



Metro Vancouver's modeling framework to support regional planning

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RTM user group meeting, November 10th, 2022

metrovancouver

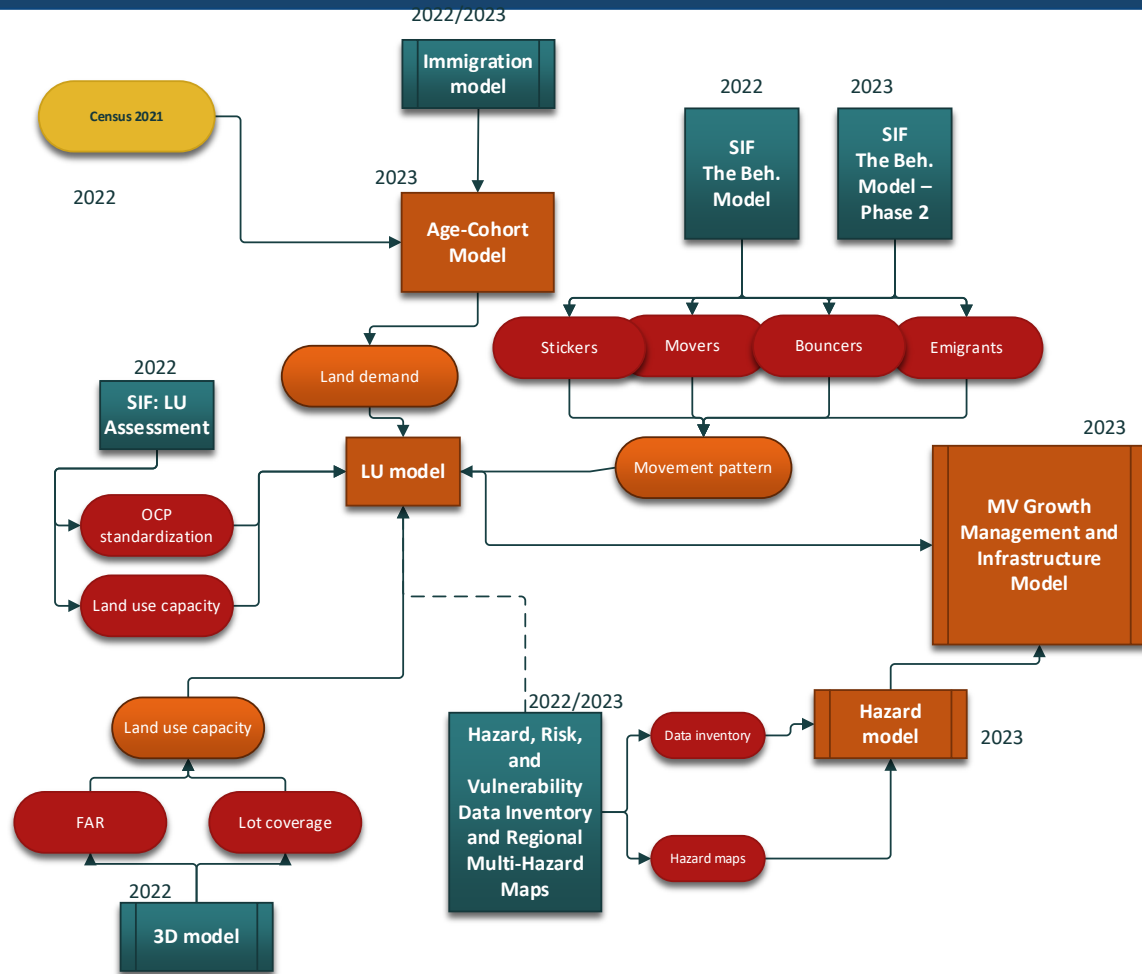
REGIONAL PLANNING/PLANNING ANALYTICS

Primary Roles

- Regional Growth Strategy, Metro 2050
- Population, dwelling unit, employment, and land use forecasting
- Land utilization monitoring and **modeling**

