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Data Issues, Promising Practices and Key Methods from CanmetENERGY Integrated Community Energy Mapping Research

Presentation to the Open Geospatial Consortium Energy and Utilities
Summit: *"Harnessing the Power of Geospatial information for Smart
Energy Communities and Utilities"*

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Overview

- CanmetENERGY Ottawa energy mapping research 2006-12
- Integrated Community Energy Mapping (ICEM)
- Key methods
- Data Issues and Promising Practices for ICEM
- Selected outputs
- Current context



CanmetENERGY Supported ICEM Research

- Urban Archetypes Project, 2006-08
 - Objective: Characterize energy and emissions in the built environment
- Spatial Energy Carbon and Cost Characterization Model (SCEC³), 2008 – 12
 - Objective: Develop and demonstrate a map-based model of the building stock in support of municipal energy and emissions plan
- Tract and Neighbourhood Data Modelling (TaNDM), 2010-12
 - Objective: Improve energy and emissions inventory method for buildings
- Integrated Energy Mapping for Ontario Communities (IEMOC), 2010-11
- Strait-Highlands Energy Asset Mapping, 2010-11
- The Value of Energy Mapping Symposium, 2009
- Putting Energy and Emissions on the Map – workshop package

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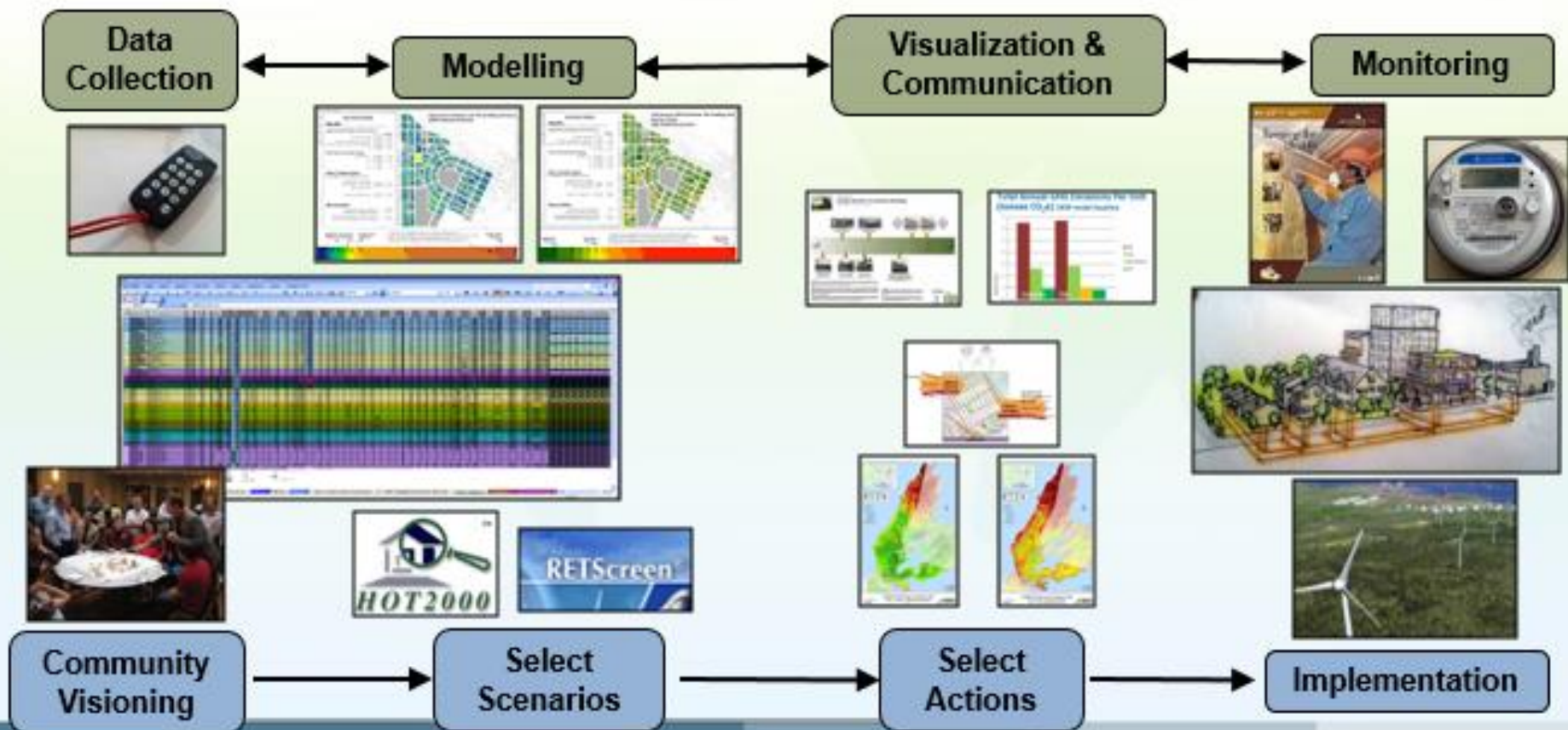


