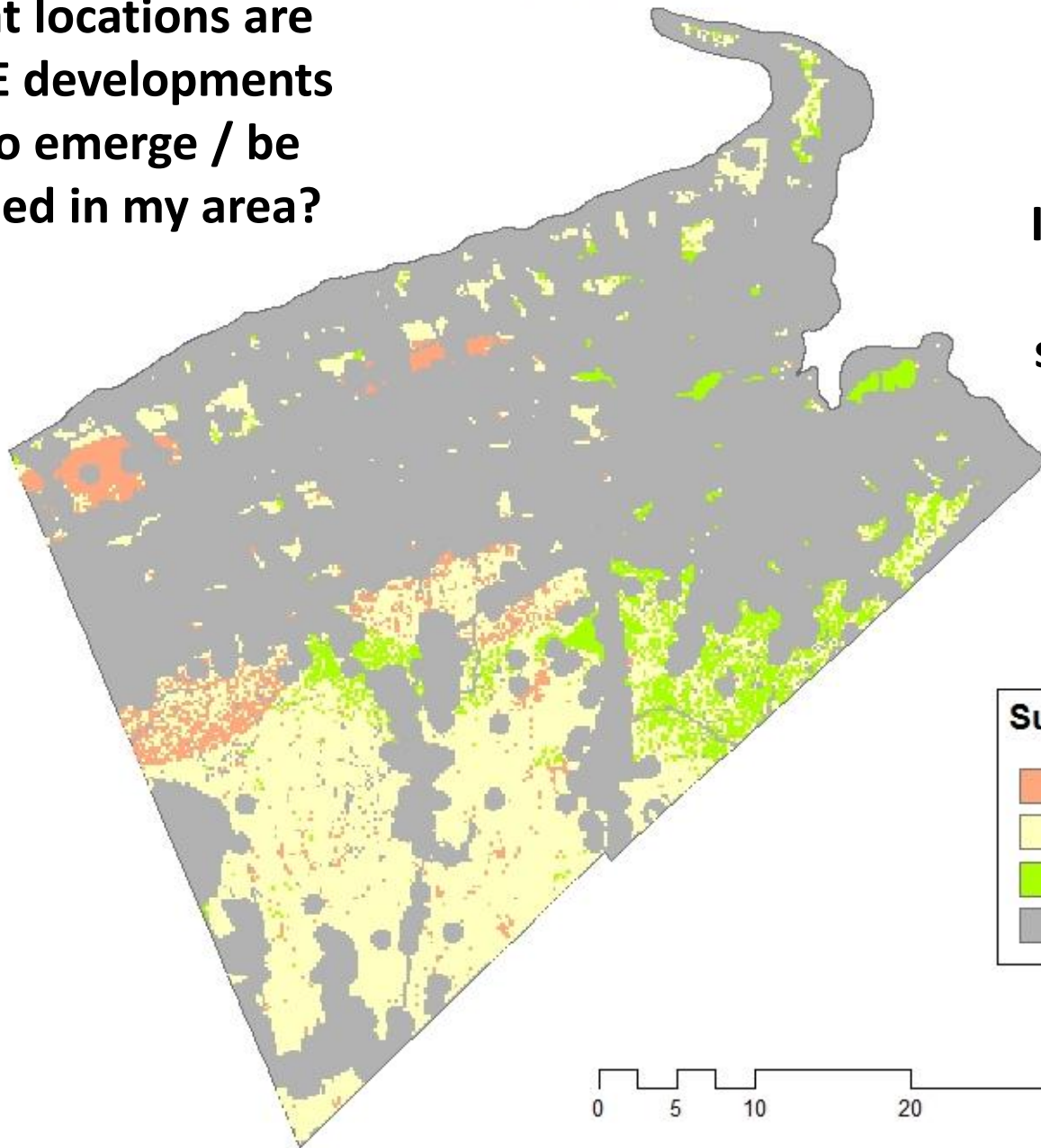


2100m

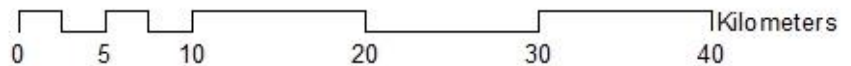


**How will more or
less aggressive
regulations
impact RE
development
opportunities?**

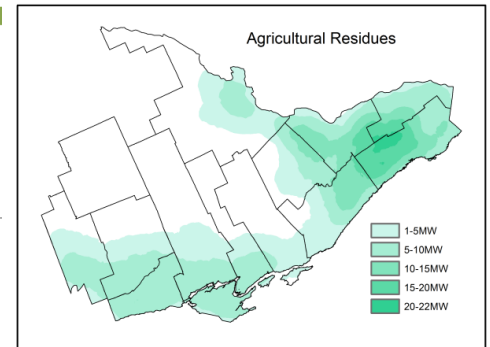
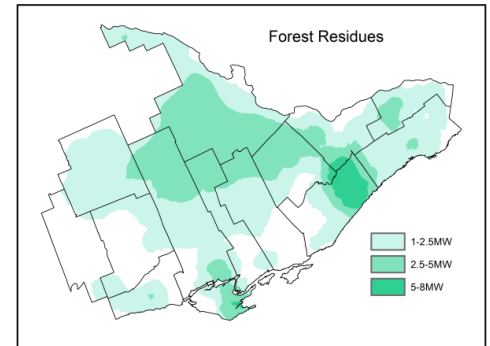