PLANNING ANALYTICS

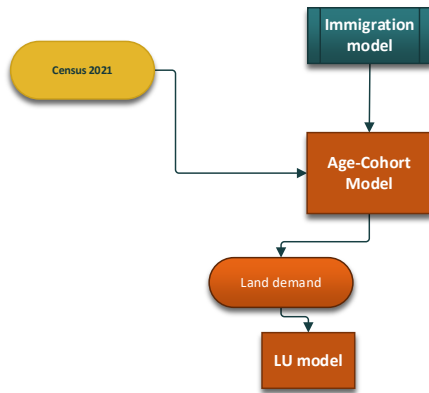
Modeling framework



AGE-COHORT MODEL

Conceptual diagram

Understanding of
data inputs,
workflow and
outputs



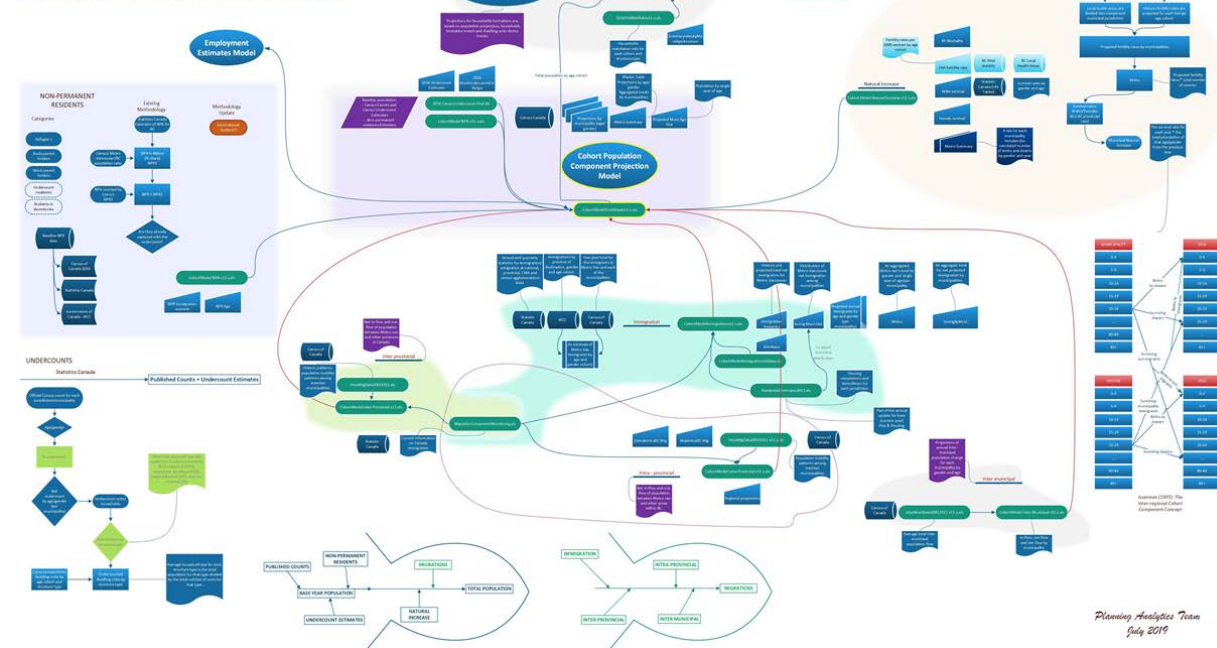
METRO VANCOUVER COHORT COMPONENT MODEL WITH MIGRATIONS

ASSUMPTIONS

- The 2011 Stats Can undercount estimate is 1.87% Metro used 0 to 2.0% and used at 2011 population levels to reflect this revision.
- The fertility rates are projected for each female age cohort and its assumed to stay constant within the next 10 years.
- Marital partner migration by age and gender cohorts are assumed constant for all municipalities.
- Immigrant flows into the province are projected to be a net of projected 20% (20% to 30% cohort) population in the year 2050. Projected Metro net flows assumes a continuing 0% net of projected population in the year 2050.
- Marital partner migration projections assume that 50% of all residents move to 5,000 to 6,000 per year over the next 10 years, with a declining number in subsequent years as marital migration projections assume to be a net of projected 20% (20% to 30% cohort) population in the year 2050.
