Targets, Tactics & Triumph:
Strategic Targets & Indicators for CleanBC Success

Submission to the BC Government on Sectoral Targets & Accountability

January 25, 2021

This paper responds to the ***BC Government Consultation: Setting Sectoral Targets for Emissions Reductions.*** Most input responds to *BC Government questions laid out below in italics*. While input is applicable to all GHG and economic sectors, the focus is on traditional community sectors, i.e. buildings, transportation and waste.

ACCOUNTABILITY PLUS

Simplicity and accountability are critical. This exercise will be inadequate and fall short of its potential if accountability is the only objective and the guiding principle is extreme simplicity.

General Recommendations:

- ***Implementation, Continuous Improvement, Collective Will and Accountability Philosophy:*** This process should be more than, simply, accountability. Targets and indicators should foster literacy, guide implementation, facilitate monitoring, support continuous improvement towards climate action, cultivate collective action AND engender accountability.

  While there may be a smaller set of targets, e.g. 15, established in legislation, it would prudent as part of the exercise to have a more comprehensive set of targets and indicators that are integrated into the reporting process, which help diverse actors inside and outside government and across diverse sectors realize a zero emission future while advancing prosperity and equity.

- ***Audience Sensitivity & Diversity:*** Good target and indicator regimes appreciate their audience. Typically, audiences are diverse. As underscored above, a target and indicator regime should help foster collective will and a shared sense of responsibility, as well as deeper literacy and guidance. The BC Government should strengthen its understanding of the diverse audiences relevant to a valuable target and indicator regime. Some general audiences that should be considered, include:
  - Engaged public
  - Senior decision makers in diverse public, private, social sectors
  - Policy makers and practitioners in diverse public, private, social sectors

  The reporting structure should reflect the needs of these distinct audience needs.

1. PRINCIPLES FOR DEVELOPING SECTORAL TARGETS - CONSULTATION QUESTIONS & ANSWERS

a) Which principle(s) are most important to you in designing sectoral targets? Please explain.

- *Feasibility*
- *Cost-effectiveness*
- *Transparency and credibility*
- *Flexibility*
- *Competitiveness*

All proposed principles are important in designing an effective climate change mitigation agenda, however, given the relatively small set of targets *and indicators* (e.g. 30-40), some are not as important in identifying the indicators to be used, but may be an important consideration in establishing the intensity of a target, e.g. *competitiveness*

Some of these principles are important, but require definition:

- ***Cost-effectiveness is important, yet relative***. If data collection for some targets/indicators is more costly but extremely valuable and instructive to guiding policy development, measuring and monitoring, and the data may be super valuable for other applications above and beyond climate. This higher cost data may be worth it, e.g. driving distance data (vehicle km travelled – vkt). Some targets/indicators are very cost effective but provide modest value, e.g. new building units by type.

b) Are there other principles that should be considered in establishing targets?

Just as this discussion paper identified important principles in designing an effective climate change mitigation agenda, **there are other principles that are important in establishing the overall agenda but that shouldn't be applied to evaluating individual targets/indicators or the set as a whole**, e.g.

- ***Scientific Integrity:*** It is critical to appreciate that every sector has to achieve deep emission reductions. Forty percent emission reductions by 2030 is deep and B.C. is currently not on track to achieve these emission reductions. The BC Government will be legislatively adopting a net zero 2050 target in line with IPCC 1.5C recommendations. Net zero is a defensible and extremely deep emission reduction target which will require action by every GHG sector, as well as the complete transformation of some sectors, notably, fossil fuel production. Fossil fuel generation will almost invariably disappear. New sectors will emerge and, if they desire, companies that focussed on fuel can move into this space. ***Just Transition is another important principle, but not for selecting a set of targets.*** Robust, thoughtful and innovative policy and program development is necessary to support economic and social transitions.

There are design principles and concepts that should be used to inform the development of a target and indicator system that are different from evaluating a set of targets and indicators.

- ***Continuous Improvement:*** It would be prudent to manage expectations, communicating that targets and indicators will have be revisited, not weakening them but strengthening and optimizing them, to reflect the dynamism of CleanBC implementation. There are two key facets of a target and indicator regime that demand continuous improvement.
    - ***Data Quality Improvements:*** Data will improve! If only those targets and indicators that have really easy, high quality data sources today are selected, the BC Government will likely be omitting key targets and indicators. Policy-makers and British Columbians risk being misled about the challenges and opportunities with only a partial understanding of the salient issues. Carbon and energy dynamics are complex in many sub-sectors. Some indicators and targets may have only moderately high data quality and accuracy but are still sufficiently high to be useful for establishing a target. Moreover, there are likely some targets and indicators that are so useful for climate change mitigation and broader policy priorities, that efforts should be made to collect higher quality data, e.g. total driving activity (VKT - vehicle km travelled).
    - **Target Adjustment:** As with any good plan, there will be a need to fine tune targets as policies and plans progress, for instance:
        - ***EV Share of New Auto Sales:*** BC businesses and households have proven relatively eager to put their money down on a new EV. EV sales share of total new vehicles are much higher than was expected, and higher than anywhere in North America. It would be prudent to update new EV sales targets. This is an excellent target to include as it is one very strong indicator of B.C.'s potential to drive GHG reductions in the light duty vehicle sector.

        - ***Diverse events profoundly alter "normal" energy and emission activity:*** COVID-19 has profoundly altered carbon emissions in many sectors (residential and commercial buildings, transit, transportation writ large, some industrial sectors). It will take several years to bounce back to a *new normal*. The 2008 financial crisis profoundly impacted GHG activity in many sectors. These unexpected shocks will happen again, and some may change our economy and society in big ways. Targets and the target and indicator regime must adjust to these dynamics.
- ***Layered & Textured:*** A range of indicators should be developed that provide useful insight into effectively managing emission reductions in a sub-sector. A regime with thoughtful layers of targets and indicators supports strategic communication that is sensitive to different audiences' needs and interests and as a system fosters deeper literacy.
    - ***Leading and Lagging:*** The provincial target setting paper focuses on lagging or secondary indicators. These are indicators that are highly dependent on changes in other activities. Performance changes in these indicators aren't driving change. They lag behind other indicators. Targets associated with leading/primary indicators are critical because progress on these targets necessarily leads to GHG reductions.
        - Building GHGs are a lagging or secondary indicator. *Zero emission new buildings as a share of new construction*, *deep carbon reduction building retrofit rates*, new buildings by type, demolition rate…. are all leading or primary indicators. These leading/primary indicators identified are important for provincial analysts in multiple departments, diverse building sectors, local government building officials and planners.
        - *ZEV New Vehicle Sales / ZEV Share of Total Stock, Passenger Vehicle Stock per Capita, VKT* (vehicle km travelled), *Renewable Transportation Fuel Share* are all implementation focussed, primary or leading indicators important for another diverse set of analysts in provincial and local government, car dealers, transit authorities, fuel suppliers.