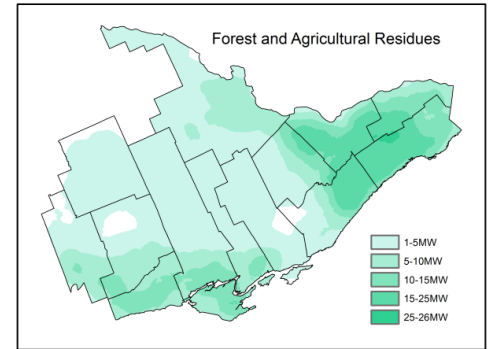
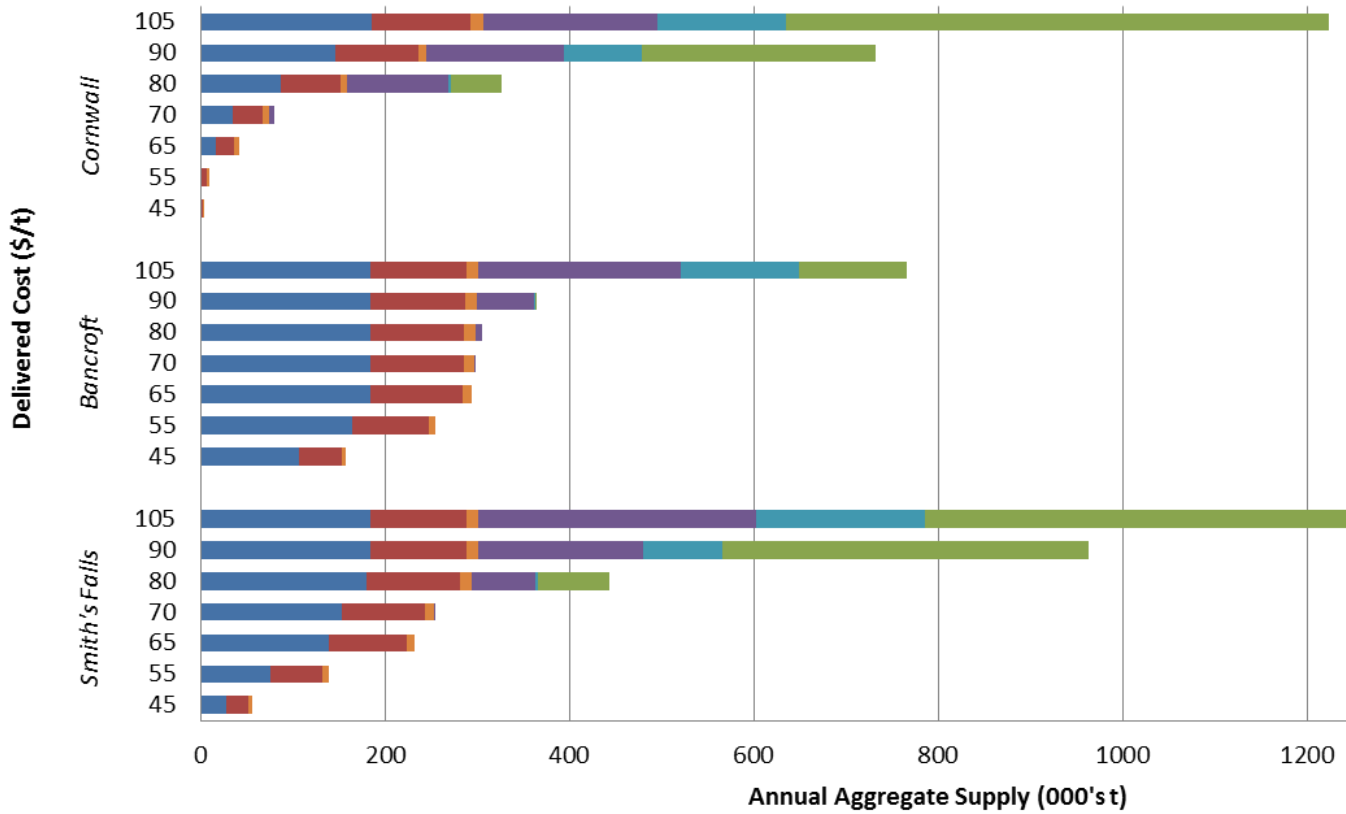
At what locations are new RE developments likely to emerge / be proposed in my area?



Is there sufficient suitable land to support our local RE targets?