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- The Urban Community Boundary (UCB) will be developed by the year 2050, 20% of residential growth will be in the urban community boundary.
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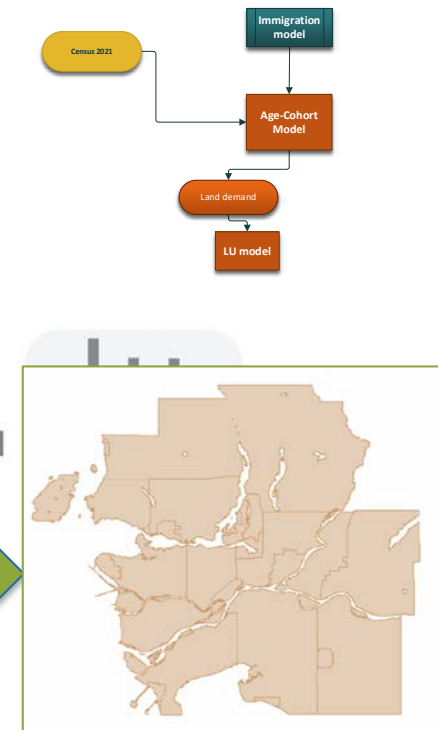
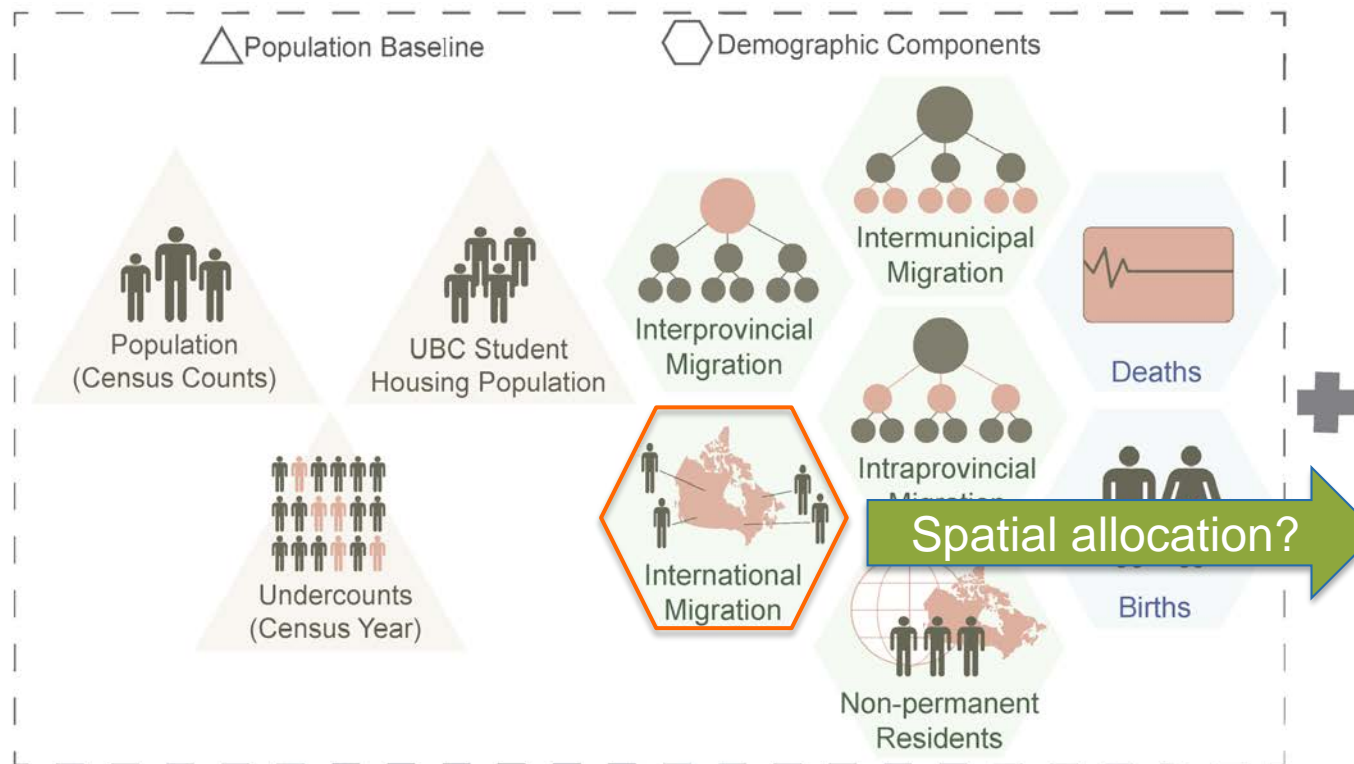
MODEL ASSUMPTIONS

- The survival rate is not a function of time, it is assumed to remain constant for the duration of the projected period.
- The population in age cohort is assumed to be homogeneous and individuals are assumed to have the same survival probabilities.



PROJECTIONS: COHORT COMPONENT MODEL

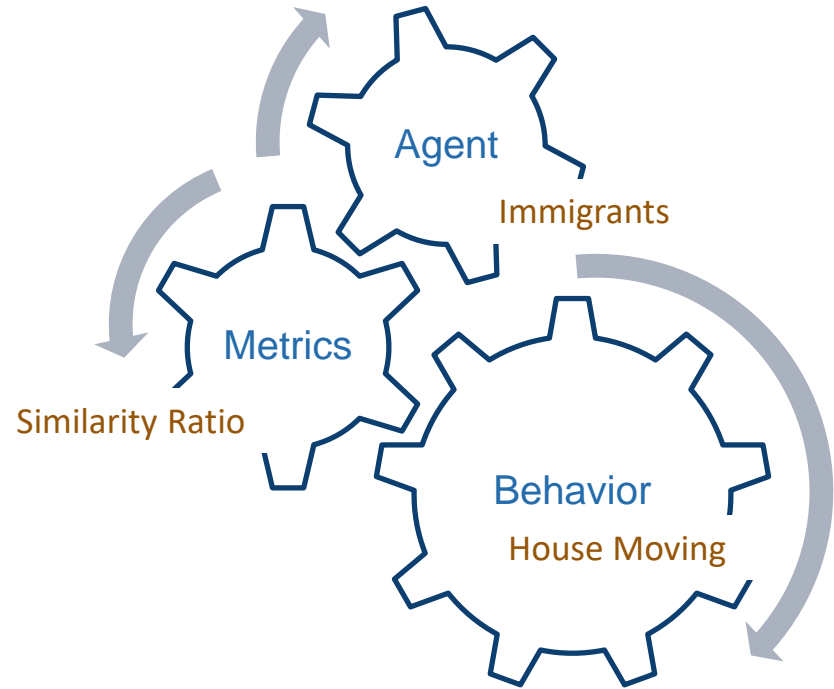
Vensim modeling platform



IMMIGRATION MODEL

Agent-based Model (ABM)

An agent-based model (ABM) simulates the decision-making process on where to live and reveals geospatial patterns of residential segregation.