      The public and many senior decision makers may be focussed on lagging or secondary indicators. ***Leading or primary indicators are more important in guiding implementation, monitoring and continuous improvement.*** The provincial cabinet and local councils are typically more interested in lagging indicators, at least for the time being. Both are important.

    - ***Informational Indicators vs Performance Indicators (targets):*** Some indicators are very valuable in informing progress but do not necessarily strongly correlate to a change in performance, e.g. *Bike Route KM.* Bike route km is a moderately strong indicator of cycling potential, but does not necessarily lead to a predictable or big modal shift or congestion management or, ultimately, GHG reductions in passenger transportation. There are too many other variables, notably the urban (or suburban or rural) nature of those lane kms. New bike route kms in low density, highly distributed settlements far from services very modestly contribute to growth in cycling trips. Bike routes in medium to high density, mixed use areas, notably those with high employment can drive big shifts in cycling trips, such investments are, in fact, the lowest cost way to move people around a city. Bike route quality/safety also has a big influence on utilization. Bike route km is still a very useful indicator as it underscores the importance of active transportation as an important part of the solution matrix and, importantly, it has diverse co-benefits, i.e. affordability, public health. Population growth and economic growth rates are other informational indicators that provide important context influencing emission activity but are not necessarily part of an indicator regime. An effective target and indicator regime includes informational indicators and performance indicators.

TABLE 1: RECOMMENDED PROVINCIAL TARGETS AND INDICATORS FOR COMMUNITY SECTORS.

Indicator	Indicator Type / Unit	Relevance	Data Source(s), Reporting Frequency	Data Quality / Confidence
Transportation				
Renewable Fuel Share by type: gasoline, diesel, natural gas	Target % | % | %	**Strong indicator** of transportation GHGs	Source: EMLCI Frequency: Annual	High
Road lane KMs: total and growth	Informational km | %	Road/highway capacity is a **strong indicator** of vkt and car ownership, a major driver of BC transportation GHG and complementary provincial priorities, e.g. congestion, (transportation) affordability	Source: Statistics Canada, possibly MOTI Frequency: Annual	High
Infrastructure spending balance: Road-Bridge / Transit / Active / TDM	Target % | % | % | %	Transportation infrastructure spending type is a **strong indicator** of access to transportation modal choice and a major driver of BC transportation GHG and complementary provincial priorities, e.g. congestion, (transportation) affordability	Source: BC MOTI, Finance Frequency: Annual	High (can be further strengthened procuring local government spending)
Personal Transportation				
ZEV Share: New sales / Share of total stock	Target % | %	This is **strong indicator** of liquid transportation fuel consumption and, in turn, passenger transportation GHGs	Source: Electric Mobility Canada plus Frequency: Annual	High
Bike route KMs by type: triple A / total | growth	Informational km, % | km, %	Bike route km is a **moderately strong indicator** of cycling potential. (Long bike routes in lightly populated areas with few destinations have very low utilization rates.)	Source: open street map, possibly MOTI Frequency: Annual	Med-High (sufficient to be used; steadily getting better; can be easily strengthened)
Total driving distance: passenger/personal transportation vehicle km travelled (VKT)	Target km	This is a **strong indicator** of personal transportation GHGs over the next 15-40 years as light duty vehicle stock electrifies. It is also a very strong indicator of congestion and sustainable land use.	NRCan has course data. BC Government is improving data collection. This should continue, including consideration of alternative methods such as ICBC registration/renewal. This is an extremely valuable indicator for decision makers in climate, transportation and neighbourhood planning, notably when procured at finer geographies.	
Frequent transit service route km: total and growth	Informational km | %	Frequent transit service (every 20 mins / 12 hrs per day) is a **strong indicator** of mode choice and a major driver of BC transportation GHG and complementary provincial priorities, e.g. congestion, (transportation) affordability	Source: BC Transit, TransLink Frequency: Annual	High
High-capacity transit use: e.g. service hours at ≥50% capacity	Target %	Service utilization rate is a **moderately strong indicator** of effective land use integration and transit cost effectiveness and a major driver of BC transportation GHG and complementary provincial priorities, e.g. congestion, (transportation) affordability. COVID-19 underscores the vulnerability of transit.	Source: BC Transit, TransLink Frequency: Annual	High

Vehicle stock growth / population growth ratio	Target % / %	This is a **strong indicator** of sustainable land use and a major driver of LDV emissions, total driving, public health, affordability, sustainable land use	Source: Statistics Canada / ICBC / BC Stats Frequency: Annual	High
Car ownership per capita (personal LDVs)	Target # / #	This is a **strong indicator** of sustainable land use and a major driver of LDV emissions, total driving, public health, affordability, sustainable land use. This is very similar to vehicle stock growth / population growth ratio.	Source: Statistics Canada/ ICBC Frequency: Annual	
Commute to work/school (car, transit, walk, bike)	Target % | % | % | %	This is a **strong indicator** of personal transportation GHGs, transportation choice and integrated land use and transportation infrastructure planning	Source: Statistics Canada Frequency: Every 5 Years	Med-High (This data should be released as part of a special report every five years with other data that comes from the census.)
Smart growth: share of infill versus greenfield (e.g. forest, farmland) used for new development	Target % | %	This is a **strong indicator** of transportation GHGs, congestion, sustainable land use and forest carbon/urban forest canopy change. (Average commuting distance steadily rises every census reporting year.) It is also a strong indicator of local governments ability to effectively finance civic infrastructure over its lifecycle (the vast majority of local governments don't have the revenue and are unwilling to raise taxes/utility fees to operate, maintain and replace their civic infrastructure costs, in large part because linear infrastructure is so extensive and expensive).	Source: BC Assessment Authority, BC Land & Title Survey Frequency: NA	Medium (This data is available but not currently collected. It can be readily collected through BCAA new building data referenced against BC LTSA parcel map data)
Share of population by walkscore: walkers' paradise, very walkable, car dependent, very car dependent	Target % | % | % | %	This is a **strong indicator** of the potential of a population to walk for a share of their trips, cut transportation GHGs and sustainable land use. It is also strong indicator of transportation affordability, physical health (obesity, sedentary lifestyles) and associated health care costs.	Source: Walkscore.com plus or alternative Frequency: NA	Med-High (this data is available but not reported at a provincial geography. Some effort would be necessary to collect and analyze and prepare data to report provincially. Walkscore.com could be used or an expressly developed methodology.)
Buildings				
Net zero new building construction share of new buildings by type: zero carbon new buildings by Part 9, Part 3 Res, Part 3 Comm/Inst, Part 3 Mixed	Target % | % | % | %	This is a **strong indicator** of progress decarbonizing building stock	Source: Energy Step Council Frequency: Annual	Uncertain of data quality. This is critical data to collect and may be high quality. It may be appropriately integrated into BC Assessment Authority.
Deep carbon retrofit rate by building type: zero carbon new buildings by Part 9, Part 3 Res, Part 3 Comm/Inst, Part 3 Mixed	Target % | % | % | %	This is a **strong indicator** of progress decarbonizing building stock	This data is not being systematically collected across all building types, yet is critical to understanding progress on building decarbonization and informing policy and program design. EMLCI is working on such data collection and it should be actively supported.	
New high performance prefabricated new building construction by type Part 9, Part 3 Res, Part 3 Comm/Inst, Part 3 Mixed	Target # | # | # | #	This is a **strong indicator** of BC's ability to scale new construction *and* retrofits to decarbonize. It also complements the BC Governments mass timber policy objectives	Source: FPI/FII collects similar data Frequency: Annual	Data should be broadened to include energy/carbon performance, all pre-fabricated buildings including wood frame and mass timber, and across all building types.