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Integrated Community Energy Mapping



Key Method: Requirements Gathering Workshop



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Key Method: Document Data Needs

BC Assessment Attribute	Use for Data
Actual Use Code	Identification of building type for most situations.
Manual Class Code	Supplemental identification of building type where actual use code is not sufficient. Mostly for residential and education facilities.
Number of Storeys	To assist with building characterization in creating archetypes.
Year Built	To identify age of building, which may influence energy consumption.
Effective Year	To refine age of building.
Number of Suites	For residential, to determine consumption per suite.
Total Floor Area	To determine indicator of energy consumption per m ² .
Building Finished Area (Residential Measure)	To determine indicator of energy consumption per m ² for residential buildings with basements.
Jurisdiction	Location identifier for cross referencing with other data sources and for mapping.
Roll number	Location identifier for cross referencing with other data sources and for mapping.
Parcel ID	Location identifier for cross referencing with other data sources and for mapping.
Civic address	Location identifier for cross referencing with other data sources and for mapping.

Key Method: Standard Building Categories

- Cross-walk table aligning building categories from a general to detailed level, as maintained by utilities, governments, property assessment corporations etc..

Sector	Major Categories	Sub Categories
Residential	Single family	Single detached
	Multi-family	Single attached - duplex, row, townhouse
		Low-rise apartment
		Hi-rise apartment
		Other residential
Commercial/Institutional	Office	Office - large
		Office - medium
		Office - small
	Healthcare	Hospital
		Care facilities
	Education	Elementary school
		Secondary school
		University/college
	Retail	Shopping centre
		Retail strip
		Big box
		Retail - other
		Food-retail
	Accommodation	Hotel
		Medium hotel/motel
		Accommodation - other
	Restaurant/Pub	Restaurant/Pub
		Fast food

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Key Method: Standard Building Information Report

- Authoritative dataset of building attribute information, vetted for energy modelling, consistency, privacy
- In TaNDM, report was produced by BC Assessment

Attribute grouping	Attribute
Locational	Area/Jur/Roll
	PID
	Civic address
	Legal description
Use	Actual Use Code
	Building Type
	Manual Class
	Occupancy
	Unit of measure
Floor Area	Total Area
	Foundation Area
	Number of Units
	Strata Unit Area
	Gross Building Area (GBA)
	Gross Leasable Area (GLA)
	Net Leasable Area (NLA)

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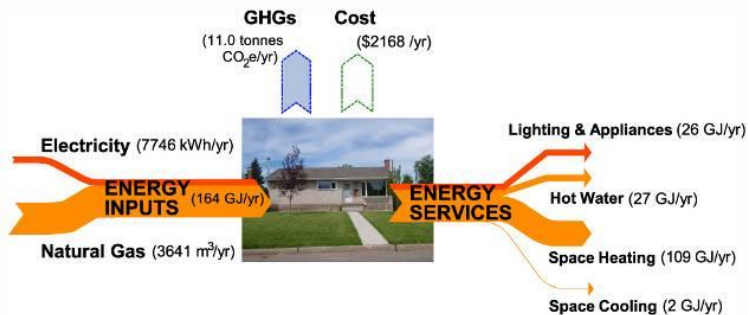
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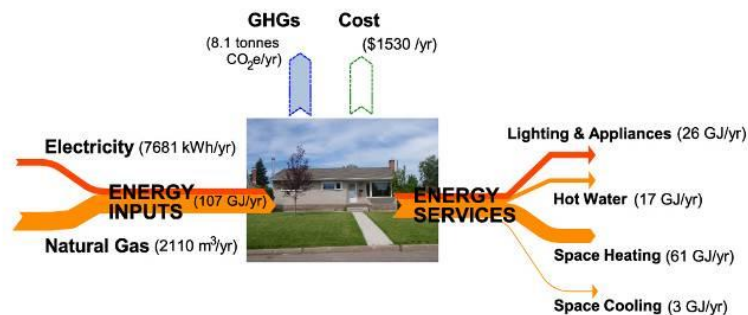
Key Method: Building Energy Modelling