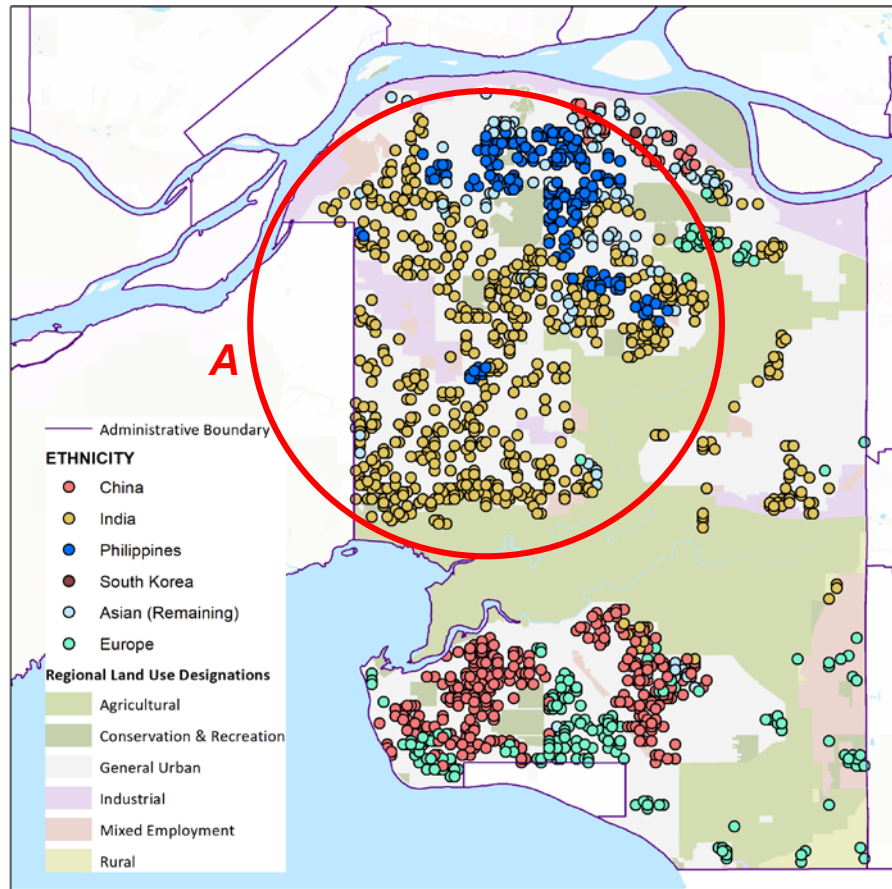


MODEL OUTPUTS

Results, City of Surrey

Indian immigrants:

- **40%** (Model results)
- **41%** (2016 Census, Recent immigrants from 2011 to 2016)

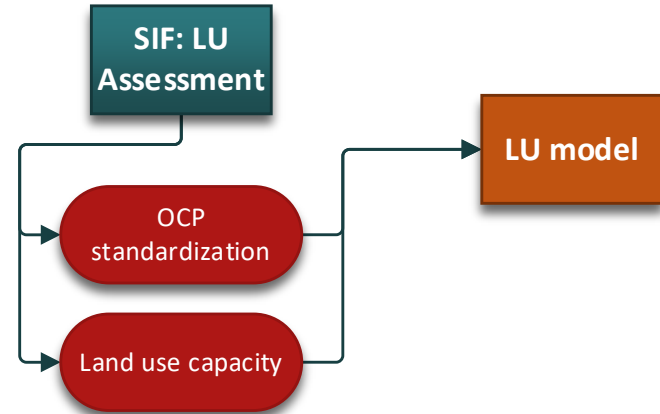


Source: Metro Vancouver Regional District

LAND USE ASSESSMENT

Task 1

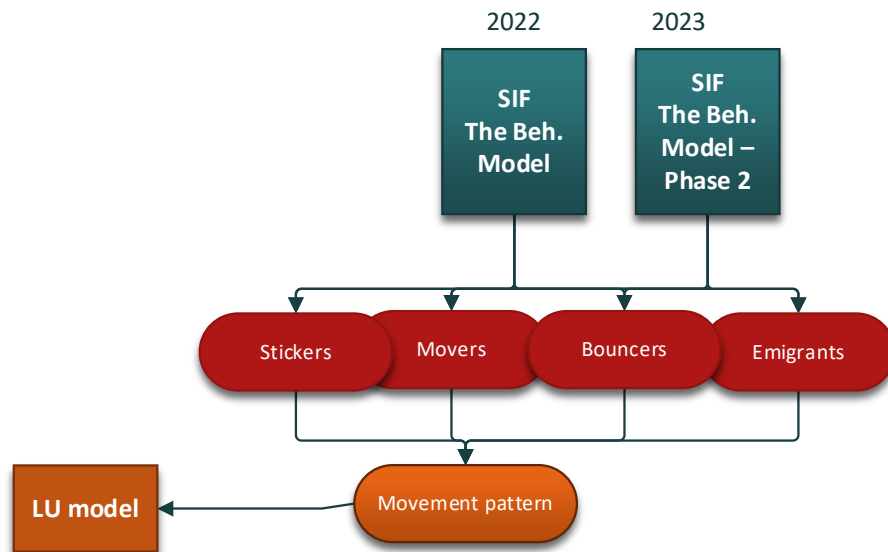
- Standardization of general land use classifications based on municipal OCP land use designations
- Calculation of the land use capacity as a result of existing and planned development capacity