Waste				
Share of organics in municipal residuals (going to landfills)	Target %	This is a **strong indicator** of CleanBC waste prevention targets and circular economy progress, and **moderately strong** indicator of landfill GHGs (as landfill gas capture rates vary). The indicator helps understand progress on meeting biomethane (renewable gas) targets.	Source: BC E&CCS plus Frequency: Annual	Moderate (data quality varies across province. Quality is sufficient for reporting and can improve)
Organic Diversion per capita: composting / energy	Target kg / kg	This is a **strong indicator** of CleanBC waste prevention targets and circular economy progress, and **moderately strong** indicator of landfill GHGs (as landfill gas capture rates vary). The indicator helps understand progress on meeting biomethane (renewable gas) targets.	Source: BC E&CCS plus Frequency: Annual	Moderate (data quality varies across province. Quality is sufficient for reporting and can improve)
Landfill Residuals per capita	Target kg	This is a **strong indicator** of CleanBC waste prevention targets and circular economy progress.	Source: BC E&CCS plus Frequency: Annual	Moderate (data quality varies across province. Quality is sufficient for reporting and can improve)
Deforestation				
Deforestation / Afforestation by Type: Agriculture / Forestry / Hydro / Oil & Gas / Urbanization	Target ha | ha | ha | ha | ha	This is a **strong indicator** of terrestrial carbon loss. It should be measured in tonnes of carbon loss as well as area loss. Some forest will be lost. Permanent forest loss forever compromises the ability to stabilize the climate.	Source: NRCan Frequency: Annual	Med-High

*Note: all indicators should have targets or performance assumptions with a time horizon (year)

2. Target Metrics - Consultation Questions & Answers

a) Do you agree with a percentage-based approach? Why or why not?

Yes. Percentage based targets provide insight into overall progress. But they are wholly insufficient to provide meaningful insight into where progress is being made or not, monitoring, continuous improvement and policy development. They provide very limited insight into key dynamics that are driving emission reductions (or growth). As discussed above, a combination of leading and lagging targets and indicators are essential for an effective regime. Now, it may be the case that 15 basic GHG percent reductions are the only ones established in legislation. Hopefully not. But if this is the case, then the importance of a high value target and indicator regime should be established. See Appendix One Sample

b) Should any sectors have a supplementary metric to complement percentage of emission reductions, e.g. emissions intensity? If so, what additional metric should be used to measure specific sectoral targets?

Yes. Every *sub-sector* should have multiple targets and indicators to foster a deeper understanding of the complex problems in each sub-sector. As discussed, some indicators should be associated with legislated targets and others should be informational. Targets should use both leading and lagging indicators. Leading indicators are much more important in guiding policy and program development for diverse public, private and social sectors. Lagging indicators are more important in helping understand overall progress.

See *Table 1: Recommended Provincial Targets and Indicators for Community Sectors.*

See *Appendix: Sample Target and Indicator Framework* to understand the relationship and integration of high level *lagging* community-wide GHG reduction targets, other accessible and resonant sectoral *leading* targets. All targets and indicators include base year data as well as future milestones. There are additional indicators with performance assumptions. These performance assumptions are intended to guide implementation and support monitoring and continuous improvement sector by sector. The Community's Climate Plan, lays out high level targets more elegantly. With more resourcing, a target and indicator regime can be more attractively organized to meet unique audience needs. An online dashboard would be user friendly interface.

3. Sector Groupings - Consultation Questions & Answers

a) Are you in favour of having a smaller (3 or 4) or a larger (8) number of sectors or something different? Why?

The greater the number of sectors, the better. Eight is still insufficient. Every one of these sectors must be broken down into sub-sectors to have a meaningful target and indicator regime, e.g. Buildings (part 9 residential and part 3 commercial, institutional, residential), Heavy Duty Vehicles (medium and heavy by class and/or by use), etc. High-level, lagging/secondary indicators are useful for informing policy design, monitoring, accountability on a wide range of policies and actions, but are not very useful for focussed policy and program design.

b) Which of the models achieve emission reductions for the province most fairly? c) How do you think this sector grouping could affect household affordability and/or business competitiveness?

These are not the most relevant questions in target and indicator design. Deep emission reductions are necessary in every sub-sector; zero carbon in 2050 is very deep. Fairness, equity, and competiveness are much more important in mitigation policy design, not targets and indicators. Indicators should be broad enough to account for diverse carbon management strategies.

d) Does this sector grouping in your opinion keep within the spirit of other design principles and priorities outlined earlier?

More detailed sub-sectoral targets and indicators are essential to meet design principles, objectives and priorities discussed above.

e) How can we continue to motivate emission reductions for the individual sub-sectors listed within the eight- and twelve-sector groupings?

As well as legislating sub-sectoral targets, stronger governance systems that include diverse sectors like B.C.'s exceptional step code council are necessary in other sectors, to direct efforts for capacity/literacy building and integrated policy innovation that drives carbon reductions into other policy priorities like transportation and housing affordability and ecosystem resilience.