- Modelled housing and building archetypes for future energy, GHG, cost scenarios
- CanmetENERGY platforms: HTAP, BTAP
- Other common tools: Hot2000, EnergyPlus



Single Family Dwelling 1 Base Case

Prince George, BC



SFD1 Retrofit - Furnace, DHW & closed chimney upgrade

Prince George, BC

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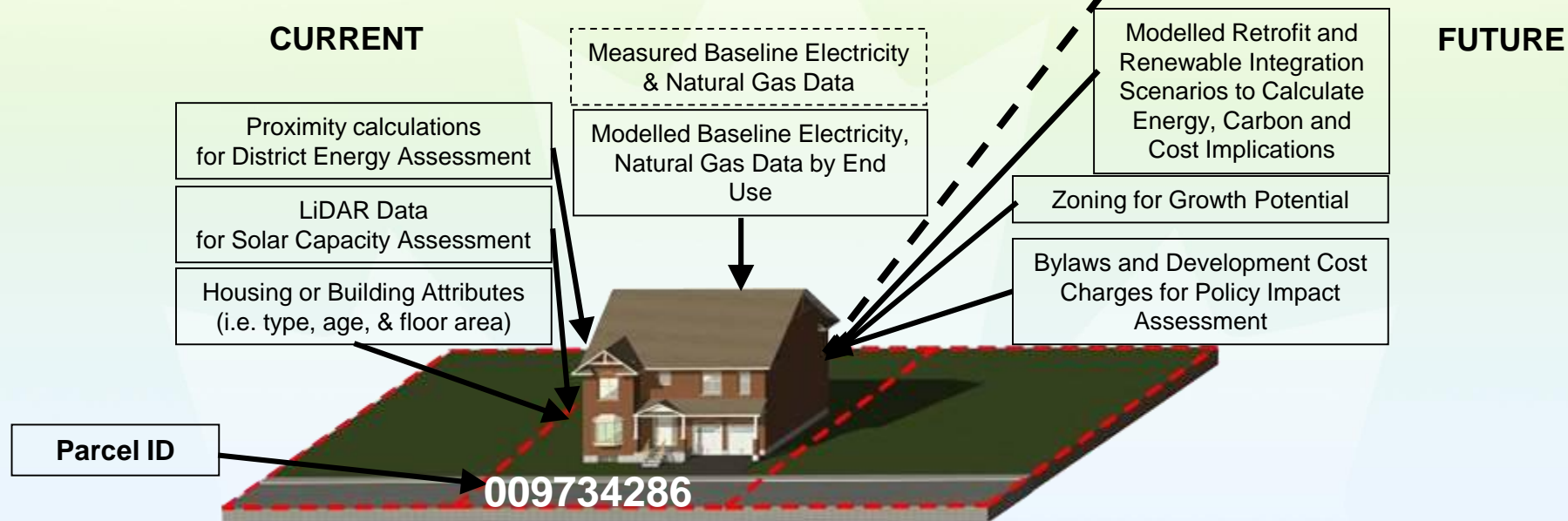
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Key Method: Parcel Data method

A flexible decision support approach.



