



71

CENTRAL COAST REGIONAL DISTRICT

DATE: 01 October 2015

TO: Board Chair Reginald Moody and Board Members

FROM: Director Alison Sayers

SUBJECT: **Area C Director's Report for September 2015**

UBCM:

It was a very busy and marvelous convention. Here are some highlights, learnings, and recommendations based on my experience:

Highlights:

- Elected to UBCM Executive as a Director at Large for 2015-2016. Thank you all CCRD Directors for your nomination and support with this.
- Chosen as one of three members of the Coastal RD Chairs group to address Minister Todd Stone directly regarding BC Ferries. (Coastal RD Chairs are continuing to work with Minister Stone and his staff regarding formation of a working group consisting of Chairs, Chiefs, BC Ferries, and MOT.)
- Many important resolutions were passed by the membership, which can be found on the UBCM website.
- Productive meetings with MCSCD staff regarding governance/restructuring study, and SCIF (and similar) funding
- Productive informal meeting with NDI staff regarding applications to the regional infrastructure development account

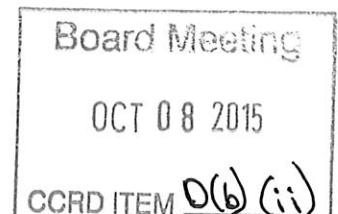
Learnings:-

Resolutions:

- Voting on resolutions is not necessarily equitable. I will be asking about this at Executive in November.
- Resolutions are a great opportunity for local government to influence the province.

First Nations, Reconciliation, Government-to-Government Work:

- There are more than 350 non-treaty agreements between Local Government and First Nations in BC
- Federation of Canadian Municipalities, Reconciliation Canada, and UBCM are all a wealth of information regarding government-to-government work with First Nations Chiefs and Councils



- First Nations governments are not necessarily interested in meeting other local government timelines. They are dealing with massive social and economic issues in their own communities; therefore they may not place CCRD timelines high on their priority list.
- UBCM is the only government association in Canada to unanimously pass a reconciliation resolution
- Canada is 6th in the world in social/health/economic well-being; Indigenous Canada is 63rd
- Inuit people have the highest suicide rate in the world

Backcountry/Recreation:

- Roadless backcountry in BC is shrinking at an alarming rate
- BC Parks is badly underfunded
- BC's parks are a huge economic driver however Parks budget is only .07% of total BC budget

Emergency Management:

Emergency Management BC is doing a lot of good work regarding increasing readiness for disaster at the provincial level. However there has been no forward movement with regards to resolving the issue of diking authority. (Note: UBCM members passed a resolution requesting that diking authority be returned to the province.)

Recommendations: (this is a lot, I know; our first step should be prioritizing)

UBCM:

- We should budget for two (or more) CCRD Directors to attend the UBCM convention in 2016. As a UBCM Executive, I will have responsibilities at the convention, and I do not feel it is a good idea for me to be the only one attending, as our Board will miss too many opportunities for learning and making change.
- CCRD needs a system in place for Board review of all resolutions to be voted on at convention.
- CCRD needs a system in place for proposing resolutions to UBCM Executive (or better yet to AVICC), to potentially be voted on at convention.

Reconciliation:

- Policy: All CCRD Board and staff read all 94 of the Truth and Reconciliation Commission's (TRC) Calls To Action
- CCRD needs to formally adopt all relevant TRC Calls To Action (there are 16 that are targeted at or include local government) starting with reading, then adopting and implementing, the UN Declaration on the Rights of Indigenous Peoples
- The second Call To Action that should be adopted is #57, which refers to educating all public servants (staff and elected officials) in intercultural competency, human rights, and anti-racism

- CCRD also should consider renaming of important places with indigenous names (renaming Walker Island would be an example of this), and raising of Nuxalk, Heiltsuk, and Wuikinuxv flags (or something similar) at CCRD office.
- CCRD should extend another invitation to all Chiefs and Councils for Community to Community work, with the intent of applying for a grant from UBCM next March.
- All elected officials and employees of CCRD, if not residential school survivors themselves, need to make every effort to hear firsthand the stories of residential school survivors

Backcountry/Recreation:

- CCRD Board needs to discuss whether or not we want to find more ways in which we can take a proactive role in enhancement of recreational access to and opportunities for recreation in the backcountry (under economic development mandate); an example of this is to take an active role in providing feedback to province regarding deactivating roads and trails
- Our updated OCP ought to identify our highest value recreation access points

Emergency Management:

CCRD needs to be providing more information on our website (and other communications) regarding emergency/disaster preparedness:

- Encourage residents to be prepared
- Provide a list (from the province) of contents of a 72-hour kit which all households should have
- Encourage residents to mitigate risks to life and property by "firesmarting" and protecting their own properties against flood and erosion damage
- Provide links to: FireSmart, Prepared BC, and Home Flood Protection
- CCRD: conduct an assessment, and/or prepare a report for the Board, of how ready we are to deal with emergencies, identify gaps in readiness, provide appropriate training if needed

Other:

- Annual acknowledgment of local community volunteer(s)
- I suggest, based on our meeting with MCSCD staff regarding a governance study, that we may want to spend some time as a Board identifying and prioritizing top two or three governance/structure issues

Respectfully Submitted

Alison Sayers
Director Area C

**Central Coast Regional District
Denny Island Recreation Commission Bylaw No. 441**

Being a bylaw to establish a Recreation Commission for Electoral Area A and to repeal bylaws 95, 109, 296 and 320

WHEREAS the Central Coast Regional District has established by Bylaw 329 the Denny Island Recreation Service Area to provide recreation services to Electoral Area A; and

AND WHEREAS the Regional Board of the Central Coast Regional District deems it expedient to establish a Denny Island Recreation Commission to oversee the operations of the Denny Island Recreation Local Service Area;

NOW THEREFORE the Regional Board of the Central Coast Regional District in open meeting assembled ENACTS AS FOLLOWS:

The Denny Island Recreation Commission is hereby established to be known as the Denny Island Recreation Commission being within and composed of Electoral Area A of the Central Coast Regional District.

This Bylaw may be cited for all purposes as the “Denny Island Recreation Commission Bylaw No. 441, 2015”.

DEFINITIONS

In this bylaw:

“**Regional Board**” means the Board of Directors of the Central Coast Regional District.

“**Regional District**” means the Central Coast Regional District (or CCRD).