MV HOUSING CHOICE RESEARCH – THE BEH. MODEL

Phase 1 and Phase 2

- Phase 1 explores historical movement patterns for residents and immigrants
- Phase 2 includes the survey about housing and NBH choices
- Sample: 3,000 residents and 1,500 recent immigrants



DEMOGRAPHIC VARIABLES

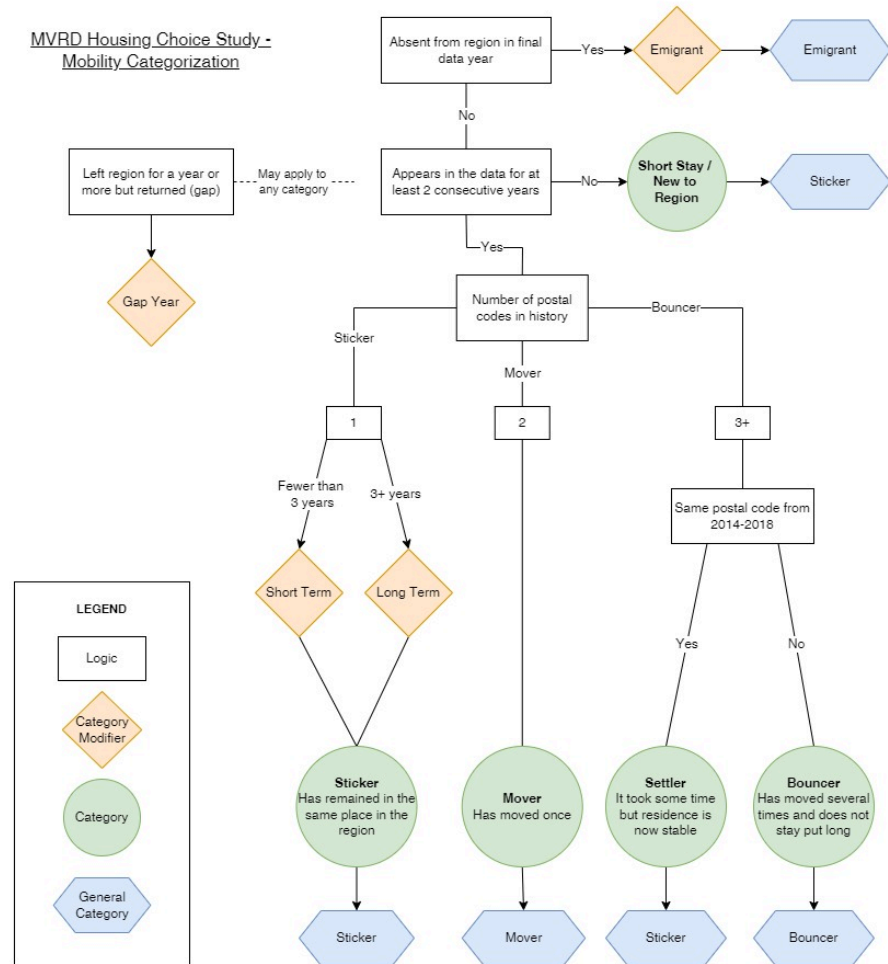
Generation group, household composition and family income

Demographic	Categories
Generation Group (Age)	Boomer or War Generation (1927-1962) Generation X (1963-1980) Millennial or Gen Z (1981-1998)
Household Composition	Kids (Family) No Kids
Family Income	\$0 - \$34,999 \$35,000 - \$59,999 \$60,000 - \$84,999 \$85,000 and over

MOBILITY CATEGORIZATION

STICKER – EMIGRANT – MOVER - BOUNCER

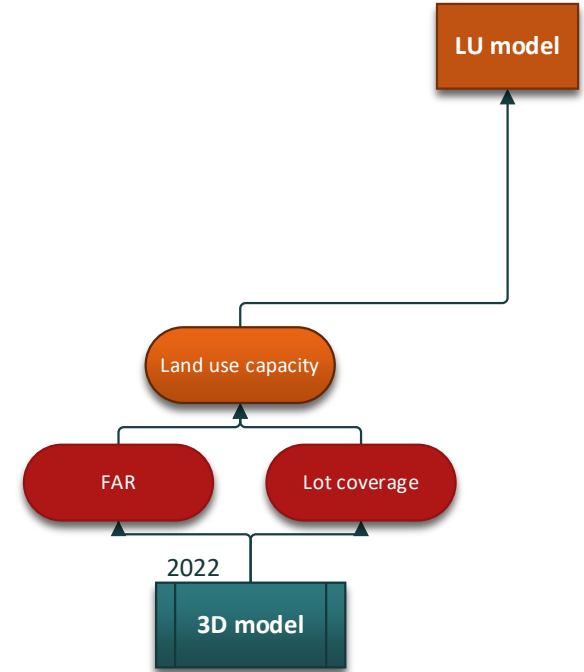
- **Sticker**
- **Emigrant**
- **Mover** Filer has moved to a different postal code within MVRD one time over the course of the data.
- **Bouncer** Filer has moved to a different postal code within MVRD two or more times.