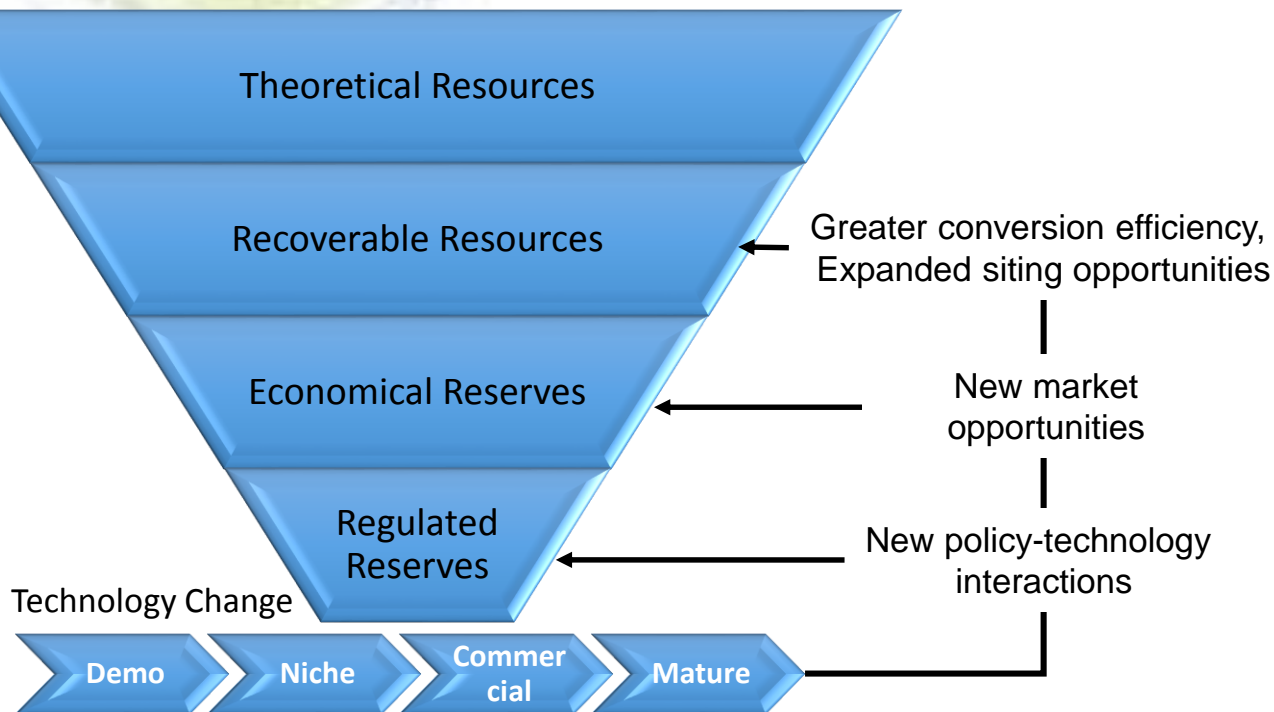
Mapping Renewable Energy 'Reserves'



■ Hardwood Residues
 ■ Softwood Residues
 ■ Unclassified Residues
 ■ Straw
 ■ Stover
 ■ Switchgrass

Mapping Renewable Energy 'Reserves'

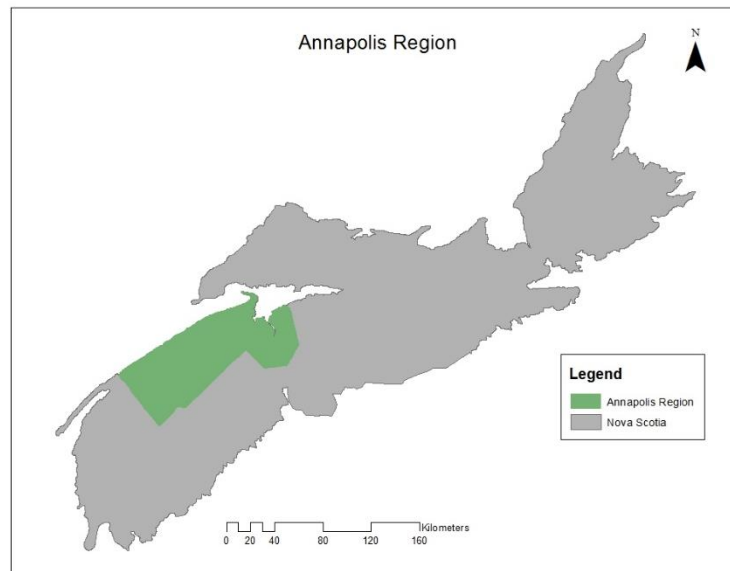
Area-based resource classification system