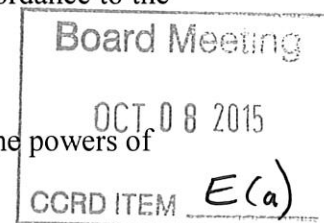
“**Commission**” means the Electoral Area A Denny Island Recreation Commission (or DIRC)

TERMS OF REFERENCE FOR THE COMMISSION & ITS GOALS

1. The Denny Island Recreation Commission (DIRC) is a volunteer commission of the Central Coast Regional District, which offers and supports recreational and leisure activities and programs for Denny Island and wider community.
2. The goals of the Commission are:
 - (a) To support inclusive recreational and leisure activities for the benefit of the community.
 - (b) To organise and inform the community of events planned by its members.
 - (c) To provide a forum for its members to share ideas and program information, resources and explore areas of mutual interest.
 - (d) To promote the concepts that physical activity, educational opportunities through leisure activities and community involvement are vital to the health and well-being of a vibrant community.
 - (e) The Commission shall conduct or have cause to have conducted, surveys of recreational facilities, programs and leadership in the best interest of the area and in accordance to the wishes of the Regional Board.

RIGHTS OF THE REGIONAL BOARD

3. The powers delegated to the Commission shall not extend to or include any of the powers of the Regional Board which are exercised by bylaw only



MEMBERSHIP AND TERM

4. The Denny Island Recreation Commission, hereinafter called the "Commission" shall consist of 8 members:
 - (a) One member appointed by the board of directors as their representative and
 - (b) Seven members representing a cross section of individuals directly concerned with community recreation
5. For the purpose of obtaining the names of persons willing to serve on the Commission, the Regional District shall place an invitation on the local Denny Island bulletin board inviting those interested, to apply to the CCRD; the Regional District will also seek nominations from the Commission.
6. The Regional District Board shall review all applications and nominations for the Commission at the December meeting. All Commission members shall be appointed by resolution of the Board of Directors of the Central Coast Regional District.
7. The term of office of each member shall be for a period of two (2) years. However, the first term subsequent to the adoption of this bylaw, three (3) members shall serve for the term which expires December 31, 2016 and four (4) members shall service for the term which expires December 31, 2017.
8. Any appointed member who is absent from meetings of the Commission for two (2) consecutive meetings without leave of absence from the Commission or without reason satisfactory to the Board of Directors of the Regional District shall cease to be a member of the Commission.
9. The regional board of directors, upon a vacancy arising from any cause other than the expiration of a members term of office, upon recommendation of the Denny Island Recreation Commission, shall appoint a new member from Denny Island who shall serve for the unexpired portion of the term vacated.
10. Each retiring member of the Commission shall be eligible for reappointment, at the discretion of the Regional Board of Directors
11. The Electoral Area A Director or his/her alternate may attend meetings of the Commission.
12. A Regional District staff member will serve as a liaison between the Commission and the Board and will provide advice and technical support as required. The staff liaison will not be a member of the Commission and will not participate in voting and will not be included when determining a quorum (if attending the Commission meetings).
13. No member of the Commission shall receive any remuneration for services.

MEETING PROCEDURES & CONDUCT

14. At its first meeting of each year, the Commission shall elect from among its members, other than the Electoral Area Director, a
 - (a) Chair who will preside over the meeting of the Commission, and a

(b) Secretary/Treasurer who will carry out the responsibilities described herein and other tasks as the Commission may prescribe.

15. In the absence of the Chair, the members present shall appoint a member to act as the Chair for that meeting or until the elected Chair returns.
16. The Commission shall hold regular meetings as they deem practical but not be less than four (4) times per year. Four (4) Commission members shall constitute a quorum.
17. The Chairman or any two members may summon a special meeting of the Commission by giving at least one (1) days' notice by phone or in writing to each member, stating the purpose for which the meeting is called.
18. Notice of Commission meetings will be posted on the local Denny Island Bulletin Board and the Denny Island Recreation and Leisure Activities Commission Facebook page.
19. Unless otherwise authorized by Section 90 of the *Community Charter*, all Commission meetings will be open to the public and held in a location accessible to the public.
20. Prior to each Commission meeting, the Chair, shall prepare an agenda which shall be circulated to the Commission members at least 24 hours in advance. The Commission may waive the requirement for advance notice of the agenda in emergency situations requiring a special meeting.
21. The Secretary/Treasurer shall prepare the minutes of the Commission meetings. Copies of the minutes shall be circulated to Commission members and forwarded to the Regional District staff liaison who shall carry out any actions required by the Regional District, including presenting to the Board any recommendations from the Commission that require a resolution by the Board of Directors.
22. The Commission may adopt rules of procedure which are consistent with the *Local Government Act*, the *Community Charter* and the CCRD Meetings Procedures Bylaw or this bylaw, as necessary.
23. Members who have a direct or indirect pecuniary interest in a matter under discussion shall not participate in the discussion of the matter or vote on a question on the matter. Where members believe they are in a conflict, they must declare the conflict and state the general nature of the conflict, and leave that part of the meeting where the matter is under discussion. The member's declaration shall be recorded in the minutes. The member shall not attempt before, during or after the meeting to influence the voting on any question in respect of the matter.
24. The Chair shall preserve order and decide all points of order which may arise subject to an appeal to other members present. All such appeals shall be decided in accordance with Robert's Rules.
25. Except as provided in this bylaw, the Commission shall regulate the conduct of its meetings as it deems desirable.

26. All acts authorize or required to be done by the Commission under this bylaw shall be decided by a majority vote of those Commission members present at a meeting.
27. All Commission members, including the presiding member, may vote on questions before it, and in all cases where the votes of the members present are equal for and against the questions, the question shall be negated. Any member who abstains from voting shall be deemed to have voted in the affirmative.
28. No act or other proceedings of the Commission shall be valid unless it is authorized by resolution at a regular or special meeting of the commission.

ADMINISTRATION – FINANCIAL MATTERS

29. All purchases by the Commission over \$500 require a request from the Commission to either the Chief Financial Officer (CFO) or Chief Administrative Officer (CAO) to be authorized prior to the expenditure (in accordance with the CCRD Purchasing and Procurement Policy A-26).

All capital purchases shall be conducted only with the approval of the CFO pursuant to CCRD Purchasing and Procurement Policy A-26.