This target regime needs a broader suite of indicators, and keystone data needs to be provided at appropriate scales, building on B.C.'s global leadership established with the Community Energy And Emission Indicator System**. This initiative should be coupled with a Data Platform for uploading and downloading data for different sectors at scales and within sectors** that fundamentally matter, e.g. municipalities and regional districts should be able to download data, as should auto dealers and freight transportation sectors.

f) Do you have any suggestions to help improve results or address concerns?

Yes. **Integrate all Renewable Cities insights and recommendations above and below.**

4. Other Design Features - Consultation Questions & Answers

a) What tools (e.g. offsets, future technological improvement, purchased credits, verification mechanisms) for achieving the target over and above direct emission reductions would you support and why? Are there any tools you would not support? Why not? Are there other tools that we should be considering?

While extremely important, this question cannot be easily answered as part of this consultation. Answers to these questions are really more important to inform the intensity of a target vs the suite of targets.

Some key points, regardless:

- ***Carbon pricing is overplayed & more sensitive politically than consumer activity.*** Carbon pricing is effective for large carbon intensive industries and sectors and largely ineffective for medium and small consumers unless prices are significantly higher. However, if/when carbon taxes are being raised, attractive options must be developed in advance to manage opposition. Unpopular taxes, regardless, of their wisdom (or not) on paper can sink governments: federal GST, BC HST, 13 Colonies Tea Tax, UK Poll Tax. The risks of associating our important climate action agenda with such an unpopular tax are great. Carbon pricing is needed. Thoughtful policy design with carbon pricing and broader mitigation policy is essential. **The contribution to meeting targets from consumers from carbon pricing should be tempered.**
- ***Good Governance should be thoughtfully considered and is largely overlooked*** despite the Step Code and Step Code Council being such an extremely effective approach for getting diverse players around the table to solve complex problems and build common ground. This is proven in other jurisdictions in other sectors where step changes in emission activity have been driven, e.g. Transportation Electrification in Netherlands, Waste, Circular Economy and Biomethane in South Korea. If B.C. is to successfully drive step changes in other sectors, it will need similar multi-level, multi-sectoral governance institutions, e.g.
    - Zero Emission Transportation Council focusing on electrification for LDVs and largely electrification as for MDV/HDVs and other transportation sectors.
    - Organic Waste and the Circular Bioeconomy that includes generation of biomethane, industrial/food grade CO2 to replace natural gas in horticulture, fertilizers, etc.
    - Integrated Transportation, Housing, Land Use & Affordability
    - …

  If good governance regimes are more comprehensively integrated into CleanBC, sharing policy-making with diverse stakeholders, notably including emerging industries and innovators versus only established players, more ambitious targets can be set.

- ***Innovative financial tools*** should be considered more robustly. The capital necessary to decarbonize some sectors is immense. Grants and large public expenditures are inadequate and often have sub-optimal performance requirements (carbon, equity, transit ridership, etc.). For example:
    - ***Impact Investment:*** Deeper thinking is needed around how the provincial and federal government use scarce dollars to accrue lower returns and higher risk to leverage massive private sector financing through impact investment. The emerging Metro Vancouver Zero Emission Innovation Centre will be one such mechanism.
    - ***Low Friction Financing Instruments:*** Hopefully current CAS analysis regarding PACE (Property Assessed Clean Energy) surfaces more comprehensive insights into low friction financing instruments. PACE may be a good tool for some sectors, but the administrative burden is high for many local governments. On bill financing is likely much better for most households. The source of capital still has to determined and will not likely be utilities. Turnkey wrap-around services to deliver the retrofits are as important as the financial instrument. ESCO enabling policies are worthy of deeper consideration. Thinking should go beyond buildings. Micro electric mobility is a powerfully disruptive zero emission innovation with measurable potential for shifting modes, cutting carbon and congestion a significant amount—by several percentage points.. With bulk purchasing of other programs that promise scale, consumers should be able to easily finance an e-bike or e cargo bike for $100 a month over a couple of years through a low friction financing instrument such as on bill financing with their home energy bill.
    - ***Managing Fuel Tax Revenue Loss & Surging Car Stock, Congestion & Carbon:*** All jurisdictions must contend with fuel tax revenue loss from transportation electrification. While fuel taxes fund only a modest share of transportation infrastructure funding, they are critical revenue. At the same time, there is an urgent imperative to get better value for dollar for large transportation infrastructure projects, e.g. the 2009 Sea to Sky billion dollar upgrade is now often at capacity and contributes to North Vancouver highway and bridge-crossing gridlock. Generous subsidies to driving, in the form of large highway and bridge expansions, are driving growth in carbon and actually fueling congestion, not managing it. There is also an imperative to manage congestion in road-based transportation, the largest GHG sector, which has continued to grow since 2007 while most other sectors are dropping.

      A politically feasible solution is instituting a distance-based user fee for electric vehicles. This is an entirely fair charge to account for their omission in contributions to gas tax revenue. This increased cost can be offset with generous holidays over the next decade to EV owners in the form of discounted ferry fees, access to HOV lanes, premium parking spaces, etc. As more and more of the vehicle stock is electrified, these holidays would need to become less generous. Distance-based road fees can be methodically phased in for entire sectors, e.g. ride hailing or urban freight (e.g. Amazon) or long haul freight. All internal combustion engines would be covered by this fair regime for financing road use.

      Jurisdictions around the world are turning to road pricing to effectively manage growth in car stock, driving and congestion, and to fairly finance road infrastructure capital and maintenance costs.
- ***Sustainable land policies*** must be better integrated into climate mitigation, this target and indicator regime and other key provincial mandates, notably affordability. B.C.'s fastest growing neighbourhoods spend more money on transportation than housing, undermining household affordability. They are situated in car-oriented, greenfield developments, e.g. the outer rings of Metro Vancouver, the Fraser Valley and Squamish, as well as other regions of B.C. (e.g. South Island, Okanagan). Costly highway and bridge projects and increasingly inadequately conceived rapid transit projects subsidize their growth and drive transportation carbon, terrestrial carbon loss, congestion, civic infrastructure deficits, obesity and

vulnerability to climate change impacts. Sustainable land use policies can reverse all these trends, including housing affordability. Most of these policies are negative cost solutions, i.e. they make money. Decarbonization will be expensive, but approaches too often focus on higher cost solutions while avoiding the low to zero to negative cost solutions.

A Suite of Swedish Solutions for Surging Transportation GHGs

Transportation has become the largest and most stubborn GHG sector in most jurisdictions around the world. Sweden is the only country in Europe to successfully reduce transportation GHGs below 1990 levels, the original UNFCCC emission base year. Sweden has deployed a wide range of policy levers. B.C. uses some of these levers: carbon pricing, renewable fuels, ZEV mandate—all of which are more intense in Sweden than in B.C. Sweden also uses: road pricing, transit/active travel/road budget balancing, sprawl management (Sweden has Europe's lowest rate of sprawl. The vast majority of growth is intensification. Loss of agricultural land is halted.) B.C. needs this range of strategies underpinned by strong performance indicators.