**How will
technological
innovation impact
RE development
opportunities?**

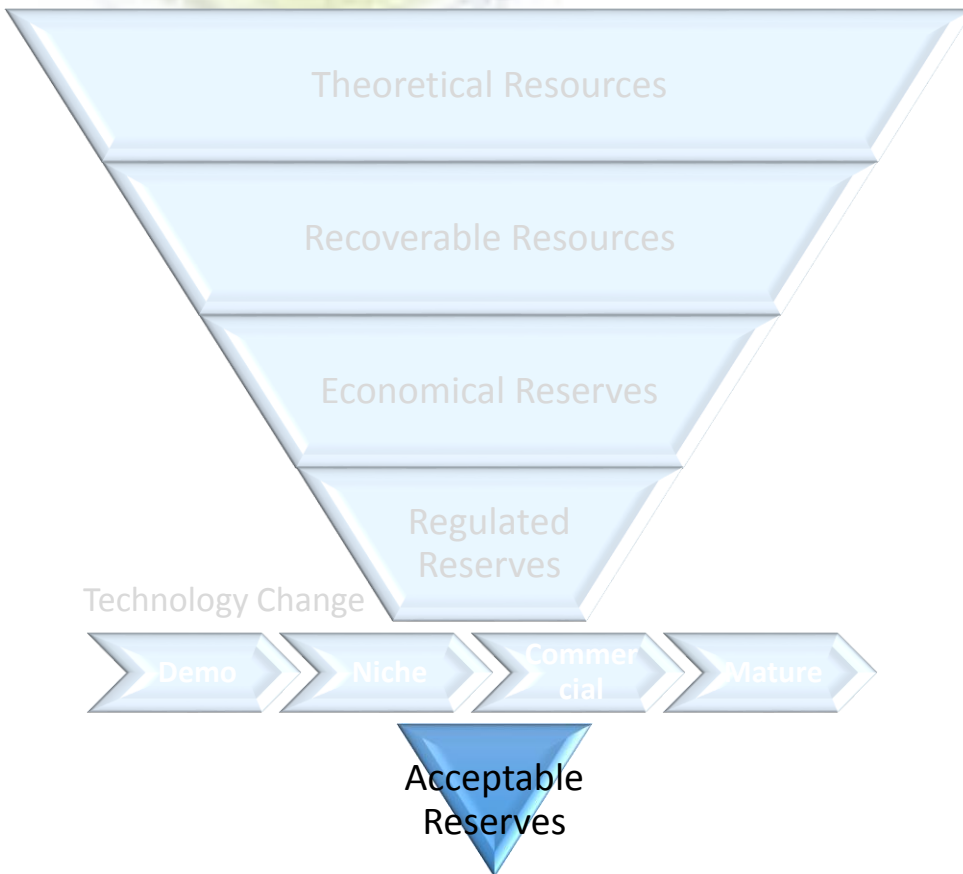
Participatory GIS for community engagement

Lead: Rebecca Jahns, MA Candidate
Department of Geography
University of Guelph



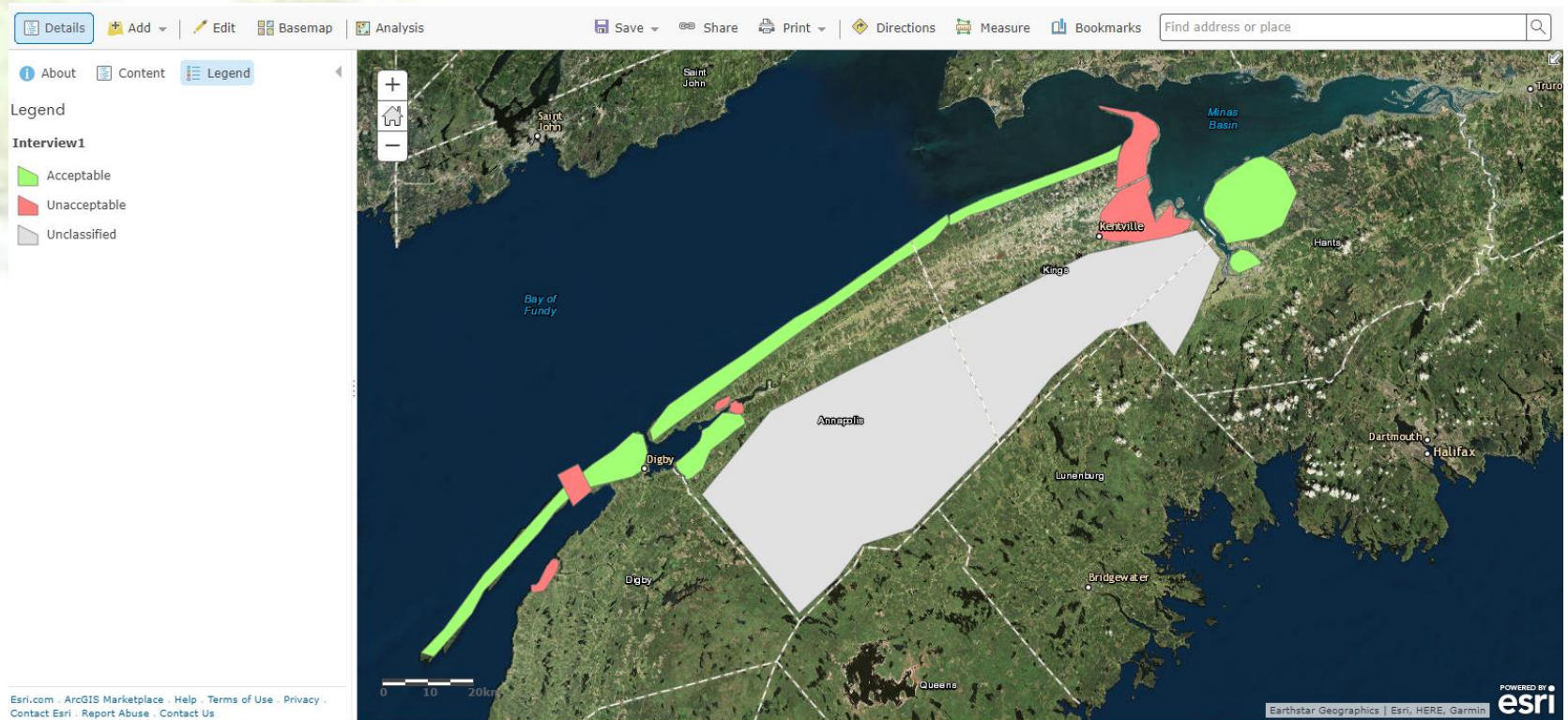
Engaging Communities on RE Development

Area-based resource classification system



Minimal social objections to development (e.g., impacts on wildlife, aesthetics etc.; land-use preferences)