NOTE: Nothing in the purchasing policy or purchasing limits, as stated above, provides for purchasing goods and services which are not contemplated in the financial plan as approved by the board of directors, except where unbudgeted resources have otherwise been provided as determined, confirmed and approved by the CFO or the CAO.

30. The Commission shall, at each meeting, approve invoices for payment by the CCRD that meet the criteria of the CCRD Purchasing and Procurement Policy A-26 and delegated authorized purchasing authority for no more than \$500, and these will be forwarded immediately to the regional district's financial officer for processing. All invoices goods and services purchases over \$500 (not including capital purchases) must be approved prior to expenditure as stated in clause 30.
31. No less frequently than four (4) times per year on or before the following dates, the Commission shall provide to the regional district's financial officer, a detailed report of all petty cash receipts and expenditures complete with opening and closing balances:
 - April 15th (for the period January to March)
 - July 15th (for the period April to June)
 - October 15th (for the period July to September)
 - Jan 15th (for the period October to December)
32. All items of revenue and expenditure, assets and liabilities relating to the activities of the Commission shall be accounted for in the books of account of the Central Coast Regional District in accordance with the provisions of Section 814(1) and other relevant sections of the *Local Government Act*.
33. The Commission shall, before the 31st day of October in each year, cause to be prepared and submitted to the Regional Board a detailed budget outlining its anticipated receipts and expenditures during the next calendar year.

AUTHORITIES, RESPONSIBILITIES AND DUTIES

34. The Board of Directors hereby delegates to the Commission, the following authorities, responsibilities and duties:
- (a) Empowers the Commission to organise and conduct recreation and leisure activities programs
 - (b) Empowers the Commission to incur liabilities for the purposes of organising and conducting recreation and leisure activities programs, provided that the costs incurred are within the annual budget as approved by the Regional District and without limiting the foregoing:
 - (i) to set rates and admission charges to the Regional District if and where applicable
 - (ii) to conduct or cause to conduct surveys of residents and participants involved in the recreation and leisure activities programs, to gauge levels of satisfaction and programs for the future
 - (iii) to establish and appoint advisory or select Committees, which will serve without remuneration, to assist the Commission with their activities.
 - (iv) to ensure all invoices and payments of all commitments, liabilities and accounts are in accordance with the annual budget approved by the Board of Directors of the Regional District; and
 - (v) to follow and/or make recommendations for operational rules and procedures to the Regional District that will improve the methodologies for accountability to the Regional District and the taxpayers of the Electoral Area A of the Central Coast Regional District.
35. All organizations operating under the auspices of the Commission shall, in terms of any liability whatsoever, save harmless the Commission and the Regional District.
36. Bylaws 95, 109, 296 and 320 are hereby repealed.

READ A FIRST TIME THIS 10th day of September, 2015
READ A SECOND TIME THIS 10th day of September, 2015.
READ A THIRD TIME THIS 10th day of September, 2015.
RECONSIDERED, FINALLY ADOPTED THIS 8th day of October, 2015.

<hr/> CHAIR	<hr/> CORPORATE ADMINISTRATOR
<p>I hereby certify the above to be a true and correct copy of Bylaw No. 441 cited as the “Denny Island Recreation Commission Bylaw No. 441, 2015” as adopted.</p>	
<hr/> CORPORATE ADMINISTRATOR	

CENTRAL COAST REGIONAL DISTRICT

BYLAW NO. 451

A bylaw to repeal the Central Coast Economic Development Commission Bylaw No. 374, 2004

WHEREAS the board of directors for the Central Coast Regional District has adopted the Central Coast Economic Development Commission Bylaw No. 374, 2004 to regulate the vision, goals, and structure of Economic Development in Electoral Areas A, B, C, D and E;

AND WHEREAS Bylaw No. 374 provided for the regulation of the Economic Development mandate of the Central Coast Regional District, which is now administered by CCRD administration and the Economic Development Advisory Committee;

AND WHEREAS pursuant to Section 137 of the *Community Charter*, with respect to the power to repeal a bylaw.

NOW THEREFORE THE Board of Directors for the Central Coast Regional District, in open meeting assembled enacts as follows:

1. Bylaw 374 cited as the "Central Coast Economic Development Commission Bylaw No. 374, 2004" is hereby repealed;
2. This bylaw may be cited as "Central Coast Economic Development Commission Bylaw No. 451, 2015".

READ A FIRST TIME THIS 10th day of September, 2015.

READ A SECOND TIME THIS 10th day of September, 2015.

READ A THIRD TIME THIS 10th day of September, 2015.

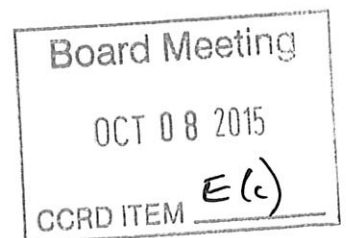
ADOPTED THIS 8th day of October, 2015.

Chair

Corporate Officer

I hereby certify that the above is a true and correct copy of Bylaw 451 cited as "Central Coast Economic Development Commission Bylaw No. 451, 2015".

Corporate Officer



CENTRAL COAST REGIONAL DISTRICT

BYLAW NO. 450

A bylaw to repeal the Bella Coola Townsite Curfew Regulation Bylaw No. 8, 1977

WHEREAS the board of directors for the Central Coast Regional District has adopted the "Bella Coola Townsite Curfew Regulation Bylaw No. 8, 1977" for the better protection of persons and property within Electoral Area E of the Central Coast Regional District, to regulate the time after which children under a certain agree shall be required to be off the street and in their respective home;

AND WHEREAS Bylaw No. 8 provided for the regulation of children after nightfall, which is no longer adequate;

AND WHEREAS pursuant to Section 794 of the *Local Government Act* the board is no longer required to have a bylaw in place for this purpose and more specifically to Section 137 of the *Community Charter*, with respect to the power to repeal a bylaw.

NOW THEREFORE THE Board of Directors for the Central Coast Regional District, in open meeting assembled enacts as follows:

1. Bylaw 8 cited as the "Bella Coola Townsite Curfew Regulation Bylaw No. 8, 1977" is hereby repealed;
2. This bylaw may be cited as "Bella Coola Townsite Curfew Regulation Bylaw No. 450, 2015".

READ A FIRST TIME THIS 10th day of September, 2015.

READ A SECOND TIME THIS 10th day of September, 2015.

READ A THIRD TIME THIS 10th day of September, 2015.

