

TaNDM Victoria Workshop Outcomes Summary

Workshop Date and Location:

The TANDM Victoria Workshop was held on November 29, 2022 at the offices of the BC Ministry of Environment in Victoria, BC.

Attendees:

Jessica Webster, NRCan; **Ken Porter**, CAS; **Elizabeth Lytviak**, CAS; **Yuill Herbert**, SSG; **Brett Korteling**, SSG; **Scott Williams**, OHCS; **Prabatha Hewa**, EMLI; **Nairn Albrecht**, EMLI; **Chris Ray**, City of Kelowna; **Tamara Sears**, BCA; **Matthew Wood**, Fortis; **James Allen**, Fortis; **Joe Wang**, NRCAN; **Aaron Licker**, Licker Geospatial; **Christopher Gilmore**, MENV; **Ben Finklestein**, MENV; **Meli Stylianou**, NRCan; **Julia Purdy**, NRCan; **Ben Clark**, Delphi Group

Objectives:

- To review, discuss and confirm components of the TaNDM method.
- To achieve consensus on the implementation plan.
- To discuss medium-term strategy options and what roll-out beyond Kelowna could look like.

Endorsements:

- ✓ Building categories table
- ✓ Vintages
- ✓ Data Matching
- ✓ Aggregation

Implementation Plan:

The following tasks and timelines were discussed in the workshop as follows:

December 23	Workshop summary: endorsements, discussion topics, documentation, decision points and actions	Elizabeth Lytviak, CAS
December 23	Submit package for FortisBC approval: Workshop summary Security and privacy forms RACI chart Task Shared Research Agreement Draft	Jessica Webster, NRCan; Ken Porter, CAS; Gurdeep Singh, GeoBC
January 13	BA Documentation: Entity Relationship Diagrams, Swim Lane Diagrams, etc	Jessica Webster, NRCan
January 20	Intellectual Property forms	Jessica Webster, NRCan
January 25	Steering Committee Meeting – Update on progress	Jessica Webster, NRCan
January ??	FortisBC approval	James Allen, Fortis

Upon approval	Develop energy summary reports	Matthew Wood, Fortis supported by Brett Korteling, SSG
February, exact deadline TBD	Add emissions factors	Ken Porter, CAS
February, exact deadline TBD	Conduct Validation Exercise	Yuill Herbert, SSG; Brett Korteling, SSG
February, exact deadline TBD	Integrate energy and emissions summary in Dashboard	Ysabel Garcia, GeoBC; Gurdeep Singh, GeoBC
February 22	February Steering Committee Meeting Review Results: numbers, visualizations and report Review Comparison to CEE Map Dashboard	Jessica Webster, NRCan; Brett Korteling, SSG; Yuill Herbert, SSG; Ken Porter, CAS
March 3	First draft of journal article	Jessica Webster, NRCan + co-authors
March 22	Final Steering Committee Meeting: wrap up and conclude	Jessica Webster, NRCan; Ken Porter, CAS
March 31	Consolidated materials and publish to Github	Brett Korteling, SSG; Jessica Webster, NRCan
March 31	Publish TaNDM page to BC MENV website	Ken Porter, Elizabeth Lytviak, MENV

Outputs:

- Energy Reports (FortisBC)
- Webpage (MENV)
- TaNDM CEEI Inventory XLS (MENV)
- ArcGIS Dashboard (GeoBC)
- Methodology on Github (NRCan)
- Peer Reviewed Paper (NRCan)
- Standard PowerPoint Deck (MENV)

Further Discussion, Documentation or Decision Point:

1.1	Energy Reports Output; Methodology, Inventory, Paper	Decision point: use building floor area to assign pt 3 vs pt 9	Brett Korteling, SSG; Jessica Webster, NRCan
1.2	Energy Reports Output;	Document: issues around FA and EUIs/ data quality.	Brett Korteling,