Map-Elicited Interviews

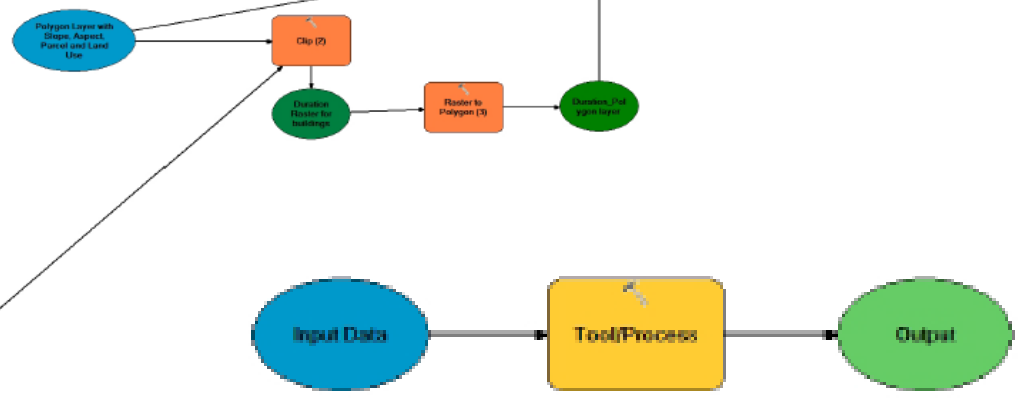
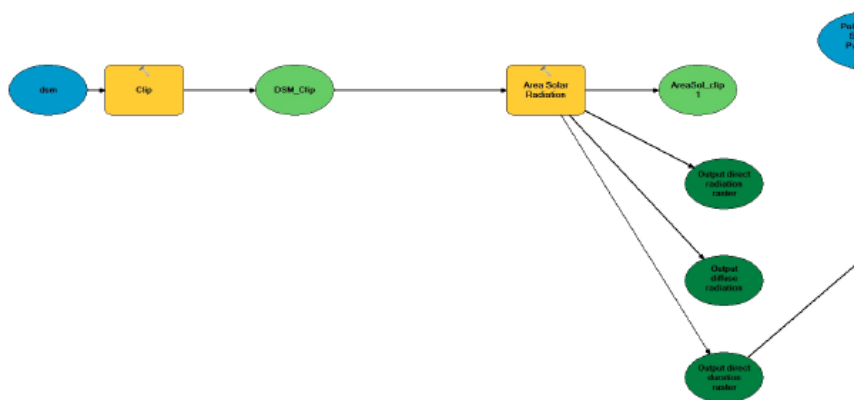
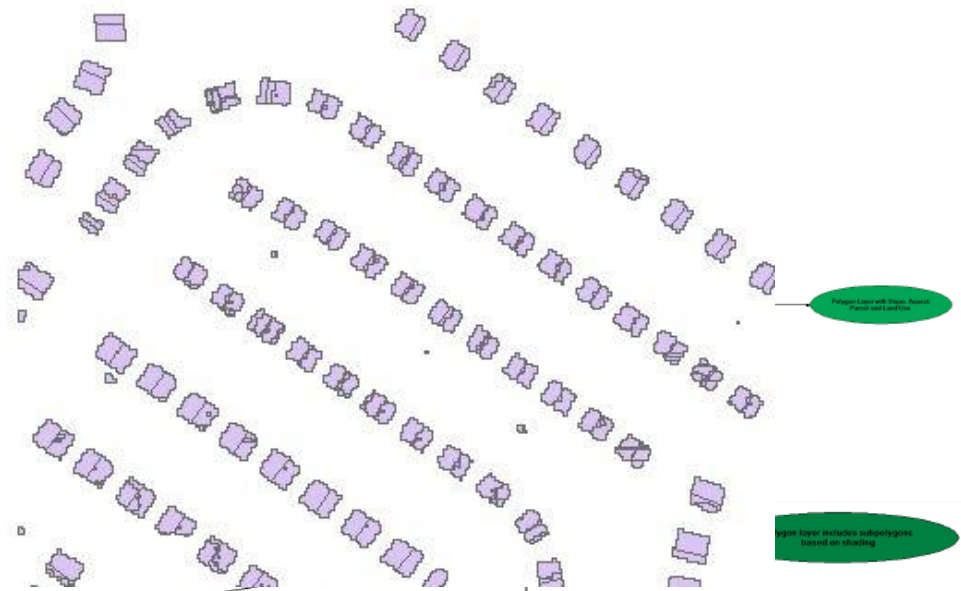
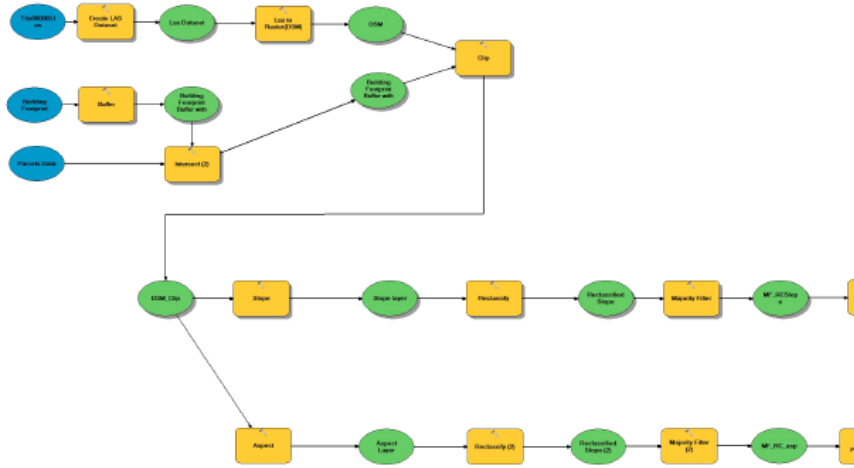