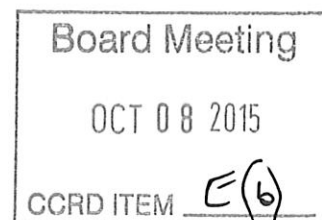
ADOPTED THIS 8th day of October, 2015.

Chair

Corporate Officer

I hereby certify that the above is a true and correct copy of Bylaw 450 cited as "Bella Coola Townsite Curfew Regulation Bylaw No. 450, 2015".

Corporate Officer



CENTRAL COAST REGIONAL DISTRICT

BYLAW NO. 452

A bylaw to establish the rates and charges for the operation and management of the Bella Coola Airport and to repeal Bylaw No. 422

WHEREAS the board of directors for the Central Coast Regional District has adopted the "Central Coast Regional District Airport and Facilities Conversion and Service Establishment Bylaw, 410, 2011" with Electoral Areas C, D & E participating;

AND WHEREAS pursuant to Section 803(1)(c) and 363(1)(b) of the *Local Government Act* the board may impose fees and charges in respect of the operation and management of the Bella Coola Airport;

AND WHEREAS the board of directors for the Central Coast Regional District deem it necessary to establish the rates and charges for the Bella Coola Airport Facilities;

NOW THEREFORE THE Board of Directors for the Central Coast Regional District, in open meeting assembled enacts as follows:

1. Bylaw 422 cited as the "Bella Coola Airport Rates & Charges Bylaw No. 422, 2014" is hereby repealed;

2. DEFINITIONS

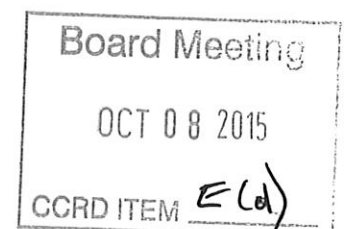
Airport: means the Bella Coola Airport, located in the Bella Coola Valley on the south bank of the Bella Coola River between the Snootli Creek and Nooklikonnik Creek junctions of the river, and includes terminal building(s), lease lots, runway, parking area and other things associated with the airport facilities.

3. RATES AND CHARGES

The rates and charges hereto attached shall be due and payable thirty (30) days after the billing date, if applicable, and any rates or charges remaining unpaid after the said date shall have added thereto a percentage addition of 2% per month on the outstanding balance.

Rates and charges will be reviewed from time to time and may be subject to an adjustment at the discretion of the board of directors, and in all cases applicable taxes will be added to the amounts contained in the attached Schedules;

4. All users of the airport terminal and facilities shall be subject to the rates and charges for airport improvement fees, landing fees, fuel surcharges, aircraft parking fees and airport signage/advertising as prescribed in Schedule 'A'; attached hereto and forming part of this bylaw.
5. This bylaw may be cited as "Bella Coola Airport Rates and Charges Bylaw No. 452, 2015".



READ A FIRST TIME THIS	10 th	day of	September, 2015 .
READ A SECOND TIME THIS	10 th	day of	September, 2015.
READ A THIRD TIME THIS	10 th	day of	September, 2015
ADOPTED THIS	8th	day of	October, 2015.

Chair

Corporate Officer

I hereby certify that the above is a true and correct copy of Bylaw 452 cited as “Bella Coola Airport Rates and Charges Bylaw No. 452, 2015”.

Corporate Officer

**CENTRAL COAST REGIONAL DISTRICT
BYLAW NO. 452**

SCHEDULE "A"

**BELLA COOLA AIRPORT
RATES & CHARGES**

1. Airport Improvement Fee

An Airport Improvement Fee of \$7.00 applies to those passengers departing Bella Coola Airport on scheduled services. Calculation and remittance of this payment is determined by the airline operating the service.

2. Landing Fee

Non-scheduled aircraft landings for operators whose base is at the Bella Coola Airport - \$5.80 per landing.

Non-scheduled aircraft landings for operators who base is other than at the Bella Coola Airport - \$33.00 per landing

Calculation and remittance of these payments are determined by the operator.

3. Fuel Surcharge

A Fuel Surcharge of \$0.0347 per litre, applies to all aviation fuel delivered to the airport, including both Jet A and 100LL fuel. Calculation and remittance of this payment is determined by the operator.

4. Aircraft Parking Fees

This charge does not apply to airport leaseholders or business operators based at the Bella Coola Airport.

All aircraft that require parking in the tie-down area are required to pay a parking fee of \$5.50 per day per aircraft.

5. Airport Signage/Advertising

For those wishing to display or advertise in the designated area on the airport premises, an annual fee of \$57.75 applies. The cost of the display is the sole responsibility of the payee. The format, size, shape and placement of the signage must receive prior approval of the Central Coast Regional District which reserves the right to refuse to display advertisements that are considered inappropriate or unacceptable. The Central Coast Regional District may alter the annual fee based on the size or nature of the display. The annual fee is required to be paid in advance to December 31st of each year or portion of year.



September 2, 2015

RECEIVED

SEP 10 2015

Central Coast Regional District

Mr. Reginald Moody
Central Coast Regional District
Box 186
626 Cliff Street
Bella Coola BC V0T 1C0

Mr. Moody:

Cariboo Chilcotin Coast Tourism wishes to extend to you an invitation to join us at the Association's Annual General Meeting and Tourism Summit. This event will be taking place October 16 – 18, 2015 in Quesnel, British Columbia.

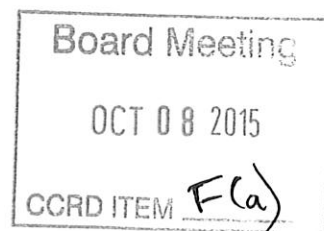
The AGM and Summit is open to everyone in the region who has an interest in learning more about the tourism industry and their regional tourism association.

We hope your busy schedule will allow you to be with us at some point during the event and look forward to your reply.

Yours truly,

Amy Thacker
Chief Executive Officer

Cariboo Chilcotin Coast Tourism Association
204-350 Barnard St. Williams Lake, B.C. V2G 4T9
Phone: (250) 392-2226 Toll Free: 1-800-663-5885 Fax: (250) 392-2838
www.landwithoutlimits.com





City of Campbell River
From the Office of the Mayor

RECEIVED

SEP 08 2015

Central Coast Regional District

August 31, 2015

Ms. Dorthe Jakobsen, Section Head, FLNR Resource Initiative (Nanaimo)
Great Bear Rainforest Land Use Order/BMTAs/Conservancy
Minister of Forests, Lands and Natural Resource Operations
West Coast Region
Suite 142, 2080 Labieux Road
Nanaimo, BC V9T 6J9

By email to: Great.Bear.Rainforest@gov.bc.ca

Dear Ms. Jakobsen:

The City of Campbell River (Campbell River) wishes to comment on the 2015 Great Bear Rain Forest Order (Order).

