Measurement to action: transforming carbon reporting with innovative proxy data

A scalable, replicable approach to improving the quality of financed emissions reporting for residential buildings through a collaboration between Vancity and Climative

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Executive Summary

Financial institutions face increased pressure to measure, disclose, and reduce their financed emissions. Yet, in many jurisdictions including Canada, financial institutions continue to face challenges accessing reliable data—often relying on low-quality regional proxies. This makes it challenging for Canadian financial institutions to set accurate emissions reduction targets, manage climate related risks, and report actual progress toward net-zero targets. Today, obtaining the necessary data is logistically challenging and infeasible at scale.

Vancity engaged Climative to test whether Climative's modelling can enhance Vancity's financed emissions reporting by improving Vancity's PCAF data quality score from Level 4 or 5 to Level 3[1]. Using their proprietary Automated Carbon Model, Climative shifted Vancity's residential building portfolio data quality score (DQS) up from 4.03 to 3.31. This higher level of data quality enabled the delivery of actionable, property-level insights that would not have been possible with lower quality data, shifting from passive to active measurement of financed emissions.

1 Introduction

Canadian financial institutions are facing increased regulatory and stakeholder pressure to measure, disclose, and reduce their financed emissions. However, most institutions struggle to move beyond low-quality assessments that rely on regional averages. When it comes to the built environment, the absence of data on building energy efficiency or consumption means that many financial institutions, including Vancity, use national or provincial proxy data, combined with individual home square footage and property values obtained from BC Assessment. This process at best meets PCAF DQS 4.

This limited access to reliable data sources makes it difficult for financial institutions to set accurate emission reduction targets, actively manage climate risk, and demonstrate measurable progress toward net zero commitments. Recently, the low availability of high quality data was cited as a key reason for postponing enhanced Scope 3 reporting requirements in the latest Canadian Sustainability Disclosure Standards, which banking regulator OSFI then aligned to in its OSFI B-15 guidance.

Increasing the accuracy of building emissions reporting requires building-level energy use and emission factors specific to each heating energy source. To date, obtaining this data

[1] PCAF – Partnership for Carbon Accounting Financials – is the Global GHG Accounting and Reporting Standard for the Financial Industry. The Standard provides guidance on data quality scoring per asset class, facilitating data transparency and encouraging improvements to data quality in the medium and long term. The data quality score ranges from 5 (most uncertain) to 1 (most certain).

directly from building managers, property and home-owners, utilities, or third-party platforms such as ENERGY STAR Portfolio Manager has proven logistically challenging. This is due to a range of barriers including inconsistent data formats, limited data-sharing agreements, privacy concerns, and the administrative burden of coordinating data collection across thousands of individual stakeholders. The lack of building-level data prevents financial institutions from enabling building-specific actions to reduce energy and carbon emissions.

1.1 The Vancity-Climative partnership

Vancity, a financial co-operative and leader in sustainable finance, partnered with Climative, a Canadian clean tech company and PCAF-certified data provider, to address challenges in carbon reporting.

Vancity is a values-based financial co-operative serving the needs of 570,000 member-owners and their communities across B.C., Canada. Vancity uses its assets to help improve the financial well-being of its members while at the same time helping to develop healthy communities that are socially, economically and environmentally sustainable. Vancity has five climate commitments to help build a clean and fair world, including Net-zero by 2040 across mortgages and loans.

Climative is dedicated to accelerating the decarbonization of buildings by providing data-driven solutions. Its energy and carbon assessment methodology has been reviewed and certified by PCAF to support financial institutions in carbon reporting at Data Quality Score 3 (DQS 3) across their residential building portfolio.

2 Pilot project on carbon reporting using PCAF DQS 3 data

2.1 Project goals

Vancity initiated the project with three goals in mind:

1. Evaluate Climative's solution as a pathway to enhance Vancity's financed emissions reporting by improving its PCAF data quality score from Level 4 or 5 to Level 3
2. Gain insights into potential applications of the data including access to an analytics dashboard
3. Compare Climative's outputs to 1) EnerGuide audit results and 2) Vancity's Level 4 or 5 emissions data.