METRO VANCOUVER 3D MODEL

VERTICAL REGION

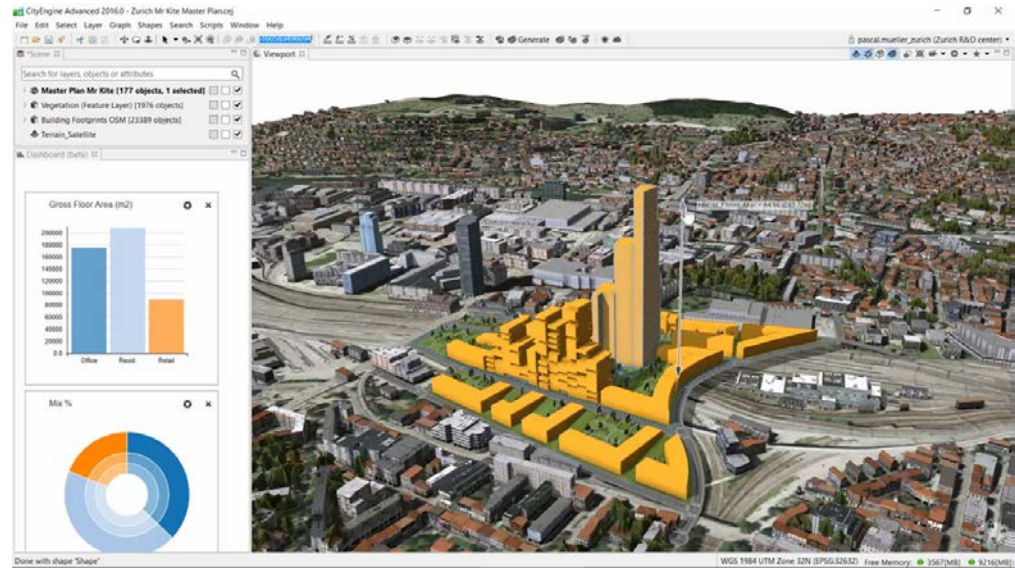
- The objective of the work is to develop the foundation for a 3D analysis and monitoring of how our region is becoming more “vertical” with the strong apartment development and skyscrapers in shaping regional urban form.



METRO VANCOUVER 3D MODEL

VERTICAL REGION

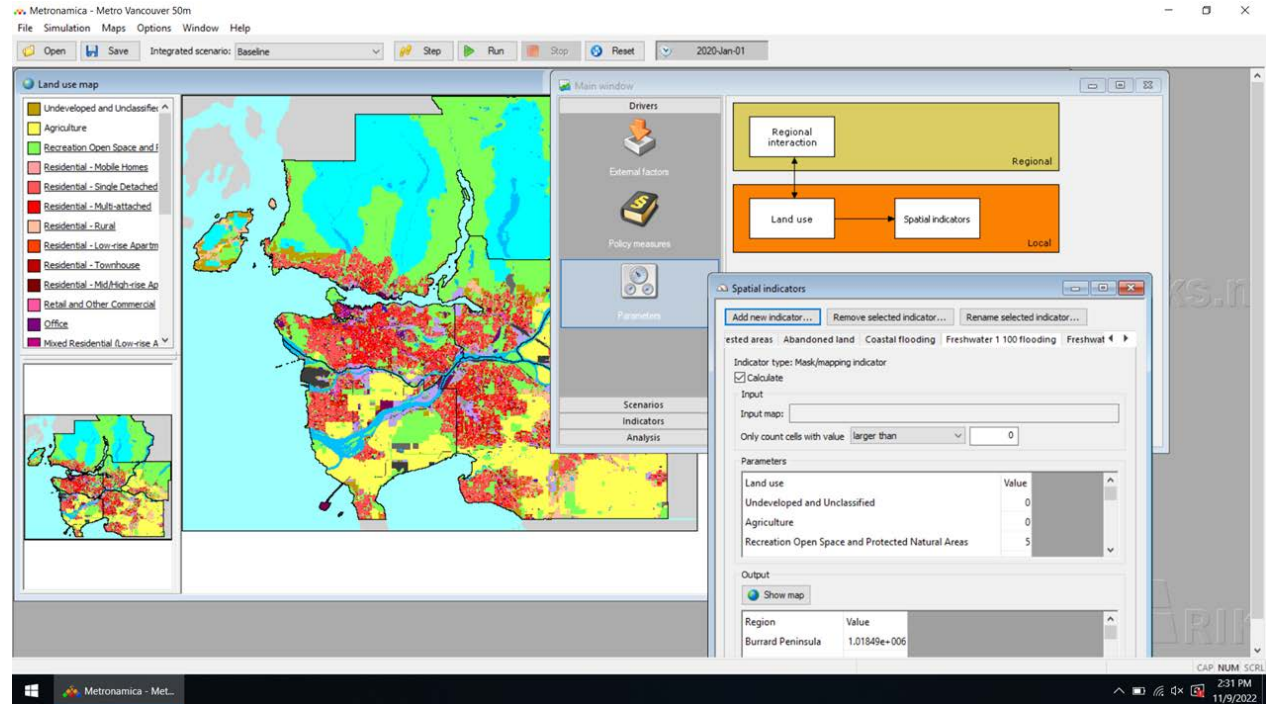
- The model will be based on BC Assessment data, Metro Vancouver parcel-based land use map, and LiDAR data
- The analysis will include changes in building heights in urban centres and FTDA's, changes in FAR, and lot area coverage.