The Great Bear Rain Forest initiative has been a multi-year collaborative process. Given the extensive consultations, Campbell River is very concerned the Order is void of economic objectives. The only reference to economic impacts to our communities is *Part 1, 5. Objectives for Managed Forest and Natural Forest*, which indicates the area available for timber harvest (550,032 ha). Although this may appear to provide some stability for the forestry economy, we have no basis for comparison. The preamble to the Order converts this 550,032 hectares into an annual allowable cut of 2.5 million cubic meters. Campbell River questions how much of a loss to the current annual timber harvest this is.

The Order provides many objectives related to the environment and to First Nation priorities, however, proof of other societal benefits is lacking. Campbell River, like many other forestry-based coastal communities, relies on a viable forestry industry. Changes to the forestry economy since the turn of the century has greatly impacted our community and any further jobs losses would have a devastating impact on our quality of life, not to mention the loss of revenue for the Province of British Columbia.

The opportunity for public comment for the Order has been challenging. Local Governments on Vancouver Island rely on the annual convention of the Association of Vancouver Island and Coastal Communities (AVICC) as the opportunity to discuss legislation of this magnitude. The Order was presented after the AVICC 2015 AGM and Convention. In addition, summer months

Board Meeting

OCT 08 2015


CCRD ITEM

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are a poor time for any company, organized group or government to provide appropriate comment.

The Land Use Objectives Regulation requires an appropriate balance of social, economic and environmental benefits. The Great Bear Rain Forest Order fails to provide science-based proof of the necessary balance of these benefits; therefore the City of Campbell River does not support the Order.

Sincerely,



Andy Adams
Mayor

- C: Reg Moody, Chair, Central Coast Regional District
Mayor Phil Germuth, Kitimat
Mayor Lee Brain, Prince Rupert
Mayor Carol Leclerc, Terrace
Mayor Hank Bood, Port Hardy
Mayor Shirley Ackland, Port McNeill
Mayor Michael Berry, Alert Bay



Islands Trust

200 - 1627 Fort St., Victoria, BC V8R 1H8
Telephone (250) 405-5151 Fax (250) 405-5155

Toll Free via Enquiry BC in Vancouver 660-2421. Elsewhere in BC 1.800.663.7867

Email information@islandstrust.bc.ca

Web www.islandstrust.bc.ca

September 18, 2015

RECEIVED

File No.: 0420-20

Via e-mail: cao@ccrd-bc.ca

SEP 18 2015

Darla Blake
Chief Administrative Officer
Central Coast Regional District
P.O. Box 186
Bella Coola BC V0T 1C0

Central Coast Regional District

Dear Darla Blake:

Re: Islands Trust Council request for 25% reduction in minor route ferry fares

I am writing in response to your July 17, 2015 letter. The Islands Trust Executive Committee received your letter on August 5, 2015, and asked me to respond. I apologize for the delay in responding.

At this time we will not be acting on your Board's request to rephrase the Islands Trust Council's request to the Province for minor route fare reductions to incorporate Route 10s which serves communities between Bella Bella on route to Bella Coola. The request is beyond current capacity of the Islands Trust as it would require updating of the financial calculations prepared for the Islands Trust. We would be pleased to share the spreadsheet model created for the Islands Trust to inform any costs estimates your Board wishes to produce. We sincerely empathise with the impacts that your communities are facing due to rising ferry fares and service reductions, and encourage the Central Coast Regional District to advance the request for fare reductions on Route 10s through the Coastal Regional District Chair's Ferry Group.

I understand that the Coastal Regional District Chairs are meeting for 15 minutes on September 22, 2015 with the Premier's Chief of Staff, Dan Doyle, and the Minister of Transportation and Infrastructure, Todd Stone. Vice-Chair Laura Busheikin of Denman Island will represent the Islands Trust at that meeting and can be contacted at lbusheikin@islandstrust.bc.ca.

I will also be meeting with Minister Stone on September 24, 2015. In advance of that meeting, I would value conversations at the Union of BC Municipalities Convention with you and elected officials from the Central Coast Regional District.

Thank for your letter and I look forward to working together to support efforts towards sustainable, affordable and appropriate ferry services.

Sincerely,

Peter Luckham
Chair, Islands Trust Council
pluckham@islandstrust.bc.ca

cc. Islands Trust Vice-Chair Laura Busheikin
Coastal Regional District Chairs Group c/o Powell River Regional District Director Colin Palmer
Islands Trust Council
Islands Trust website

Preserving Island communities, culture and environment

Bowen Denman Hornby Gabriola Galiano Gambier Lasqueti Mayne North Pender Salt Spring Saturna South Pender Thetis

Board Meeting

OCT 08 2015

CCRD ITEM

F(c)



**AUDITOR GENERAL FOR
LOCAL GOVERNMENT**

ACCESSIBILITY · INDEPENDENCE · TRANSPARENCY · PERFORMANCE

RECEIVED

SEP 28 2015

Central Coast Regional District



**BRITISH
COLUMBIA**

88

September 28, 2015

Ref: 164701

To: Mayors and Councillors
Chairs and Directors of Regional District Boards
Chairs and Directors of Greater Boards

I am pleased to inform you that the Office of the Auditor General for Local Government will be releasing a performance audit report on the District of West Vancouver under the topic "Achieving Value for Money in Operational Procurement."

The audit report will be published on our website www.aglg.ca on Tuesday, September 29 at 11:00 am.

I welcome feedback from local governments on all aspects of the work of our office, so I look forward to your comments on the report to be issued tomorrow.