2.2 Project description

Vancity provided Climative with anonymized residential mortgage data for Part 9 buildings[2]. The data set included property attribute data sourced from BC Assessment (BCA)[3], as well as the Forward Sortation Area (FSA) for each mortgaged building. No member identifying data was shared with Climative.

Climative then applied its Automated Carbon Model (ACM), utilizing data fields such as FSA, building vintage, floor area, and property type to estimate each property's energy consumption. Greenhouse gas (GHG) emissions were subsequently calculated by multiplying these energy estimates by region-specific emission factors for each energy source.

Climative's ACM is a proprietary suite of machine learning algorithms built to overcome the limitations of current financed emissions reporting. The ACM delivers scalable, cost-effective, and reliable carbon assessments for residential buildings across North America.

By integrating historical onsite energy audits, property-level building characteristic data, historical weather data, and region-specific GHG emission factors, the ACM generates defensible energy consumption and carbon emissions estimates for each individual property. This "bottom-up" approach provides a solution for achieving PCAF DQS 3 across residential mortgage portfolios, offering a robust and highly scalable alternative to onsite audits or estimates using provincial averages (DQS 4/5).

3 Key outcomes

Improved overall PCAF Data Quality Score: Using building-level ACM data for Vancity's entire residential building portfolio achieved an overall PCAF DQS of 3.31, representing a significant improvement compared to the previous DQS 4.03. See section 3.1 for more details.

Robust data visualization and analysis dashboard: A data dashboard created by the ACM visualized carbon emissions and intensity across geographies, building types, and heating fuels. The analysis also provided options for the GHG reduction potential of Vancity's residential building portfolio (Part 9 buildings).

Alignment with EnerGuide: Climative compared ACM DQS 3 estimates against EnerGuide audits at the building, FSA, and provincial levels, demonstrating that ACM DQS 3 data align closely with EnerGuide results.

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[2] Part 9 buildings in BC have a height of three storeys or less and a footprint of 600 square metres or less.

[3] In some jurisdictions, property attribute data is publicly available in bulk for free, in which case it will be incorporated into the ACM by Climative. In BC, this is not the case, and Vancity used procured property attribute data for its residential buildings portfolio.

3.1 Detailed results

Results for ACM outputs compared to EnerGuide audits

Climative conducts an accuracy evaluation of ACM outputs against historical onsite energy audits across Canada. The models are trained on 90% of the dataset, with 10% reserved for validation. The models are tested at the national, provincial, and granular levels. Key evaluation metrics include mean and median percentage errors, as well as mean absolute percentage errors.

At the national level, the results demonstrate high accuracy, with a mean percentage error (MeanPE) of 1%, a median percentage error (MedPE) of 0%, and a mean absolute percentage error (MeanAPE) of 14%. In British Columbia, results were similar, with a MeanPE of 2%, MedPE of 0%, and MeanAPE of 16%.

When further evaluated at the FSA and property type levels, the model showed strong consistency and robustness, confirming its reliability for applications such as carbon reporting, program design, and portfolio-level loan studies, while also providing meaningful guidance for member-level energy retrofits.

Results for DQS 3 compared to scores 4 and 5

Applying the ACM method to Vancity's entire residential property portfolio – which includes non-part 9 buildings - improved Vancity's PCAF data quality score from 4.03 to 3.31. The improvement was particularly notable for properties classified as Single Attached and Single Detached, with data quality scores improving to 3.10 and 3.07, respectively. Financed emissions increased by 1.25% for the portfolio overall, with the largest percentage increase (5.89%) for single attached homes[4]. Additionally, the overall financed emissions intensity of the portfolio increased from 15.43 to 15.62.

Comparing only the overlapping subset of properties between the two approaches (ACM and Vancity's – so Part 9 Buildings only) the data quality score improved from 4.03 to 3.0, financed emissions increased by 1.51% and financed emissions intensity increased from 15.76 to 16.01.

Other studies conducted by Climative generally show higher relative emissions when moving from DQS 4/5 to DQS 3. In Vancity's case, emissions and emissions intensity did not increase by as much for the part 9 buildings Vancity financed. Several factors may influence this, including Vancity's history of proactively seeking to finance energy efficient homes and retrofits.

[4]In fact the largest increase was for mobile homes (7.18%) but emissions related to these are immaterial.