Source: ESRI

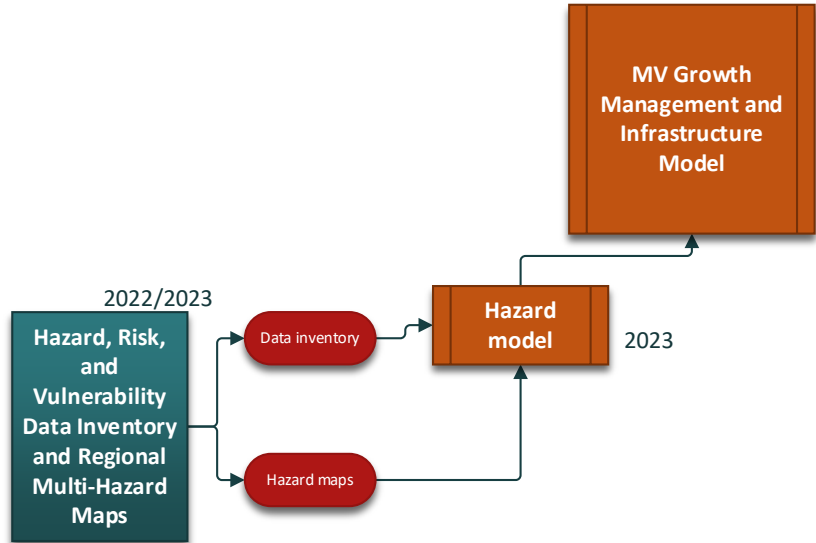
METRO VANCOUVER HAZARD MODEL

Some hazard data
(flood scenarios) are
already incorporated
into the model.