1. Please fill out areas on the map which you would consider to be completely unacceptable for wind farm development.
 - a. When you were filling out the map, which factors did you consider when drawing the 'unacceptable' locations?
 - b. Can you elaborate on why these factors matter to you?
 - c. Are there any conditions that would cause you to change this to an acceptable location?

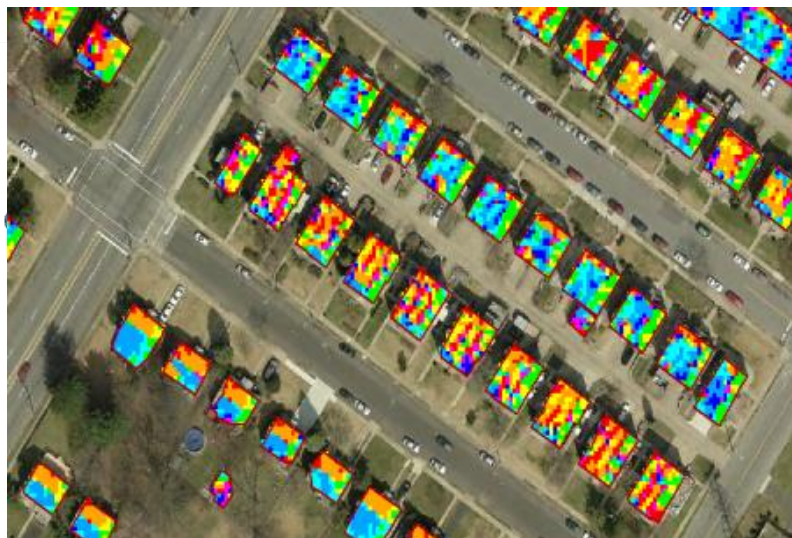
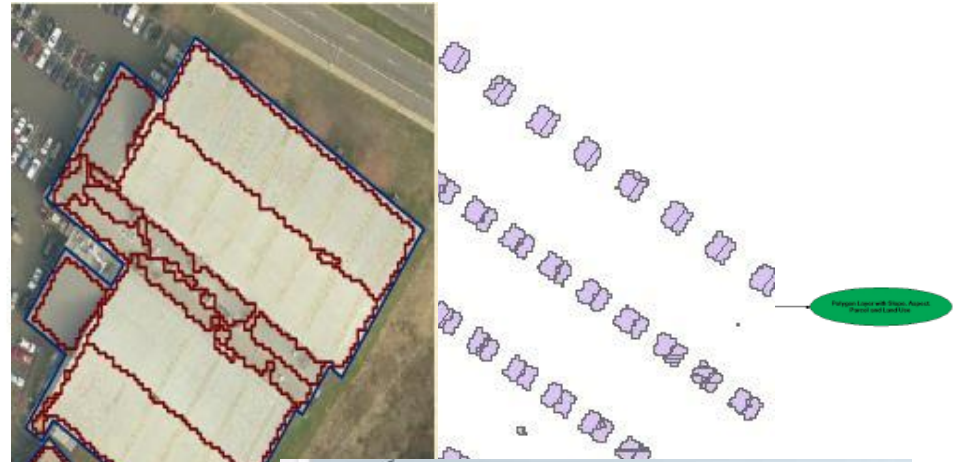
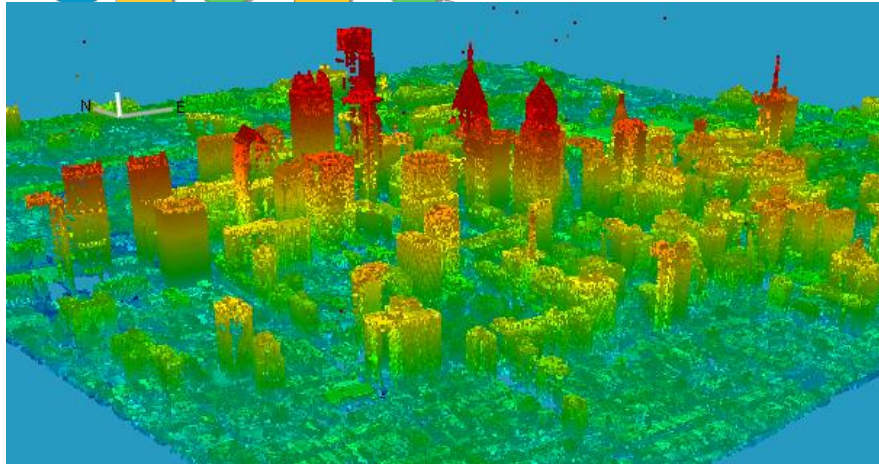