Assumptions and limitations

Both onsite audits (such as EnerGuide) and Climative's ACM can achieve carbon reporting at PCAF DQS 3. This means that variations in estimated GHG emissions may occur within the same data quality score, depending on the data inputs. In addition, although a property's primary heating fuel source is not the dominant factor in creating an energy label, it significantly influences the derived emissions calculations.

In Vancity's case, for BC-based properties, data on heating fuel type was not available. In the absence of this data point, Climative's ACM applied a randomly generated "Estimated Heating Fuel Type" based on a predefined distribution at the provincial level based on NRCan's National Energy Use Database (NEUD)[5]. This meant that results for emissions may not be reliable at the property level, or for certain regions where the actual distribution is significantly different from the province. (Note that energy consumption/the energy label is deemed reliable at the property level).

Vancity proposed and applied an alternative approach to converting energy use into emissions where heating fuel type is unknown: a weighted average emission factor (based on provincial-level household fuel usage shares) is applied to both heating and water energy consumption for each key property type.

Vancity found that, for the portfolio, this alternative method reduced volatility across geographic subgroups and resulted in a -6.30% decrease in financed emissions compared to DQS 4/5, vs. a +1.25% increase in financed emissions using the ACM methodology.

Applying the two approaches to unattributed (total) building emissions for Part 9 Buildings only: the ACM method resulted in a 1.35% increase in absolute building emissions compared to DQS 4/5 while emissions intensity increased from 15.8 to 16.0. Applying the alternative method resulted in a decrease in building emissions by 7.81% while emissions intensity decreased from 15.8 to 14.5.

So, notably different results depending on the approach. While the use of regionally representative data provides a reasonable balance between accuracy and feasibility, financial institutions are encouraged to source the most reliable primary heating fuel data to ensure reliable DQS 3 reporting.

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5 https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=bc&year=2022&rn=14&page=0

4 How improved data quality can translate to climate action

The Vancity-Climative partnership successfully shifted Vancity's portfolio data quality score up from DQS 4.03 to 3.31. This higher data quality score enables the delivery of actionable, property-level insights that would not have been possible with DQS 4 or 5. This section provides examples of how higher quality data can support financial institutions to progress from passive measurement to active management of their financed emissions.

4.1 Strategic insights and progress tracking

High-quality DQS 3 data can support financial institutions to shift from static, annual reporting to a real-time, strategic approach—unlocking ongoing insight and accelerating momentum toward net-zero. This data provides a robust feedback loop, supporting transparent, accountable progress against established climate targets.

- **Establishing a reliable baseline:** This higher quality data can be used to establish a more reliable baseline of the portfolio's emissions using property-level data (PCAF DQS 3). In addition to the carbon reporting results, the financial institution should also record the underlying building characteristics and emissions factors used in the calculation.
- **Segmenting for deeper insights:** The power of the data emerges when the property-level energy labels, property attribute data, and emissions (where heating type is available) are combined with customer data and demographic information. Progress can be analyzed and reported on by various criteria:
    - **Geography:** Are certain municipalities or neighborhoods decarbonizing faster than others? This can reveal the impact of local rebate programs, identify areas with higher physical climate risk, and highlight regions needing targeted support.
    - **Heating fuel type (if available):** This is one of the most critical segments for decarbonization. Identifying homes that rely on high-carbon sources like heating oil or natural gas allows for the creation of targeted fuel-switching campaigns and programs, which yield the most significant GHG reductions.
    - **Loan characteristics**: Segmenting the portfolio by mortgage vintage, outstanding principal, or loan-to-value ratio can reveal the concentration of financial risk within high-carbon properties. It can also inform strategies for engaging customers at key moments, such as mortgage renewal.

- **Demographic & customer segmentation**: Using anonymized and aggregated data, this analysis helps ensure that decarbonization strategies are equitable and effective.