	Methodology, Inventory, Paper		SSG; Jessica Webster, NRCan; Aaron Licker, LickerGeo
1.3	Energy Reports Output; Methodology, Inventory, Paper	Document: additional fuel types or fugitive emissions– considerations for rural remote, Indigenous communities	Jessica Webster, NRCan
1.4	Energy Reports Output; Methodology, Inventory, Paper	Document: stemming from comment that “census tracts change” – briefly document census tracts, how they’re applied, frequency of change etc. To anticipate impacts on method if scaled and applied across changes in census tract boundaries.	Jessica Webster, NRCan
1.5	Energy Reports Output; Methodology, Inventory, Paper	Document: vintages - what was uncovered, recommendation around modeling best practices and inventory best practices. Documenting issues around year built. To improve modeling consistency and collection of measured data to validate building stock models that include archetypes with vintages.	Jessica Webster, NRCan;
1.6	Energy Reports Output; Methodology, Inventory, Paper	Further discussion: should FortisBC be advised to use label points instead of or in addition to parcel centroids to improve match rates relating to odd shaped parcels?	Aaron Licker, LGeo, Brett Korteling, SSG; Jessica Webster, NRCan
1.7	Energy Reports Output; Methodology, Inventory, Paper	Further discussion: Confirmation of validation method. Aspects involving building/parcel scale validation to be removed; validation at scale only.	Yuill Herbert, SSG; Jessica Webster, NRCan
1.7	Energy Reports Output; Methodology, Inventory, Paper	Confirm if no less than 5 rule in FortisBC and MENV CEEI data sharing agreement pertains to no less than 5 buildings or customers/meters	Ken Porter, MENV; James Allen, FortisBC
1.8	Methodology, Inventory, Paper	In January TaNDM meeting, present CEEI and link with GPC and CDP and discuss how this can be incorporated into the methodology	Yuill Herbert, SSG; Ken Porter, MENV
2.1	Dashboard	Decision point: Should differentiate that we are looking at two datasets on left and right - use same colour schemes	Jessica Webster, NRCan; Gurdeep Singh, GeoBC
2.2	Dashboard	Decision point: dashboard needs to be less complex (drop down options, hide some features). Too overwhelming. Basic query, selection and print widget.	Jessica Webster, NRCan; Gurdeep Singh, GeoBC

2.3	Dashboard	Further discussion: include user stories/priority use cases on dashboard to help guide users	Jessica Webster, NRCan; Gurdeep Singh, GeoBC
3.1	Implementation	Further discussion: timeline for this iteration (3 month extension?)	SC
3.2	Implementation	Further discussion: med-term strategy, continuation and scaling	SC

Actions:

1.1	Project Management	Diagram reworking – split pt 9 and pt 3, occupancy codes, neighbourhood and census tract to achieve finer granularity Business Analysis Documentation	Jessica Webster, NRCan
1.2	Project Management	Miro board or ppt on sticky note exercise during Jan meeting	Elizabeth Lytviak, CAS
1.3	Project Management	Standard deck	Elizabeth Lytviak, CAS
2.1	Approvals	Fortis package to VP <ul style="list-style-type: none"> Workshop summary Slide deck Security and privacy forms RACI chart Task Shared Research Agreement Draft Dashboard screen captures/access Business Case Output spreadsheet 	Jessica Webster, NRCan; Ken Porter, CAS; Gurdeep Singh, GeoBC
2.2	Approvals	Send BCA Fortis package	Jessica Webster, NRCan; Ken Porter, CAS; Gurdeep Singh, GeoBC
2.3	Reporting	Report on TaNDM for Kelowna City Council	Chris Ray, Kelowna
3.1	Dashboard	Remove assessment fabric layer on dashboard (hide)	Gurdeep Singh, GeoBC
3.2.	Dashboard	Accessibility assessment of Dashboard required and define acronyms	Jessica Webster, NRCan; Gurdeep Singh, GeoBC
3.3	Dashboard	Disclaimer required for data accuracy for publishing	Brett Korteling, SSG
4.1	Energy Reports Output; Methodology, Inventory, Paper	In Derived BIR to send to FortisBC: <ul style="list-style-type: none"> Add PID count and folios Use label points and set of centroids because of the funny shaped parcels 	Brett Korteling, SSG

Notes, Questions and Considerations:

1. Community Energy and Emissions Inventory

- Currently: in a tabular format, no disaggregation from community-scale
- 2007 tabular and dashboard format. Do not have the CEEI in a dashboard format currently.
- Residential housing types reported in prior CEEI, but not currently
- Opportunity for efficiencies in data collection if done at the provincial scale; improved data is required for evidence-based policy making.