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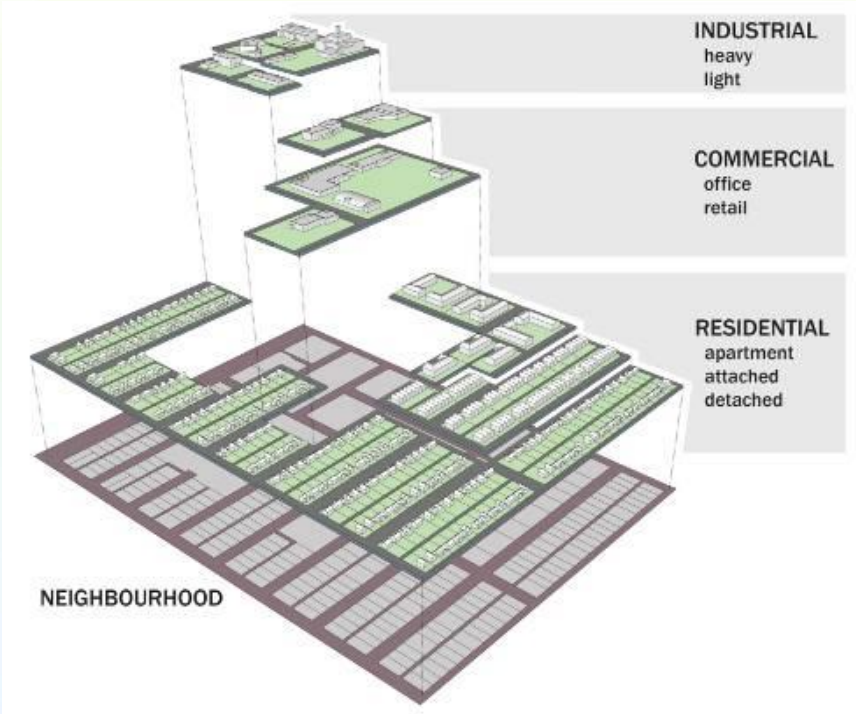
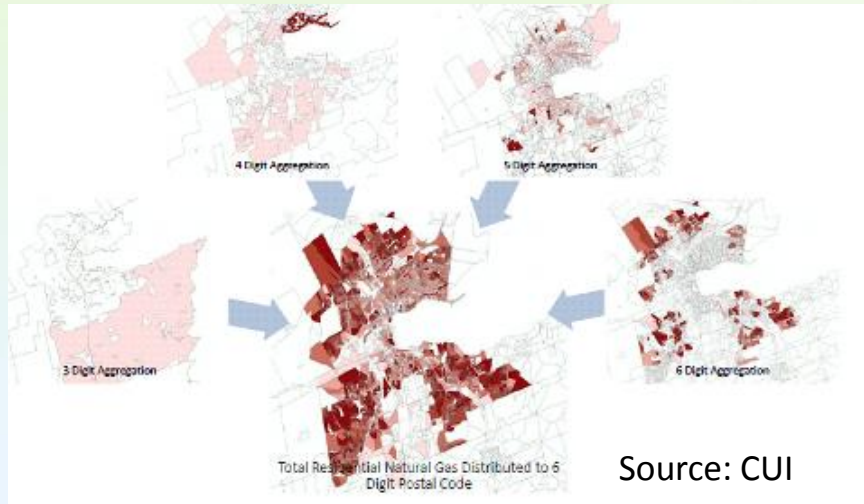
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Key Method: Aggregate Data by Building Category