To win the high stakes game of climate scrabble, B.C. must start playing more double and triple word scores. With notable exceptions, e.g. Low Carbon Fuel Standard and Passenger Transportation Board's hybrid taxi policy both of which have multiple benefits, the vast majority of B.C. policies are small, single word scores. Meeting multiple policy objectives with systems solutions is essential to cost effectively drive change and achieve equity, prosperity and broader environmental outcomes.

- **Sustainable land use has a negative cost**, i.e. it saves money and has multiple benefits, as discussed above.
- **Moving building construction onto the assembly line** can cut costs, increase quality control (building performance) and create secure jobs in forest dependent communities.
- **Future biomethane projects** should consider industrial CO2 generation to displace natural gas in greenhouses, and nitrogen and phosphorus fertilizer production. Surrey's biofuel project and Abbotsford's anaerobic digester project (biomethane generation from municipal organics and dairy manure, respectively) are excellent forays into natural gas decarbonization.

b) Which characteristic(s) of a sector should influence assigning a more stringent target? Why?

- *Lower abatement cost*
- *High emissions*
- *Growing emissions*
- *Available abatement options*
- *Lack of competitiveness or affordability concerns*
- *Ease of implementation*

All of the above are important. There are additional essential considerations:

- ***Capital Stock Turn Over Rates & Carbon Lock In:*** In order to meet long-term targets, time is of the essence to drive zero and ultra-low emission innovation into new assets, notably those with long life expectancies and/or stubborn components, e.g. buildings and building envelopes for instance.
    - Despite the low share and modest carbon intensity, these assets are extremely urgent to rapidly decarbonize
    - Existing buildings are still urgent, but not extremely urgent

- ***Emission <u>Growth</u> Rate***: Because there is a short-term atmospheric stabilization imperative and the BC Government is far from being able to reach it, an urgent priority should be placed on those sectors with emissions that are stubborn (not dropping) or continuing to rise notably if they are large sectors. Targets should be more aggressive, e.g.
    - ***Light duty passenger vehicles:*** this includes light duty cars and trucks/vans/SUVs
        - ***100% ZEV new sales should be moved to 2030*** (100% stock turn over takes 30 years. It is already too late to achieve zero carbon passenger transportation by 2050 and this is a relatively easy sector).
        - ***Population Growth to Vehicle Stock Ratio should become 1:1*** (like Sweden today) by 2030. A major driver of LDV growth in the last 20 years and current sectoral stubbornness is B.C.'s surging growth in vehicle stock, growing at two times the rate of the population, largely due to car-oriented urban growth patterns subsidized by generous road and bridge subsidies, and inadequate land use and transportation infrastructure integration. Given other activities, e.g. LNG, and the size of this sector, B.C. cannot reach its 2030 targets without managing total vehicle growth.
    - ***Urban freight delivery***: like the LDV sector, similarly requires diverse indicators to reflect the diverse strategies needed, e.g.
        - ***ZEV mandate for urban freight delivery*** for total vehicle stock (not just new sales) with targets and timetables.
        - ***Electric assist urban freight delivery share*** to diversify fleet.

c*) Which characteristic(s) of a sector should influence assigning a less stringent target?*

- *Higher abatement costs*
- *Proven impacts on competitiveness or affordability*
- *Higher likelihood of carbon leakage (activity relocating other jurisdictions)*
- *Past emissions abatement efforts*
- *High employment sector or high job growth potential*
- *Abatement/ policy implementation challenges*
- *Other*

It is critical to keep the new provincial 2050 target in mind: 0 GHGs. All these characteristics matter and should be considered in *how* emissions are reduced, but this does not necessarily mean the intensity of a target should be less stringent, at least over the long-term. Yes, nevertheless, there are reasons to adjust intensity over time based on strategic criteria, some important ones discussed under 4b (above), reiterated:

- Net Zero Carbon *New* Building construction is *extremely urgent* to achieve by 2030 to avoid carbon lock in, e.g. 2032 province-wide in all building types, notably large commercial/institutional.
- Net Zero Carbon *Existing* Buildings, i.e. retrofits, is simply *urgent* and intensity can be ramped up a little, more slowly and methodically.
- 100% ZEV new sales for LDVs is extremely urgent to accelerate and achieve by 2030 to simply meet CleanBC's 2030 *and* 2050 targets. It is imminently achievable, with perhaps some lag time for specialized LDV trucks. 80% LDV stock turn over takes 20 years. 100% LDV stock turn over takes 30.
- Integrated land use and transportation strategies and, in turn, high intensity targets (see table) are extremely urgent to meet 2030 and 2050 LDV targets and avoid carbon lock in. These strategies and targets are to manage demand of surging passenger vehicle growth (see "Population Growth to Vehicle Stock Ratio" above).
- Medium and Heavy duty trucks demand much more nuanced and differentiated strategies and targets, reflecting diverse classes and uses and varied capital stock turn-over rates, growth rates, technology solutions (battery electric, possibly hydrogen fuel cell, and renewable diesel and biomethane) and complementary strategies (electric assist, centralized distribution depots, rail freight…)

- Urban freight delivery strategies and targets demand unique, immediate and high intensity attention due to surging growth in online shopping, and the implications for 2030 targets and carbon lock in.

For More Information

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Renewable Cities, a program of SFU Morris J. Wosk Centre for Dialogue, works with policy-makers and practitioners to accelerate the transition to renewable, restorative, resilient cities through meaningful engagement, critical research, capacity building and policy innovation.

Appendix: Sample Target and Indicator Framework

This community target and indicator framework shows the high level lagging community GHG targets by milestone year as well as some other easily comprehensible sectoral leading targets that were resonant for the community. There are additional indicators with performance assumptions for the base year as well future milestones. These performance assumptions are intended to guide implementation and support monitoring and continuous improvement sector by sector. With more generous resources, a layered target and indicator regime can be more elegantly organized and presented to meet unique audience needs.

Community Energy + Emission Target & Indicator Framework (2015)

The following energy and emission targets and indicators serve as a record of key inputs and outputs used in the modeling of this Plan (see "In" and "Out" in the table below). More importantly, they support climate action planning, implementation and monitoring.