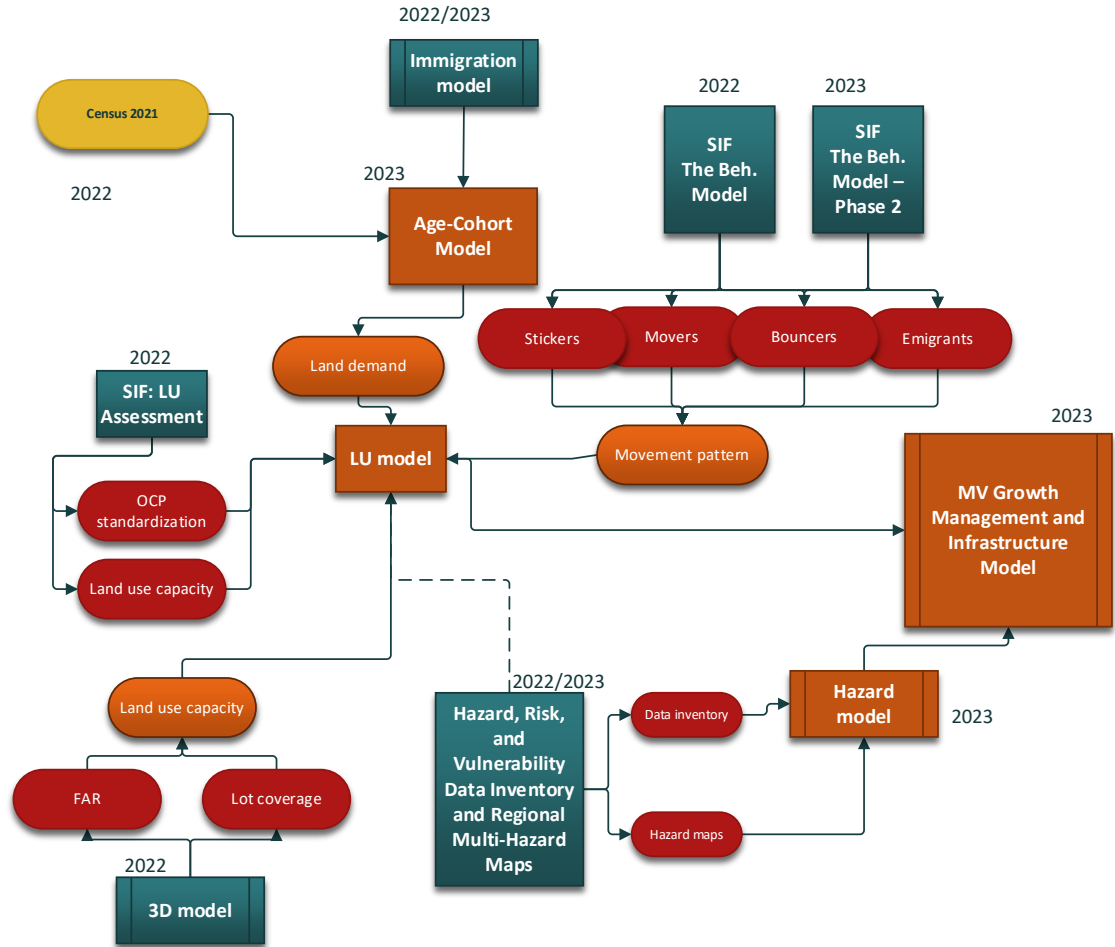
METRO VANCOUVER HAZARD MODEL

- We initiated new project “Hazard, risk, and vulnerability data inventory” and this project will inform our Hazard model that will be developed in 2023.

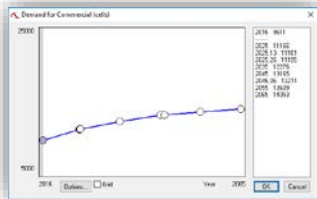


LAND USE MODEL

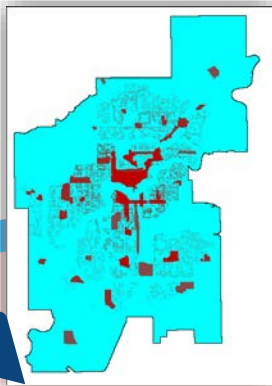
- MV land use model contains all sub-models we described earlier



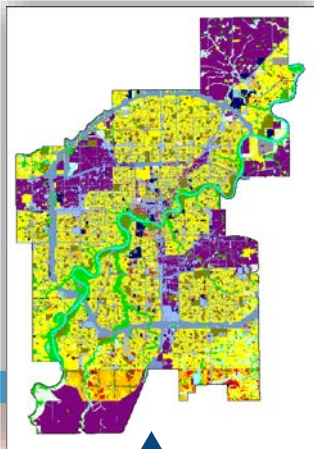
Land demand:



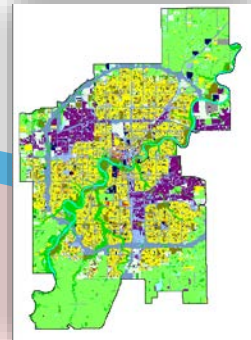
Suitability:



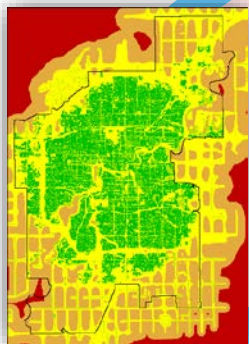
Land use 2050



Land use 2020



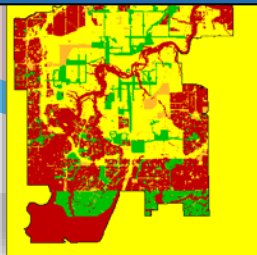
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Accessibility

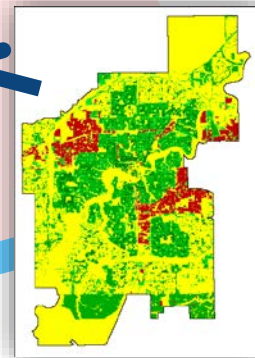
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Transition Rule
Cells change to land-use
with highest potential until
land demands are met.



Zoning:

=



Total
potential

METRO VANCOUVER GROWTH MANAGEMENT AND INFRASTRUCTURE MODEL

- The goal is to integrate water services, liquid waste, solid waste, and climate change modeling data into the overall Growth Management and Infrastructure Model.
- First step: to integrate MikeUrban outputs

INTEGRATED LAND USE AND TRANSPORTATION MODEL

LUTI models

- UrbanSim, PECAS, ILUTE, ILUMASS
- Can RTM outcomes be used as input in the growth management and infrastructure model? How might new transportation options influence land use changes?
- Can Growth Management and Infrastructure model inform RTM? How might new land use policies influence GHE?

CHALLENGES FOR INTEGRATED MODELING

- Challenges of urban models:
 - Transparency
 - Behavioral validity (theoretical validity)
 - Empirical validity (model validation)
 - Easy of use
 - Flexibility
 - Data availability and quality
 - Uncertainty

CONCLUSION

Immigration Model

- The Regional Planning modeling framework bridges academic research and practical implementation.
- Our models tend to inform policymaking and test urban growth scenarios
- One robust model vs. “granular” modeling framework?
- Integrated Land use and transportation models are extremely challenging ...



Thank You

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