Sincerely,

Arn van Iersel, FCPA, FCGA
A/Auditor General for Local Government

pc: Chief Administrative Officers

201 – 10470 152nd Street
Surrey, BC V3R 0Y3

Phone: 604-930-7100
Fax: 604-930-7128

www.aglg.ca

Board Meeting

OCT 08 2015

CCRD ITEM

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**AUDITOR GENERAL FOR
LOCAL GOVERNMENT**

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SEP 28 2015



**BRITISH
COLUMBIA**

Central Coast Regional District

September 28, 2015

Ref: 164702

To: Mayors and Councillors
Chairs and Directors of Regional District Boards
Chairs and Directors of Greater Boards

I am pleased to inform you that the Office of the Auditor General for Local Government will be releasing a performance audit report on the City of Surrey under the topic "Local Government Performance in Managing Policing Agreements and Police Budget Oversight."

The audit report will be published on our website www.aglg.ca on Tuesday, September 29 at 11:00 am.

I welcome feedback from local governments on all aspects of the work of our office, so I look forward to your comments on the report to be issued tomorrow.

Sincerely,

Arn van Iersel, FCPA, FCGA
A/Auditor General for Local Government

pc: Chief Administrative Officers

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Surrey, BC V3R 0Y3

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90



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September 24, 2015

Chair Reginald Moody-Humchitt and Board
Central Coast Regional District
PO Box 186
Bella Coola, BC VOT 1C0

RECEIVED

SEP 29 2015

Dear Chair Moody-Humchitt and Board,

Central Coast Regional District

Re: Adopted 2016 – 2020 Financial Plan

On behalf of the Board of Trustees of Vancouver Island Regional Library (VIRL), please find enclosed important information regarding the recently adopted **2016 – 2020 Financial Plan**. This information can also be found on the VIRL website: www.virl.bc.ca/about-us/reports-and-plans. As dictated by provincial legislation, the VIRL Board has adopted a balanced budget for 2016. The Financial Plan and supporting information (which includes an "At a Glance" sheet, [informative video](#) and [press release](#)) provides you with the necessary details to address questions that may arise in your community.

The Vancouver Island Regional Library Board has adopted a balanced operating budget of \$33,062,045. Municipal and rural levies will contribute \$20,372,451 to the library budget, an average increase of 3.66% or a per capita increase of \$1.68. The weighted vote was 98% in favour of the budget.

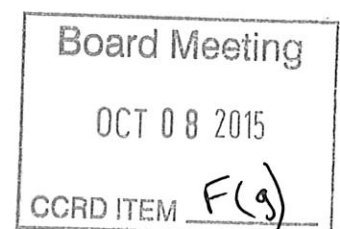
The focus of the 2016 budget is to assure VIRL continues meeting our service standards whilst maintaining financial sustainability and allocating the resources to achieve the Board's mission and vision. The 2016 - 2020 financial plan is a secure endeavour to balance the needs and aspirations of the present, without compromising the future needs of our communities. The 2016 budget supports the Board's Strategic Plan, reinforces the principles of the Consolidated Facilities Master Plan, and provides systematic funding development as previously approved by the Board.

It is our goal to balance the pressures of maintaining existing services and evolving business, in order to meet the expectations of our communities with available funding and resources. The VIRL Board's commitment to financial sustainability and quality service delivery for our Regional Library participants is underscored in the **2016-2020 Financial Plan**.

Sincerely,

Bruce Jolliffe
Chair, Vancouver Island Regional Library Board of Trustees

Cc: Director Cathi McCullagh, VIRL Trustee, Central Coast Regional District





metrovancouver

SERVICES AND SOLUTIONS FOR A LIVABLE REGION

(91)

Office of the Chair
Tel. 604 432-6215 Fax 604 451-6614

File: CP-02-02-GHGR
Ref: RD 2015 Jul 31

SEP 11 2015

Honourable Mary Polak
Minister of Environment
PO Box 9047 Stn Prov Govt
Victoria, BC V8W 9E2

RECEIVED

SEP 22 2015

Dear Minister Polak:

Central Coast Regional District

Re: Provincial Climate Leadership Plan Process

At its July 31, 2015 regular meeting, the Greater Vancouver Regional District Board of Directors adopted the following resolution:

That the GVRD Board:

- a) *Send a letter to the Minister of Environment conveying the four foundational policies identified by Metro Vancouver staff in consultation with member municipalities, as input during the 30 day comment period on the discussion papers associated with the Provincial Climate Leadership Plan;*
- b) *Direct staff to report back in September 2015 with a detailed list of policy recommendations for the Climate Leadership Plan process; and*
- c) *Share with all regional districts in British Columbia a copy of the letter sent to the Minister of Environment under part a), along with the report titled "Provincial Climate Leadership Plan Process", dated June 30, 2015, and its attachment titled "The Climate Action Plan in Metro Vancouver: Quantifying the Effect of British Columbian Climate Policy on Metro Vancouver's Greenhouse Gas Emissions and Other Air Emissions", dated September 17, 2010.*

Metro Vancouver and its member municipalities have been leaders and key partners in implementation of the BC Climate Action Plan that was adopted by the Provincial government in 2008. Correspondingly, we anticipate that the region's 2.45 million residents, nearly 150,000 businesses, and 23 member jurisdictions will play a key role in achieving the goals of the new BC Climate Leadership Plan. If paired with the proper resources, the BC Climate Leadership Plan (CLP) can build on the successes to date and scale-up climate action to significantly reduce greenhouse gases and better enable Metro Vancouver and the Province to prepare for the locked-in impacts of climate change.

Based on policy analysis conducted by Jaccard and Associates in 2010, as well as more recent consultations with Metro Vancouver member municipalities, Metro Vancouver has identified four policy areas that are foundational to reaching provincial and regional GHG reduction targets.

11742512

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Greater Vancouver Regional District • Greater Vancouver Water District • Greater Vancouver Sewerage and Drainage District • Metro Vancouver Housing Corporation



1. Widespread adoption of **low/zero carbon vehicles**.
2. Transition to **net-zero-carbon new buildings** and near net zero carbon existing buildings.
3. Support for local government actions to reduce and shorten vehicular trips and increase trips by **walking, cycling, and transit**.
4. **Carbon pricing** to create a market signal to stimulate adoption of low carbon technologies and practices.

Actions in these areas are complementary and should be implemented simultaneously in order to maximize greenhouse gas (GHG) reductions. Further details are provided in the attached staff report to the GVRD Board (Attachment 1) and the report by Jaccard and Associates (Attachment 2).

In addition to the GHG reduction policies and actions, Metro Vancouver supports the inclusion of objectives and approaches in the CLP that help prepare the region for the impacts of climate change including sea level rise, extreme precipitation events (e.g. flooding and droughts), heat related impacts (e.g. air quality, heat related health impacts) and others.