2. BIR

- Data comes from floor plans collected through municipal building permit processes
- BIR not released until after appeals process and revised roll is produced mid-April
- BIR and any product for taxation is an internal product for use by municipalities
- Laneway housing AUC has not gone through Privacy Impact Assessment and so doesn't appear in the BIR yet
- No distinction between conditioned and unconditioned space
- No basement type distinction [in residential]
- Question around parking lots for instance below grade parkade

3. Vintages

- Effort went into visualizing the different vintage categorizations.
- Organizations, projects, codes etc... categorize vintages differently; pervasive challenge.
- We captured most, but if our main purpose for this iteration of TaNDM is to compare the measured data with that in the CEE Map Dashboard, we all missed the most important one: CEE Map Dashboard Vintages
- So although in a prior meeting, the committee voted to group buildings by decade, we're proposing to use the CEE Map Dashboard vintages.
- Vintage aggregation by decade is nonetheless a promising approach for future exploration
- Issues include:
 - When buildings were built, vs. when they were permitted
 - Changes occur over time
 - BCA does not track the Code under which something was built, only year built
 - Effective year is an update but not applicable re energy consumption because the updates could be anything, not just energy-related updates.

4. Floor Area

- Floor area values reported in the BIR include Total Area, Foundation Area, Strata Unit Area, Gross Leasable Area (GLA) or Gross Building Area (GBA) or Net Leasable Area (NLA). These are specified according to the Actual Use Code (AUC)/ Manual Class Code (MCC).
- For Strata Units – BCA only reports Information on a per unit basis as the building is not taxed, the individual units are. BCA BIR does not report floor area for common areas MURBs [the implication being that floor area would be under-reported and EUIs would be over-reported for Strata buildings]
- Basement type missing for residential dwellings so unable to adjust assessed floor area to conditioned floor area.

- Small unheated spaces in Part 3 shouldn't skew EUI results; large parkades could skew EUIs in commercial and institutional buildings if location (below or beside) and floor area are unknown.
- Number of Storeys is not in the BIR and therefore not available to refine the assignment of buildings to a Code Part or Code Occupancy Category. So, we are relying strictly on the building type and then the floor area.
- Based on these limitations, concerns expressed that energy use intensity (EUI) calculated based on BCA floor area data could be inaccurate
 - Nervous about reporting EUIs that end up being a lot different than actuals. A lot of policy it is based on the EUI. If we have the wrong EUI, that feeds into policy.
 - EUI may be a more sophisticated part of TaNDM that needs more thinking
 - EUIs need to be done right in a consistent way
 - Risk with unachievable policies being put in place if incorrect EUIs are reported
 - EUI calculated when measuring buildings footprints
- Idea for a "Proxy EUI" – reporting not an absolute EUI value, but an estimate subject to error
 - Could develop rules for classification of floor area
 - Solve for the difference
 - Percentage variation from the standard
 - Compare by more granular residential building types
 - Compare by electricity and natural gas
 - Buildings missing from assessment dataset
- Option to publish EUI for some building types but not others – idea to look at the other building types (for which EUIs were off) later E.g. compliance for part 3

5. Matching

- Using non-spatial approaches using:
 - ParcelID: 3,272 BIR records cannot be matched.
 - AssessmentID: 59 BIR records cannot be matched
- Using a spatial approach:
 - BC Assessment Fabric (parcel polygons) to match with utility service locations (meter x,ys) is considered to be most accurate and is recommended

6. Aggregation

- split part 9 and 3 and use occupancy codes to achieve finer granularity
- Number used in CEEI is no less than 5 customer accounts or no one customer accounting for more than 50% of consumption in any aggregation.
- FortisBC comment that use of 10 folios is common
- Anything is possible from a technical geoscience perspective. FortisBC will need to run through the majority of the analysis to determine the privacy threshold.
- TaNDM to recommend same as CEEI for consistency's sake: no less than 5 customer accounts or no one customer accounting for more than 50% of consumption in any aggregation.
- Fortis data sharing agreement re CEEI – is the privacy threshold 5 buildings or 5 meters?

7. Validation Method

- SSG presented a workflow to compare TaNDM results with CEE Map Dashboard results first by GHG emissions by sector, then by energy consumption and floor area. The comparison was envisioned to start at the stock level and then investigate individual buildings and floor area.
- Concerns were expressed re TaNDM energy data not being reported at the building scale, so modifications would be needed to ensure the validation approach was done “at the City-wide scale” for part 9 residential dwellings. Additionally, the GHG factors used in CEE Map and TaNDM would both be official ones from the province so comparison should be done on an energy, not GHG basis. Revised approach to be developed.