Utility data aggregation by postal codes causes errors in energy inventories



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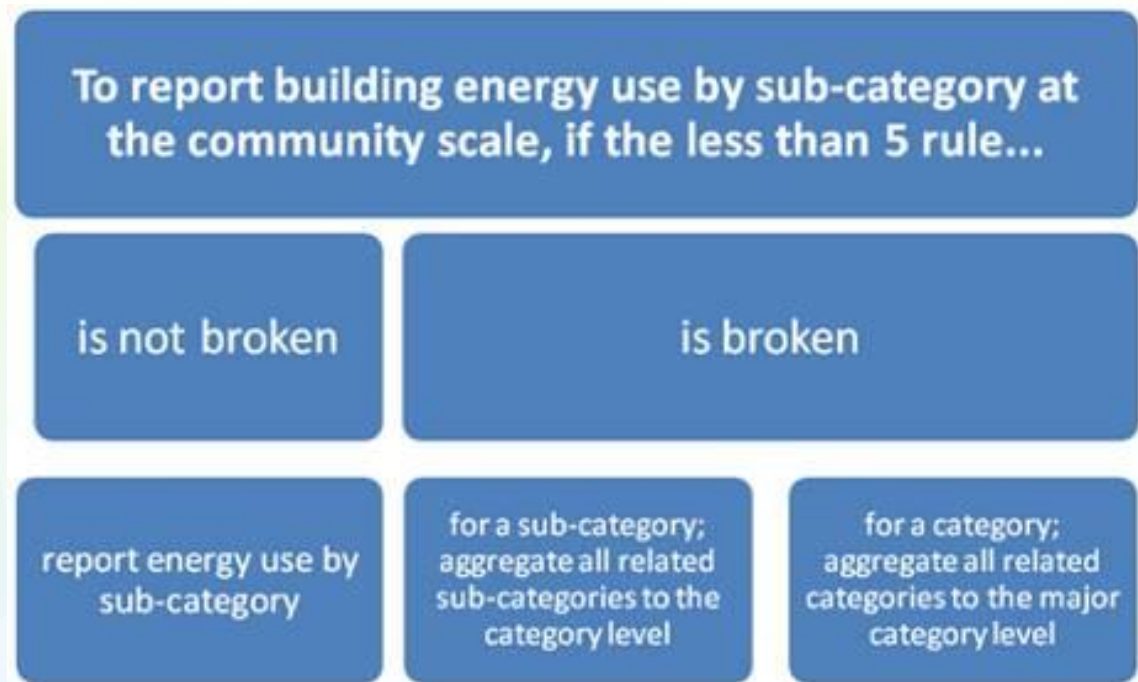


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Key Method: Aggregate to Level of geography & privacy threshold



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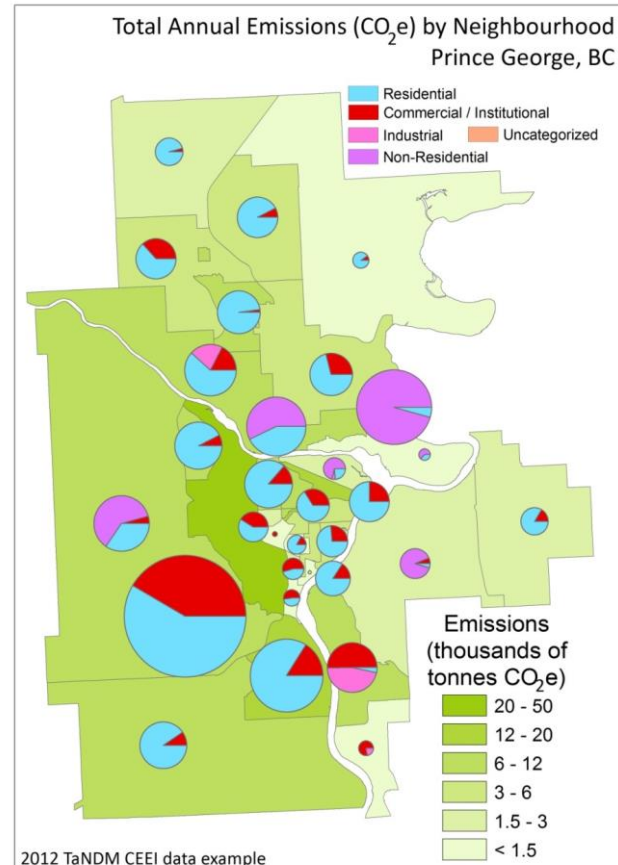
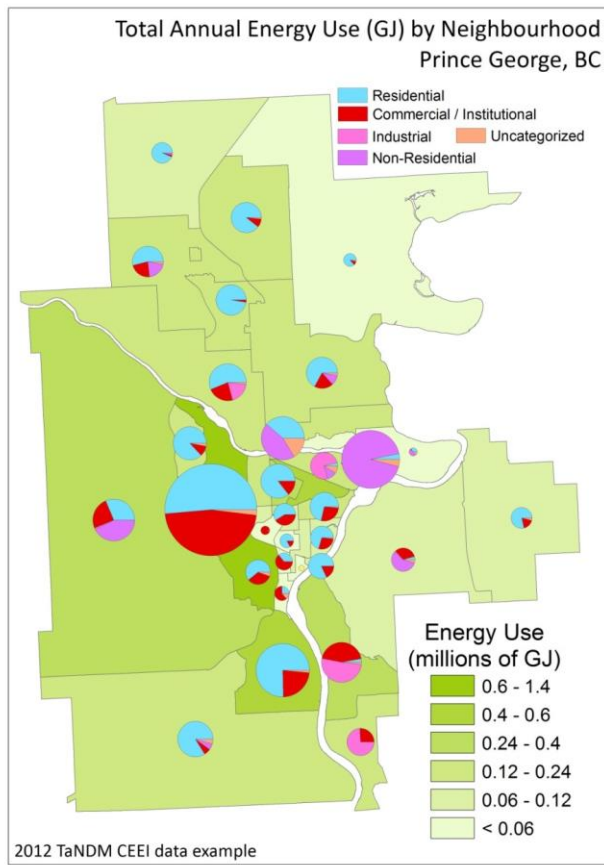
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Sample outputs: TaNDM