Effective implementation of the foundational actions described above will require enhanced funding and authority for local governments including:

- Expanded funding mechanisms for transportation infrastructure and other climate actions,
- Delegation of greater authority to local governments to regulate building performance including enabling building energy benchmarking, and
- Changes to legislation designed to allow local governments to extend support to businesses in achieving GHG reduction goals.

In support of the four foundational GHG reduction policies as well as climate adaptation actions, Metro Vancouver staff will send a subsequent letter with a more detailed list of technical policy recommendations that align with existing Metro Vancouver plans and policies.

Metro Vancouver looks forward to future opportunities to provide feedback in the CLP process and to working closely with the Province on the successful implementation of the CLP in the years to come. Please have your staff contact Roger Quan, Director of Air Quality and Climate Change, at 604-436-6770 or by email at roger.quan@metrovancover.org if you require clarification on any of the above items.

Yours truly,



Greg Moore
Chair, Metro Vancouver Board

GM/AN/rq

11742512

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cc: The Honourable Leona Aglukkaq, Minister of the Environment

Members of the Provincial Climate Leadership Team:

Mayor Linda Hepner, City of Surrey,

Mayor Paul Ives, Town of Comox

Mayor Luke Strimbold, Village of Burns Lake

Attachments:

1. GVRD Board Report dated July 17, 2015 titled, "Provincial Climate Leadership Plan Process"
2. The Climate Action Plan in Metro Vancouver: Quantifying the Effect of British Columbian Climate Policy on Metro Vancouver's Greenhouse Gas Emissions and Other Air Emissions – September 17, 2010 – MK Jaccard and Associates Inc.



To: GVRD Board of Directors

From: Climate Action Committee

Date: July 17, 2015

Meeting Date: July 31, 2015

Subject: **Provincial Climate Leadership Plan Process**

CLIMATE ACTION COMMITTEE RECOMMENDATION

That the GVRD Board:

- a) Send a letter to the Minister of Environment conveying the four foundational policies identified by Metro Vancouver staff in consultation with member municipalities, as input during the 30 day comment period on the discussion papers associated with the Provincial Climate Leadership Plan;
 - b) Direct staff to report back in September 2015 with a detailed list of policy recommendations for the Climate Leadership Plan process; and
 - c) Share with all regional districts in British Columbia a copy of the letter sent to the Minister of Environment under part a), along with the report titled "Provincial Climate Leadership Plan Process", dated June 30, 2015, and its attachment titled "The Climate Action Plan in Metro Vancouver: Quantifying the Effect of British Columbian Climate Policy on Metro Vancouver's Greenhouse Gas Emissions and Other Air Emissions", dated September 17, 2010.
-

At its July 15, 2015 meeting, the Climate Action Committee considered the attached report titled "Provincial Climate Leadership Plan Process", dated June 30, 2015. The Committee subsequently amended the recommendation as presented above in underline.

Attachment:

"Provincial Climate Leadership Plan Process", dated June 30, 2015.



To: Climate Action Committee

From: Jason Emmert, Air Quality Planner
Ali Ergudenler, Senior Engineer
Planning, Policy and Environment Department

Date: June 30, 2015

Meeting Date: July 15, 2015

Subject: **Provincial Climate Leadership Plan Process**

RECOMMENDATION

That the GVRD Board:

- a) Send a letter to the Minister of Environment conveying the four foundational policies identified by Metro Vancouver staff in consultation with member municipalities, as input during the 30 day comment period on the discussion papers associated with the Provincial Climate Leadership Plan; and
 - b) Direct staff to report back in September 2015 with a detailed list of policy recommendations for the Climate Leadership Plan process.
-

PURPOSE

At its meeting on June 17, 2015, the Climate Action Committee considered a staff report on Metro Vancouver's Climate Actions and Carbon Neutral Progress in 2014, and directed staff to provide the Committee with information reported by the provincial government regarding its carbon neutral progress and climate action plan.

This report provides a review of progress to date on the provincial Climate Action Plan that was adopted in 2008, outlines the process for the development of a new provincial Climate Leadership Plan, and speaks to the implications of the Province's efforts for Metro Vancouver.

BACKGROUND

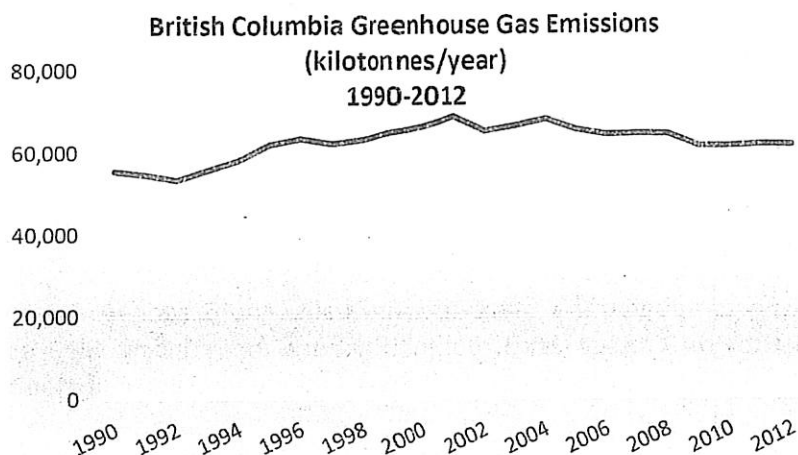
The provincial Climate Action Plan in part led to new climate action legislation. In 2007, the Province passed the *Greenhouse Gas Reduction Targets Act* (GGRTA) that set legislated targets for reducing greenhouse gases (GHGs). Under the *Act*, BC's GHG emissions are to be reduced by at least 33 per cent below 2007 levels by 2020. Interim reduction targets of six per cent by 2012 and 18 per cent by 2016 were established to guide and measure progress. A further emission-reduction target of 80 per cent below 2007 levels is required for 2050. The *Act* also provided authority for the *Emission Offsets Regulation* (enacted in December 2008) and the *Carbon Neutral Government Regulation* (enacted in December 2008). In addition to the GGRTA, the Province implemented the *Carbon Tax Act*, *Cap and Trade Act* (2008), *Emissions Standards Amendment Act* (2008), *Renewable and Low Carbon Fuel Requirements Act* (2008), *Vehicle Emissions Standards Act* (2008), *Green Communities Statutes Amendment Act* (2008), *Utilities Commission Amendment Act* (2008), *Clean Energy Act* (2010), *Zero Net Deforestation Act* (2010), and new energy efficiency requirements in the Building Code (2014).