Rooftop PV mapping systems

Rooftop Solar Mapping



Rooftop Solar Mapping



Identify from: <Top-most layer>

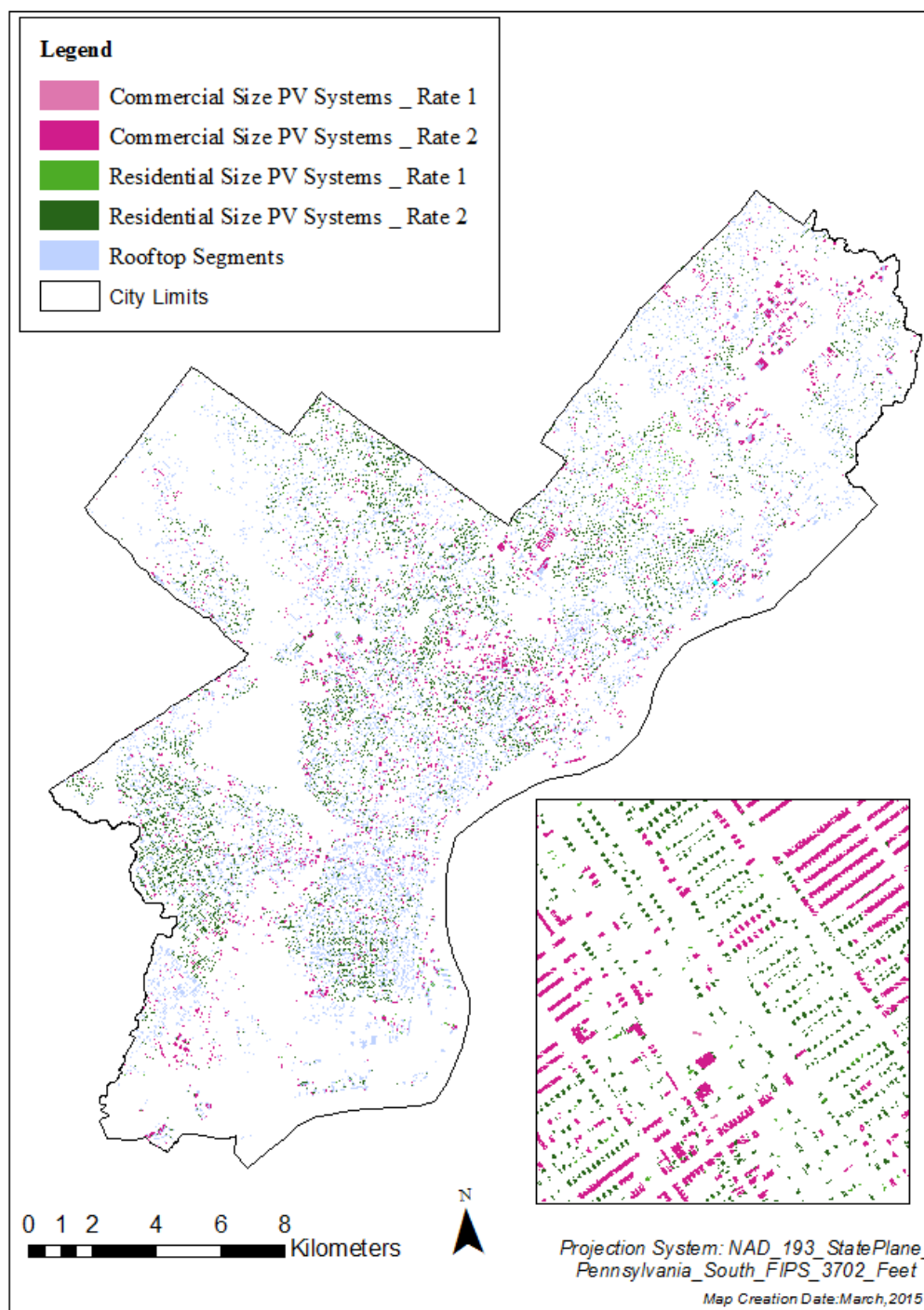
0195

Location: 2,730,509.055 295,529.406 Unknown U

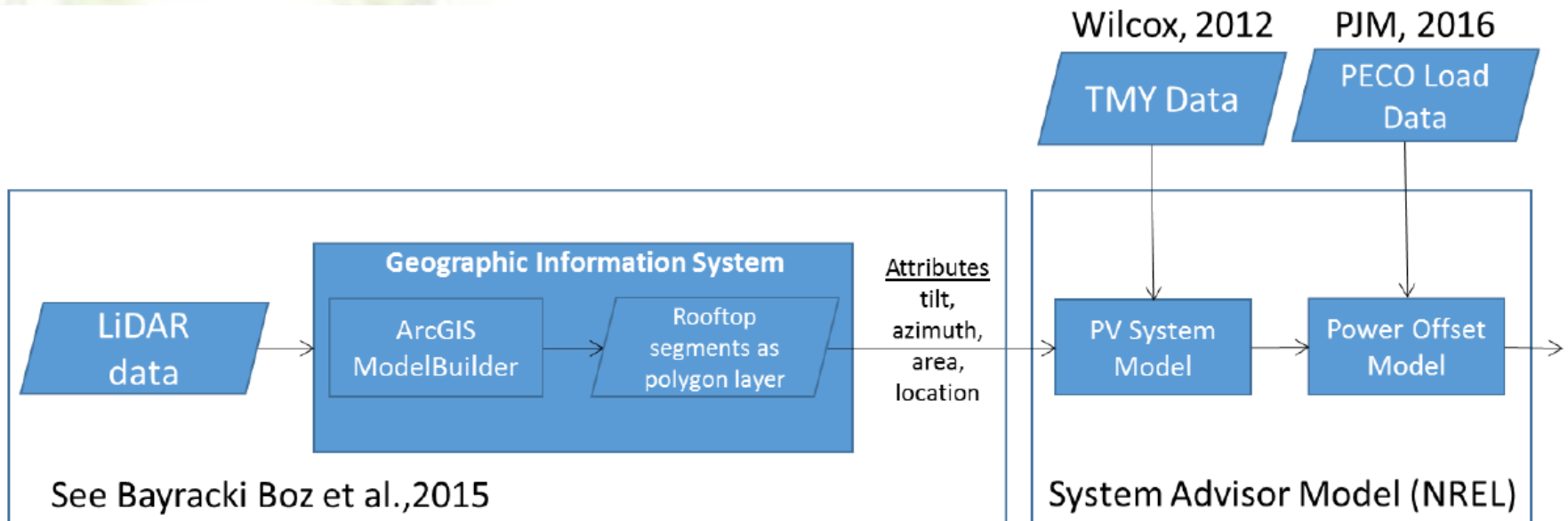
Field	Value
FID	700
Shading	1
Aspect	180
Slope	5
PARCEL	0195
C_DIG1DESC	Residential
POLY_AREA	6205.44

Rooftop Solar IV

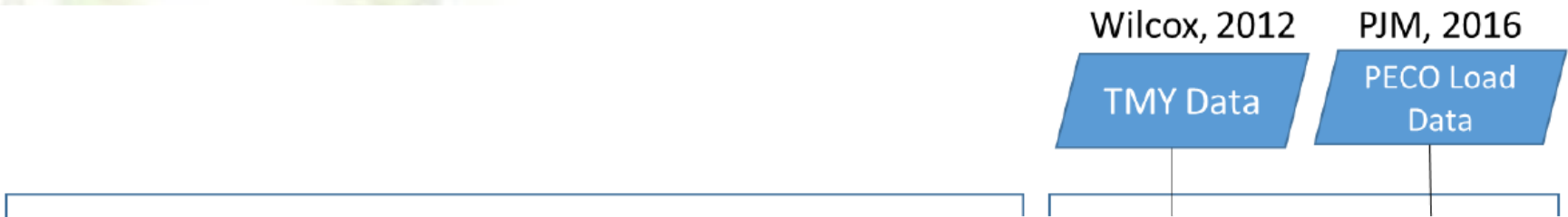