While community wide GHG reductions are the ultimate objective of this Plan. Emission reductions are a *lagging* indicator. Emission reduction (or growth) follows energy and emission activities that can be measured with *leading* indicators. A combination of good leading and lagging GHG indicators can help guide policy and planning, implementation and monitoring. Moreover, many of these indicators are useful for supporting other District objectives.

The District will develop a short list of key performance indicators to report out on annually to staff, council and the public, and integrate into work plans. Some key performance indicators have targets already associated with them. They are listed at the begining of *Part II: Strategic Directions* in the Plan, and at short term sectoral targets table, below. As detailed policy and planning proceeds to implement the strartegic directions, other targets will be developed, and these initial targets may revised.

Indicators (and targets) worthy of consideration should meet several criteria:
–*Meaningful* to Staff (helpful for climate action/lines of business), Council (resonant), *and/or* the public (understandable and resonant)
–*Relevant* (i.e. an important indicator of GHG growth/reduction)
–*Verifiable* (supported by good to great quality data that is readily accessible or cost effective/human resource efficient to collect)

Monitoring indicators are */starred below, many of which are already tracked by the District for other purposes, but not linked to climate action.

Community Climate Action Plan Targets + Timelines					
Type	Milestone	Target	GHGs	5 Yr Reduction	Reduction/Yr ∞
Base Year	2010	–	260,000	–	–
Interim	2020	5%	247,000	13,000	2,600
Interim	2025	10%	234,000	13,000	2,600
Interim	2030	20%	208,000	26,000	5,200
Interim	2035	30%	182,000	26,000	5,200
CEE Plan Target	2040	40%	156,000	26,000	5,200
Trend	2045	45%	143,000	13,000	2,600
Trend	2050	50%	130,000	13,000	2,600
Official Community Plan Target Reference		Target	GHGs	43 Yr Reduction	Reduction/Yr
OCP Target*	2050	80%	0	0	0

∞Reduction intensity based on average over 5 year reporting interval
*OCP target reduction intensity based on 43 years from 2007 base year (N.B. a 30% gap exists under existing strategies)

Short-Term Sectoral Targets	**2020 Target**	**2025 Target**	**Current**
Community + Neighbourhood Planning¥			
Share of New Growth in Walkable Villages*	70%	80%	45%
Housing + Buildings			
Housing Options: High Rise Share of New Growth*	30%	35%	22% of current
Housing Options: Missing Middle Share of New Growth*¥	15%	25%	10% of current
Annual Single Detached Energy Retrofit Rate (Homes)	1.25% (125)	2% (200)	.75% (75)
Transportation Systems			
New Sidewalks	10 km	20 km	90 km existing
New All Ages and Abilities Bike Routes	15 km	20 km	<5 km existing
4. Trash + Treasure: Solid Waste + Materials Management			
Annual Solid Waste Disposed Per Household	225 kg	200 kg	250 kg
5. Cross Cutting Strategies			
Climate Action Council Report∞	Annual	Annual	BC Climate

†Neighbourhood + Community Planning and Housing + Buildings targets may be revised during the OCP process.
**New* growth excludes housing replacements (i.e. demolition and replacement of single detached homes)
¥"Missing Middle" includes duplex, rowhouse, low/mid-rise housing of which there is very little in West Vancouver.
∞The District annually reports to the BC Government on Climate Action to receive carbon tax rebate/grant (CARIP). This reporting can be enhanced.

<—Priority Monitoring Indicator

Target & Indicator Framework

	Land Use, Cross Sectoral + Community		2010	2025	2040	Change		Model In/Output
*	**Community Wide GHGs** CO2e t	Transportation, Buildings, Waste	259,000	199,000	156,500	-40%	Net Change	Out
		Business As Usual			200,000	-23%		
	Per Capita GHGs CO2e tonnes	Total w commercial, institutional	6.05		3.14	-48%	Net Change	Out
	Population		42,800		49,900	<1%	Annual Growth	In
	WV jobs	Standard Workplace	15,106		18,177	<1%	Annual Growth	In
		Homebased	3,094		3,723	<1%	"	
		Total	18,200		21,900	<1%	"	
*	**Resident to Employee Ratio**	Local Residents/Local Jobs	2.35		2.28			In
	Share of population by area	Park Royal-Ambleside-Dundarave	19%		20%	25%	Growth Share	In
		Sentinel Hill-Cedardale	7%		7%	5%	"	
		Upper Dundarave-Ambleside	11%		9%	2%	"	
		Lower Levels-West	24%		23%	15%	"	
		Horseshoe Bay (w Sunset Marina)	5%		6%	15%	"	
		Northeast Upper Lands	30%		27%	8%	"	
		Northwest Upper Lands	4%		8%	30%	"	
*	**Housing split**	Single Detached	67%		55%	-5%	Growth Share	In
		Town/Rowhouse (+Duplex, Coach)	6%		11%	25%	"	
		Low / Mid Rise Wood	4%		11%	50%	"	
		Mid / High Rise Concrete	22%		22%	30%	"	
	Housing Occupancy	Single Detached	2.93		2.78	-5%	Net Change	Out
		Town/Rowhouse	2.30		2.19	-5%	"	
		Low / Mid Rise Wood	1.20		1.14	-5%	"	
		Mid / High Rise Concrete	1.50		1.43	-5%	"	
*	**Population share by walkability category - CEE Plan** (Car dependent neighbourhoods >60% obesity/overweight likelihood)	Walker's Paradise | Walkscore 90-100	0.9%		13%	1429%	Net Change	Out
		Very Walkable | Walkscore 70-89	16%		21%	31%	"	
		Somwhat Walkable |Walkscore 50-69	31%		21%	-32%	"	
		Car Dependent | Walkscore 0-49	52%		45%	-13%	"	
*	**Population share by walkability category - BAU Future** (Car dependent neighbourhoods >60% obesity/overweight likelihood)	Walker's Paradise | Walkscore 90-100	0.9%		10%	1076%	Net Change	Out
		Very Walkable | Walkscore 70-89	16%		13%	-19%	"	
		Somwhat Walkable |Walkscore 50-69	31%		28%	-10%	"	
		Car Dependent | Walkscore 0-49	52%		49%	-6%	"	
*	**Population 400 m to key transportation amenities**	Basic Bus (5 min walk)	85%		91%	7%	Net Change	Out
		Frequent Transit (every 15 mns 7 to 7)	31%		66%	111%	"	
		Basic Bike Network	70%		86%	22%	"	
		Triple A Bike (All Ages + Abilities)	8%		51%	573%	"	
	Annual civic infrastructure and services cost - community	CEE Plan			$110,092,500	9%	Savings over BAU	Out
		Business As Usual			$121,591,000			
	Annual civic infrastructure and services cost - per household	CEE Plan			$5,280	8%	Savings over BAU	Out
		Business As Usual			$5,770			
*	**Forest Loss** Hectares (ha)	CEE Plan			21	68%	Savings over BAU	Out
		Business As Usual			66			
		Avoided Forest Carbon Loss			45			
	Forest Carbon Loss tonnes (t)	CEE Plan			2,500	78%	Savings over BAU	Out
		Business As Usual			11,300			
		Avoided Forest Carbon Loss			8,800			
	Buildings + Land Use		2010	2025	2040	Change		Model Input/Output
*	**Building GHGs** Tonnes CO2e	Single Detached	104,000	95,000	83,200	-20%	Net Change	Out
		Multi Family	14,000	14,900	15,700	12%	"	
		Commercial	15,000	13,200	12,500	-17%	"	
		Total	133,000	123,100	111,400	-16%	"	
*	**Energy retrofit rate** Pre 2007 Buildings % at 10% | % at 20%	Single Detached	0.75%	1.5%| 0.5%	1.5%| 0.5%	150 Low + 50 High per yr		In
		Pool	–	2%	2%	30 per yr		
		Town/Rowhouse/Duplex	0.75%	0.75%	2%			
		Low/Mid Rise	0.75%	0.75%	2%			
		Mid/High Rise/Commercial	0.75%	0.75%	2%			