- Community Energy and Emissions Inventory (CEEI) report for Prince George, BC using the TaNDM method



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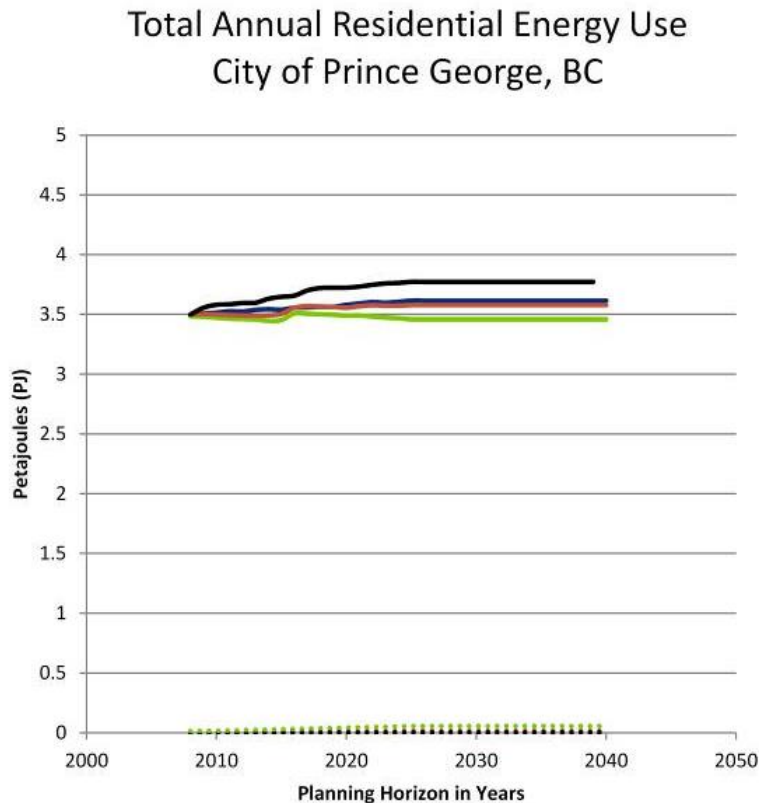
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Sample output: SCEC³

- The gap to net zero energy in Prince George, BC
- Slow growth community



Source: NRCan, Vive le Monde Mapping; results derived from the Spatial Community Energy Carbon and Cost Characterization Model (SCEC³).