How much solar PV can we realistically expect to see installed in our city? Is it sufficient to meet demands? Which neighborhoods are most attractive?



Rooftop Solar Mapping



Rooftop Solar Mapping



See Bayracki Boz et al., 2015

How will rooftop PV impact power flows in my service area?

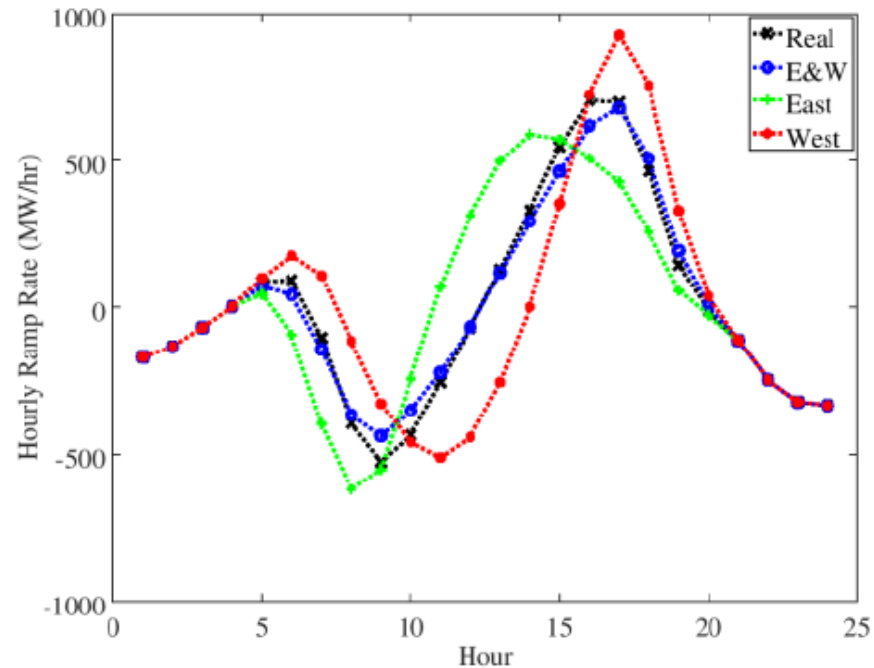


Fig. 4: Average daily ramp rates for each of the solar strategies.



Thank you!
Questions?

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