8. Outputs and How They Will be Used

- **Data**
 - Aggregated buildings data
 - Aggregated energy and emissions data
- **Algorithms**
 - Python scripts
- **Visualizations**
 - GeoBC TaNDM Dashboard
 - Maps
 - Graphics
- **Documentation**
 - Written “how-to” documentation
 - Presentations
 - Technical diagrams: data entity models, workflow diagrams etc.
 - Recommendations

Data outputs (i.e. the derived BIR, FortisBC energy reports) will go to TaNDM developers to execute the method. To develop the inventory, FortisBC energy reports will go to MENV to add the emissions factors to make the TANDM CEEI inventory in XLS for Kelowna. That will go to NRCan to conduct the validation exercise with the CEE Map Dashboard for Kelowna. Results initially shared with the Committee.

Main comment regarding what summary statistics can be published: after setting the privacy threshold and doing the exercise [TANDM aggregation routines] there would be a final determination on the part of FortisBC and BC Assessment as to what can be let out the door.

Anticipated public outputs (as presented at time of workshop) include:

- Presentations - Idea to have one standard approved deck that all SC participants could use
- Publications
 - Peer-reviewed journal
 - Github repository
- **CEEI and link with GPC, CDP (Presentation not delivered in workshop)**
- Local governments in BC use the CEEI to report to the FCM’s Partners for Climate Protection (PCP) program as well as the Carbon Disclosure Project (CDP). PCP reporting is fed to the Global Covenant

of Mayors network and both PCP and CDP reporting feed into NAZCA reporting (the United Nations Framework Convention on Climate Change (UNFCCC)'s Global Climate Action reporting portal

- <https://unfccc.int/playground-20/level-2/level-3/united-nations-framework-convention-on-climate-change-unfccc-2>
- The Inventory protocol is the Global Protocol for Community-Scale Greenhouse Gas Inventories
 - https://ghgprotocol.org/sites/default/files/standards/GPC_Full_MASTER_RW_v7.pdf
- Any improvements to accuracy in CEEI means improved accuracy in carbon reporting through these official reporting and disclosure systems
- For TaNDM, describe how there's alignment and how the TaNDM CEEI data products meet the needs of the reporting systems. Produce as memo and publish via Github.

9. Dashboard

An interactive presentation of the GeoBC TaNDM prototype Dashboard was presented via ArcGIS online. A "six hats" thinking exercise was done to critically evaluate the opportunity to develop such a Dashboard for TANDM.

White

- why number of buildings? We want energy/buildings, floor areas, or sq footage, ghgi, incentives given to a given community (did this for Kelowna- heat pumps, air conditioners etc. for dissemination scale- out of scope for now) in dashboard- may need to examine EUIs- purpose of the is to guide proxy thresholds
- Vintage groupings- 4 vintages needed to hit thresholds, fortis separate check for EUIs, assessed area remains, not conditioned floor area- maybe for meeting privacy thresholds and does it look accurate. In aggregate routines.
- Spatial disaggregation- looking at annual- can you pick time horizons? Can add trend lines when you have this info year over year
- Census tract boundaries change all the time or new ones get created- not comparable outside of census cycle (5 years). Back casting it using postal code allocation tables.
- Growth nodes fixed for ten years, may change with updated OCP. No jurisdictional boundaries fixed over time.
- Would like to see vintages
- Would like to see floor area
- Census tracts change so that could be an issue for year-over-year comparison
- Important to be clear about temporal value

Red

- Only as good as data -disclaimer needed for data accuracy. Print widget can have disclaimer, can add your own credits on there. For public, users need to understand limits/assumptions- pop up disclaimer on entry
- A little overwhelming. UX perspective- higher level then drill down (filter?) colour coding- accessibility
- Gurdeep can include user stories to give contextual info to guide users on a more narrative journey though the map- community planner, researcher – scale back for general public
- User stories and priority use cases- CEEI- professional user of the data for planning and validation of models was second priority
- Look at capacity- for smaller communities- may be barrier to using dashboard or CEEI data
- Dashboard is only as good as the underlying data
- Needs disclaimer, credits, limitations
- Overwhelming
- Needs UX colour coding etc...
- Begin from the perspective of different end users/ user stories

Yellow

- People are more engaged and can play with it, more user-friendly
- Can there be a reset button? Refresher in case you are in too deep. Home button that zooms out to city scale
- Should differentiate that we are looking at two datasets on left and right- use same colour schemes

- Can group and minimise the widgets- make graphic space wider so you get more screen size and don't have to maximise- depending on end user can add queries- identify your own area- lasso tool can do this- can print map with report. What kind of device viewing on- change view
- Could be an opportunity for training
- Dynamic engaged interested
- Colour coding contrast between buildings data
- Group and minimize widgets
- Startup
- Click and extent