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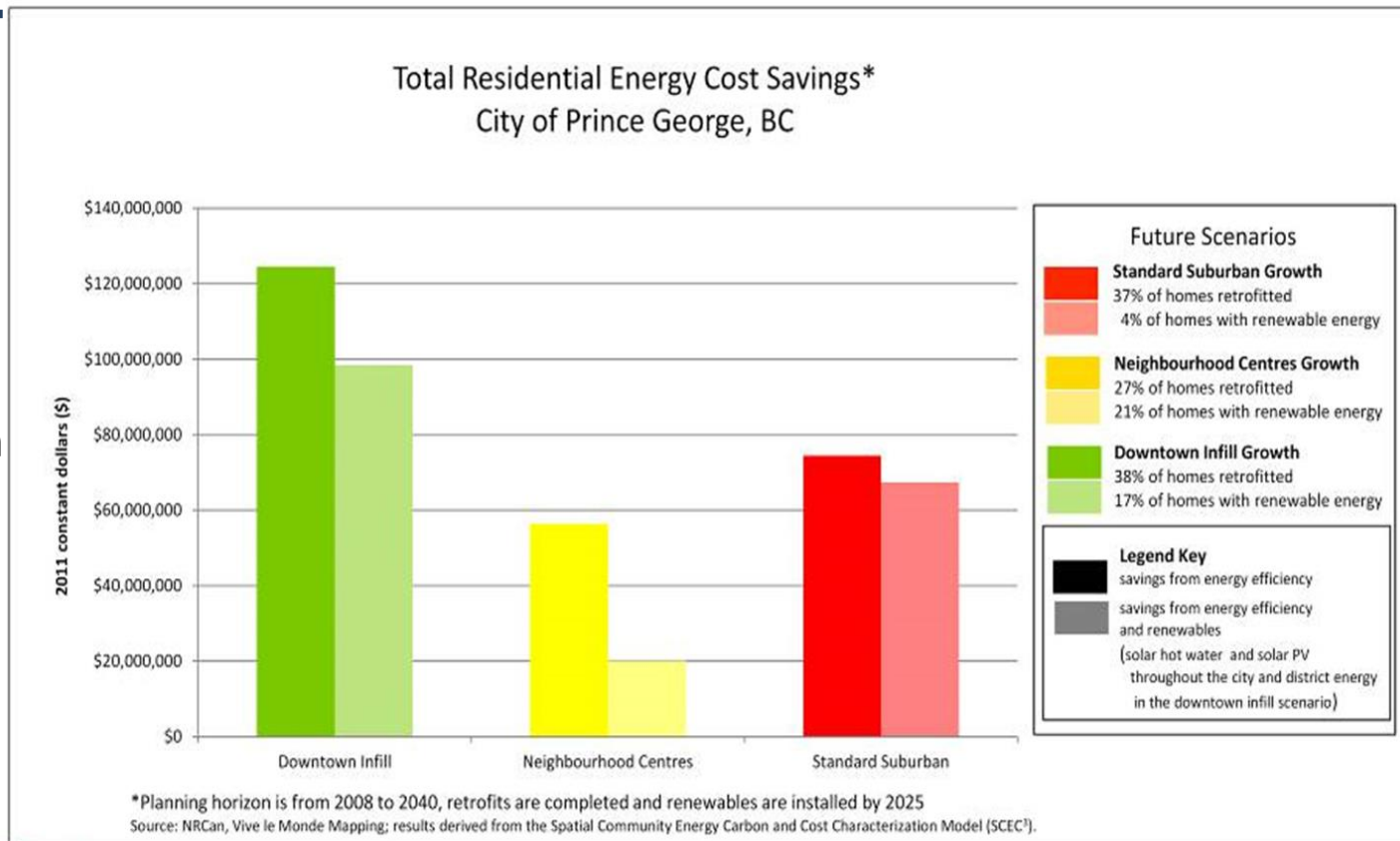
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Sample output: SCEC³

- A surprising finding was that the economic opportunity may be more of a driver than energy or environmental objectives



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Data Issues and Promising Practices for ICEM

- Research paper developed based on review of three energy mapping projects: IEMOC, SCEC³ & TaNDM
- Identifies and analyzes key data issues observed across projects and proposes promising practices for their resolution
- Available online: <http://www.nrcan.gc.ca/energy/offices-labs/canmet/publications/19118>



Selected Data Issues and Promising Practices

Theme	Data Issue	Promising Practice
Access	<u>Users</u> : making ad hoc requests <u>Providers</u> : receiving ad hoc requests	Develop standard reports, align requests w/ business cycles
Collaboration	Improper assumptions made about datasets originally collected and maintained for other purposes	Engage a broad range of organizations and skill sets to address data issues
Consistency	Inconsistent building energy modelling methods	Use housing and building archetype models according to provincial or federal archetypes
Structure	Building types defined different by different organizations	Develop cross walk tables
Level of Geography	Obtaining utility data at the building level	Integrate data at the parcel level, aggregate by archetype

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Current Context

- Energy mapping research unfunded within NRCan
- Interest in future research collaborations
- CanmetENERGY Ottawa can share
 - Modelled energy data for Canadian housing and building archetypes
 - ICEM methods



Thank you! Questions?

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Source: UBC

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