- **Measuring progress**: A key analytical challenge in tracking progress is the ability to distinguish between emission reductions because of homeowner building upgrades versus those resulting from external factors, like a decrease in the grid's carbon intensity.
  - **Energy use:** To isolate the impact of retrofits, it is beneficial to track energy use directly (vs. emissions). This provides a more stable metric for measuring progress over time, as it is not influenced by fluctuating emission factors. This segmented analysis enables a financial institution like Vancity to refine its member engagement and business development strategies, allocate resources more effectively, and report on its climate commitments with confidence and transparency.
  - **Portfolio alignment:** ACM results can be leveraged to identify and disclose environmentally focused finance products and potentially to develop portfolio-level climate alignment metrics for steering purposes

4.2 Risk management and regulatory confidence

High-quality, asset-level data is fundamental for both robust risk management and confidence in disclosures and regulatory filings. Transition risks (the financial risks related to the transition to a low-greenhouse gas economy) have the potential to significantly impact the safety and soundness of financial institutions and the financial system more broadly.

In the case of buildings, those with lower energy efficiency and gas-powered systems present greater transition risks. By leveraging Climative's energy and carbon assessment data, financial institutions can identify individual buildings with higher transition risk, reveal concentration of risk, and begin to appropriately value unsustainable assets vs. low-carbon and resilient assets thus reducing the chance of financial loss.

In an environment of increasing regulatory pressure to measure and disclose financed emissions, this enhanced accuracy enables an institution to report on its climate impacts and risks with more confidence and transparency.

4.3 Targeted engagement and decarbonization strategy

Property-level data provides the foundation for a more effective and personalized member or client engagement strategy. Engagement works best, and is more likely to drive real action, when members or clients receive clear and tailored advice. With property-level insights,

financial institutions can strategically target outreach and resources toward members or clients with the greatest potential for energy use and related emission reductions.

One of the resulting datasets generated by the ACM showed the GHG reduction potential of Vancity's residential building portfolio, based on extrapolation from EnerGuide assessments. Such data can be leveraged for planning purposes, including modelling the amount and types of renovations needed, over time, across the portfolio to meet net zero targets.

Furthermore, insights from geographic analysis can inform focused advocacy efforts in jurisdictions where targeted support is needed to accelerate decarbonization as well as accelerate efforts in those jurisdictions that are already moving forward with decarbonization efforts.

5 Conclusions and recommendations

Strategic takeaways

The Vancity–Climative pilot project demonstrates that achieving higher data quality carbon reporting is both feasible and scalable, and can provide actionable carbon reduction insights and measures that can translate to meaningful climate action.

Establishing a reliable, property-level emissions baseline is a prerequisite for an actionable decarbonization strategy. It allows for a better assessment of the gap needed to reach net-zero, helps with more reliable modelling, and builds a clear business case for decarbonization.

By leveraging PCAF DQS 3-level data, financial institutions can shift to more actively managing their financed emissions, including reducing the emissions of their mortgage portfolios. It also presents opportunities to deepen the member/client relationships by providing tangible value through personalized, cost-saving, and low-carbon advice.

Future work

Given the absence of readily available, actual energy use data for all properties, the financial sector and other stakeholders need to advocate for policies that improve access at scale to key data points that, such as heating fuel type or energy labels. Collaboration with key players such as governments, regulators, property assessment agencies, utilities and other financial institutions will be crucial in building the data infrastructure necessary to accelerate the transition to a net-zero built environment, while respecting data privacy.

To accelerate progress, governments should establish frameworks that make property-level data more accessible to financial institutions. Improved data access will allow lenders to design fair, effective, and evidence-based climate strategies, while also enhancing transparency and accountability in financed emissions and climate risk reporting.

Another area for future work is standardized approaches that encourage (rather than disincentivize) financial institutions to improve data quality, given that changes in methodologies will create variance in financed emissions during the transition year and potentially require financial institution to re-baseline emissions, or restate historical data. For example, emissions data at DQS 4/5 apply uniform carbon factors regardless of actual energy efficiency or heating fuel type, while DQS 3 incorporates more granular parameters such as building age, climate zone, and heating source. A widely used mitigation strategy for consideration is the "smooth-out" approach – for example, applying a 20–30% incremental adjustment each year from the baseline (DQS 4/5) until alignment with the more accurate DQS 3 assessment is achieved.

Collaboration opportunity:

Vancity and Climative are exploring a national registry of building-level carbon and energy labels to align advocacy across financial institutions, data providers, regulators, and other stakeholders.

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