Black

- RNG? Other fuel sources as potential improvement for tandm for this iteration- no hydrogen, rng is incorporated but would be hard to spatialize to census scale- Kelowna landfill gas capture – want to ensure isn't double counted. Calculated based on those who are willing to pay premium- that is how we can attribute it.
- At a certain point would be scaled to province and would replace CEEI- further disaggregated for bldgs. sector
- Assessment fabric usage needs to come out
- Lots of information- collapse some or group some- need high level of understanding – how to meet needs of technical and nontechnical audiences- portal can have different user interfaces
- Fugitive emissions from distribution- small but mighty- older facilities might have more fugitive emissions
- Communities with diesel power energy
- Would TaNDM replace CEEI or would they run in parallel?
- Assessment fabric can't be used publicly
- TMI - collapse, group, different levels of users with different contexts
- Anything put out there is going to be used by someone in the wrong way

Green

- Areal images
- ASHRAE, could add transparency

Blue

- access to dashboard for BCA and Fortis to aid approval process; GeoBC can make changes to support approval, documentation, instructions; defining acronyms; user testing
- BCA refreshes data once a year for Kelowna
- FBC does not put out spatial data, just census tract ID
- Medium strategy discussion: muro board to discuss sticky note exercise and can go over in Jan meeting
- documentation
- Users
- French
- Update on an annual basis
- Training
- Basic query, selection and print widget

10. Implementation Plan

- Develop approval package for FortisBC – will go to VP
 - Propose same privacy thresholds stipulated in CAS' data sharing agreement. Determine if meters or buildings.
 - Fortis' privacy officer will conduct privacy assessment.
- Develop BCA package for Board
- Send Fortis package to BCA and want to see Fortis' privacy assessment (Fortis and BCA to coordinate?)

11. Medium-term Strategy

Notes brainstormed and posted on sticky notes in categories as follows:

Data

- For dashboard would there be downloadable reports of underlying data? If so, in what formats? (link with user consultation)
- Different needs for First Nations or other areas of country
- Leverage existing data sharing agreements
- Open data
- Standards for buildings data (eg. City GML)
- What are next steps if model is not validated?
- Assessed floor area > conditioned floor area
- Can dashboard assist with other inventories and supporting indicators or related econometric analysis?
- Communities care more about up-to-date CEEI than more granular data
- Data will only get better and more ubiquitous and cheaper
- Can other data be added? Greenspace?
- Including incentives related info- types of upgrades, amount of govt support ;and transportation data for each community
- TaNDM data location?
- Temporal availability of data is different across country
- Benchmarking information is required for data validation
- New ghg/non-ghg energy sources
- Knowledge of data and tools
- Data standards for all raw data
- Options for data outside BC
- TaNDM code updates
- BIR updates- new/charge of data

Scale

- What are the different needs for small, medium and large communities? How do we design around these needs?
- Small communities do not have CTs
- Consistent level of geography
- Lack of applicability to smaller communities
- Green buildings data strategy- how can TaNDM link with that for national scaling? (link with funding)
- How to share data?
- Different privacy thresholds between utilities/provinces

Governance

- For low-cost maintenance: collaborating with local universities for maintaining and improving the dashboard- privacy could limit this
- Coordination of multiple data sources requires consistent and committed stakeholders
- Who need to be involved and who makes the decisions
- Briefing up to obtain higher-level approvals and support within orgs
- Annual workshop
- Approval process for scaling beyond Kelowna. What does this look like?
- Keeping tool focused and consistent with each new community
- Continuity between all partners- agreement/MOU?
- How to share data (privacy)

Funding

- Where can we get funding from if we need a 2/ six-month/ 1-year extension to complete this thing?
- Bag of money falling from the sky
- Alignment with Province's efforts to improve CEEI/Digital strategy/DRIPA. Alignment with Canada's priorities?
- Can improvement of data and emissions help offset costs?

Communication

- Awareness of tandm for all LGs?
- Hosted on CEEI website/database with analysis capabilities/scenario planning?
- Granularity is low functionality for targeting programs
- Can this info be legitimately used to affect climate change or inform climate policy?
- Most people do not relate to census tracts
- How to explain purpose of tool to general public?
- Any value to the public if not displayed at parcel level?
- Outreach and education- provincial/local govt- communication
- Users getting the dashboard reviewed by prospective users
- Help desk or support? Who would be responsible for this?
- GHG reporting frameworks, how-to info accompanying the data
- Application to assist with initiatives like CleanBC
- How-to fun, animated video with sample data. How to maximize use of the tool?