*	**Building stretch code**	Single Detached	0	90%	75%	>3,500 sq ft		In
	Share of buildings meeting	Pool	0	100%	100%			
	a provincial stretch code	Town/Rowhouse/Duplex	0	90%	90%	Exclude coach, small homes		
	(assumes 25% beyond code)	Low / Mid Rise (Wood)	0	0%	0%			
		Mid/High Rise	0	100%	100%			
*	**Housing size**	Single Detached	5,500	5,225	4,950	-10%	Net Change	In
	Average new (square feet)	Town/Rowhouse/Duplex	1,750	1,575	1,400	-20%	"	
		Low/Mid Rise	1,175	1,050	950	-19%	"	
		Mid/High Rise	1,525	1,375	1,200	-21%	"	
	Energy code compliance	Single Detached	90%		95%			In
	Share of new construction	Town/Row House	90%		95%			
	meeting energy code	Low/Mid Rise	90%		95%			
	assumptions	Mid/High Rise	70%		95%			
*	**District energy share**	Share in New Low/Mid Rise Units	0%	30%	30%	V small share of total		In
	Cypress Village/Park Royal Only	Share in New High Rise Units	0%	50%	50%	community square footage		
	Strategy bundle reductions	BC Building Code, Local Stock Turnover, Smarter Growth			6,900	5%	Reduction Share	Out
	Tonnes CO2e	New Building Choices (shift to missing middle, multi-family)			6,250	5%	"	
	reduced in sector	Building Retrofits (single detached dominant)			5,325	4%	"	
		New Building Stretch Code			2,110	2%	"	
		DistrictEnergy			1,050	1%	"	
		Total			21,635	17%	"	
	Energy use intensity by building ty	**Electricity Use**						
	CEE Plan	1 family/duplex, electric heat	0.32	0.17	0.14	-54%	Net Change	In
	(GJ/m2)	1 family/duplex, gas heat	0.12	0.08	0.08	-34%	"	
		Row, electric heat	0.35	0.21	0.18	-48%	"	
		Row, gas heat	0.19	0.15	0.14	-26%	"	
		Low-rise apt units, electric heat	0.28	0.20	0.17	-38%	"	
		Low-rise apt units, gas heat	0.18	0.15	0.13	-23%	"	
		High-rise apt units, electric heat	0.29	0.16	0.14	-52%	"	
		High-rise apt units, gas heat	0.27	0.16	0.14	-48%	"	
		Commercial	0.55	0.36	0.32	-42%	"	
		Gas Use						
		1 family/duplex, electric heat	0.03	-	-	-100%	Net Change	
		1 family/duplex, gas heat	1.19	0.58	0.50	-58%	"	
		Row, electric heat	0.03	-	-	-100%	"	
		Row, gas heat	0.93	0.55	0.48	-48%	"	
		Low-rise apt units, electric heat	0.70	0.60	0.54	-24%	"	
		Low-rise apt units, gas heat	1.84	1.31	1.14	-38%	"	
		High-rise apt units, electric heat	0.83	0.54	0.48	-42%	"	
		High-rise apt units, gas heat	1.61	0.93	0.82	-49%	"	
		Commercial	0.39	0.23	0.21	-47%	"	
	Energy use intensity by building ty	**Electricity Use**						
	Business As Usual	1 family/duplex, electric heat	0.32	0.24	0.24	-25%	Net Change	In
	(GJ/m2)	1 family/duplex, gas heat	0.12	0.12	0.12	0%	"	
		Row, electric heat	0.35	0.23	0.23	-36%	"	
		Row, gas heat	0.19	0.16	0.16	-12%	"	
		Low-rise apt units, electric heat	0.28	0.17	0.17	-40%	"	
		Low-rise apt units, gas heat	0.18	0.12	0.12	-30%	"	
		High-rise apt units, electric heat	0.29	0.14	0.14	-51%	"	
		High-rise apt units, gas heat	0.27	0.14	0.14	-48%	"	
		Commercial	0.55	0.51	0.51	-8%	"	
		Gas Use						
		1 family/duplex, electric heat	0.03	-	-	-100%	Net Change	
		1 family/duplex, gas heat	1.19	0.83	0.83	-30%	"	
		Row, electric heat	0.03	-	-	-100%	"	
		Row, gas heat	0.93	0.60	0.60	-35%	"	
		Low-rise apt units, electric heat	0.70	0.55	0.55	-21%	"	
		Low-rise apt units, gas heat	1.84	1.23	1.23	-33%	"	
		High-rise apt units, electric heat	0.83	0.77	0.77	-7%	"	
		High-rise apt units, gas heat	1.61	1.37	1.37	-15%	"	
		Commercial	0.39	0.25	0.25	-36%	"	
	Energy use GJ	Electricity	1,217,879		1,213,754	-0.34%	Net Change	Out
		Natural Gas	2,493,790		2,163,166	-13.26%	"	
		Total	3,711,669		3,376,920	-9.02%	"	
*	**Building replacement rate**	Annual rate	1.15%	0.75%	0.75%	-35%	Net Change	In

Note - Emission Factors: Natural Gas kg/GJ: 49.99 (2010-2040) **Electricity** kg/GJ: 6.944 (2010) 2.777 (2016-2040)

	Recommended Data Collection	Renewable energy installation	Integrate into permitting data collection: Geoexcchange/air/water heat pump, solar therma/PV…					
		Building energy retrofit	Integrate into permitting data collection: retrofit type/intensity, ideally EnergGuide ratingΔ					
		Buildings beyond code	Integrate into permitting data collection: LEED, Built Green, Energy Star, Passive, Stretch Code					
	Transportation + Land Use		**2010**	**2025**	**2040**	**Change**	**Model Input/Output**	
*	**Total Transportation GHGs**	Personal Vehicles	96,000	61,400	37,700	-61%	Net Change	Out
	Tonnes CO2e	Commercial Vehicles	5,800	4,900	4,600	-21%	"	
		Transit	1,800	1,000	900	-50%	"	
		Total	103,600	67,300	43,200	-58%	"	
	Car share access + participation	Park Royal, Ambleside, Dundarave	<1%	20%	70%	Households may shed marginally		In
	households	Caulfield, Cypress, Horsehsoe Bay	<1%	10%	45%	used 2nd cars. Overall access to cars		
		Micro Markets	0%	5%	15%	rises.		
*	**Electric automobile share**	Passenger Vehicle (CEE Plan)	<1%	15%	40%			In
		Business As Usual Passenger Vehicles	<1%		30%			
		Transit Bus Share	0%	0%	0%			
	Total personal automobiles	With Car Share (CEE Plan)	27,836		21,197	-24%	Net Change	Out
	Community wide	Without Car Share			25,789	7%	"	
		Business As Usual	27,836		30,677	10%	"	
*	**Automobiles per capita**	Avg # with Car Share (CEE Plan)	0.66		0.42	-36%	Net Change	Out
		Without Car Share	0.66		0.52	-21%	"	
		Business As Usual	0.66		0.61	-8%	"	
	Average daily personal driving	Household	95		82.7	-13%	Net Change	Out
	km	Business As Usual	95		90.0	-5%	"	
	Total community personal	Total km with Car Share (CEE Plan)	373,590,674		412,504,496	10%	Net Change	Out
	vehicle distances travelled per yea	Without Car Share	373,590,674		482,011,573	29%	"	
	km	Business As Usual	373,590,674		573,999,957	54%	"	
	Average daily transit passenger	Household	8.0		9.3	16%	Net Change	Out
	distances per household (km)	Business As Usual	8.0		9.4	18%	"	
	Total community transit	Total km by transit	45,615,900	45,139,273	55,621,800	22%	Net Change	Out
	passenger km per year	Business As Usual	45,615,900		57,900,547	27%	"	
*	**Transportation network km**	Road	374		396	6%	Net Change	In
		Basic Bus	117		150	28%	"	
		Frequent Transit (every 15 7 to 7)	5		23	369%	"	
		Electric Ferry	-		Vancouver			
		Pedestrian	90		117	30%	"	
		Basic Bike	70		115	64%	"	
		Triple A Bike (All Ages + Abilities)	7		37	469%	"	
	Fuel use	Total Gasoline (l)	41,055,284	41,055,284	15,162,703	-63%	Net Change	Out
	Volume	Total Diesel (l)	1,393,449	1,393,449	390,107	-72%	"	
		Total Other (l)	25,955	25,955	9,187	-65%	"	
		Total Electricity (kW-h)	4,270	4,270	32,533,692	761813%	"	
	Fuel use	Gasoline (GJ)	1,467,422	903,703	552,155	-62%	Net Change	Out
	(GJ)	Diesel (GJ)	152,245	97,781	72,886	-52%	"	
		CNG (GJ)	1,231	960	661	-46%	"	
		Electricity (GJ)	34	65,016	149,816	439371%	"	
	Strategy bundle reductions	Senior Gov Vehicle Standards, Stock Turn Over, Smarter Growth			30.0%	30%	Reduction Share	Out
	Tonnes CO2e	Local Electric Car, Low Emission Vehicle Action			7.5%	8%	"	
	reduced in sector	SmartGrowth			7.5%	8%	"	
		Car Sharing			6.5%	7%	"	
		Transit			4.5%	5%	"	
		Active Travel			2.0%	2%	"	
		Total			58.0%	58%	"	
	Vehicular carbon intensity	Passenger Vehicles	257	156	91	-65%	Net Change	In
	CEE Plan	Transit (vehicle km | passenger km)	358 | 87	277 | 67	208 | 51	-72%	"	
	g CO2e / km	Commercial Vehicles	440	282	201	-54%	"	
	Weighted avg for vehicl/fuel mix	Tractor Trailors	1,012	714	715	-29%	"	
	Vehicular carbon intensity	Passenger Vehicles	257	171	110	-57%	Net Change	In
	Business As Usual	Transit (vehicle km | passenger km)	358 | 87	313 | 76	313 | 76	-14%	"	
	g CO2e / km	Commercial Vehicles	440	308	243	-45%	"	
	Weighted avg for vehicl/fuel mix	Tractor Trailors	1,012	714	715	-29%	"	
*	***Recommended Data Collection***	EV Charging Stations Count	Transportation or Sustainability (Level II Chargers / 100,000 sq foot institutional/commercial)					
*		Car Share Count	Transportation or Planning collect					
*		EV Count	Transportation collect through ICBC					

	Solid Waste + Material Management		2010	2025	2040	Change		Model Input/Output
	Community Solid Waste GHGs Tonnes CO2e	CO2e from solid waste landfill decomposition or combustion in energy recovery facility	23,100	10,400	3,900	-83%	Net Change	Out
	Community Solid Waste Disposed	Total SW tonnes to landfill or energy recovery from waste facility	13,400	7,800	5,400	-60%	Net Change	In
*	**Disposed Solid Waste Per Capita/ Per Employee** (i.e. NOT composted or recycled)	Single Detached: kg per capita	156	69	65	-58%	Net Change	In
		Multi Family: kg per capita	222	100	75	-66%	"	
		Commercial: kg per employee	416	150	110	-74%	"	
	SW Tonnage and GHGs By Management Type (CEE Plan = BAU)	Waste Landfilled (t)	10,258	4,560	2,120	-79%	Net Change	In
		GHGs Landfill (tCO2e)	22,665	9,968	3,454	-85%	"	Out
		GHGs / tonne	2.209	2.186	1.629	-26%	"	Out
		Waste to Energy Recovery Facility (t)	3,240	3,240	3,240	0%	"	In
		GHGs Energy Recovery (tCO2e)	432	432	432	0%	"	Out
		tonne of GHGs / tonne of waste	0.13	0.13	0.13	0%	"	Out