PROGRESS TO DATE ON PROVINCIAL CLIMATE ACTION PLAN

The Province released biennial Progress reports in 2010, 2012, and 2014. It has also published Provincial GHG inventories every two years. The 2012 Provincial GHG inventory is currently available and the 2013 inventory is expected to be released soon.

Based on inventories and the biennial progress reports, there was a 4.4% net decrease in Provincial GHG emissions from 2007 to 2012. The largest reductions resulted from reductions in fossil fuel use for electricity generation, non-road vehicles, manufacturing, and light duty vehicles. The second most substantial declines came from reductions in fossil fuel use in residential heating, domestic aviation, agriculture, and the management of landfills. GHG emissions increased in some sectors including fossil fuel industries, mining and oil and gas extraction, agricultural and forestry burning, railways, heavy duty diesel vehicles, and metal production.

While it is difficult to attribute specific GHG reductions to the GHG emissions targets or the carbon tax, a number of government and independent analyses have identified a shift in use of fossil fuels in the economy since the introduction of these provincial initiatives. Policies and legislation targeting specific sectors and sources such as the landfill gas regulation, renewable fuel and vehicle emissions standards and the requirements for carbon neutral electricity have directly led to measurable reductions in GHG emissions from those sectors and sources. The economic downturn in 2007-2008 is believed to have played some role in overall reductions. To keep pace with future economic and population growth, additional measures will be necessary.



CLIMATE LEADERSHIP PLAN PROCESS

On May 12, 2015, the Province announced the formation of a Climate Leadership Team to provide recommendations for the development of the Province's second Climate Action Plan, now referred to as the Climate Leadership Plan (CLP). The Climate Leadership Team's mandate, to be fulfilled by November 30, 2015, is to provide advice and recommendations on:

- ways to maintain B.C.'s climate leadership;
- the need for updates to the current Climate Action Plan as well as new programs and policies required to meet B.C.'s greenhouse gas reduction targets while maintaining strong economic growth and successfully implementing the BC Jobs Plan, including the liquefied natural gas strategy;
- actions to achieve GHG reductions required across the industrial sector, transportation sector and built environment;
- ways to further the Province's government-to-government relationships with First Nations while constructively finding climate solutions; and
- ways to further the Province's collaboration with local governments within the context of mutually-beneficial climate actions.

Mayor Linda Hepner of Surrey is one of the three community representatives selected as a member of the Climate Leadership Team (CLT). There are also three BC Government representatives, three academics, three First Nations representatives, three members representing environmental interests, and four members representing business interests.

The following timeline for the CLP process has been established by government:

- **July 2015** – A draft framework for the Climate Leadership Plan will be issued with accompanying discussion papers, immediately followed by a 30-day public consultation period.
- **October 2015** – The Climate Leadership Team will present its recommendations to government.
- **December 2015** – A draft Climate Leadership Plan will be prepared, and a 30-day public consultation will take place.
- **March 2016** – The final Climate Leadership Plan will be released publicly.

Metro Vancouver staff have been working closely with municipal staff through the Regional Engineers Advisory Committee (Climate Protection Subcommittee) to compile a draft list of local government policy ideas for the Climate Leadership Plan. Metro Vancouver staff are bringing this report to the July, 2015, Climate Action Committee meeting to ensure that the Board has the opportunity to provide input during the first 30 day comment period. This report summarizes the implications of the CLP for Metro Vancouver and some proposed recommendations for the first 30 day comment period.

METRO VANCOUVER CLIMATE PLANS

In 2008, under the Green Communities legislation Metro Vancouver Board adopted the GHG reduction targets of 33% below 2007 levels by 2020 and 80% below 2007 levels by 2050. In 2011 the Board adopted the Integrated Air Quality and Greenhouse Gas Management Plan and the Regional Growth Strategy which outlined actions for reducing GHG emissions in the region. In addition, member municipalities have adopted their own GHG reduction targets and policies.

The development of the Climate Leadership Plan allows Metro Vancouver and member municipalities to highlight the efforts that the local governments in the region have made towards climate goals, and to advocate for strengthened provincial climate policy to support local government climate action.

CLIMATE LEADERSHIP PLAN RECOMMENDATIONS

In 2010, Metro Vancouver contracted Mark Jaccard and Associates to quantify GHG reductions from a number of federal, provincial, and regional GHG reduction initiatives, including the BC Climate Action Plan (Attachment).

Based on the Jaccard work and recent consultations with staff from member municipalities, staff have identified four actions for the Province that are considered to be essential to reaching provincial and regional climate targets:

1. Widespread adoption of **low/zero carbon vehicles**.
2. Transition to **net zero carbon new buildings** and near net zero carbon existing buildings.
3. Support for local government actions to reduce and shorten vehicular trips and increase trips by **walking, cycling, and transit**.

4. **Carbon pricing** to create a market signal to stimulate adoption of low carbon technologies and practices.

Low / Zero Carbon Vehicles

Almost one third of regional emissions come from vehicles. Reaching GHG targets will necessitate a transition to fossil fuel free vehicles. Electric (battery electric and plug-in hybrid electric) and fuel cell vehicles can achieve significant near-term GHG reductions (5-10 years). A limited but expanding number of low carbon vehicles are already offered in the marketplace; however, without meaningful regulatory requirements, electric vehicles will not achieve the market share required to meet GHG targets. The Province should consider implementing a Zero Emission Vehicle (ZEV) regulation, similar to California's initiative, which by 2050 will require almost all new vehicles sold to be zero or near zero carbon. In the early years, the Province can bolster this transition by continuing the Clean Energy Vehicles for BC Program and implementing supportive policies and measures to ensure that charging infrastructure is available in public spaces, work places, new homes and existing homes.

Net Zero Buildings

One-third of regional GHG emissions come from the heating of buildings. Constructing and retrofitting buildings to have net zero energy consumption will be another cornerstone of a low carbon economy. Until recently, achieving "net zero buildings" seemed far in the future, but California is now requiring all new residential buildings be net zero by 2020 and all new commercial buildings to be net zero by 2030. In order to allow for market adjustment, California is using a series of voluntary stretch building codes in addition to scheduled changes to the mandatory codes to assist builders and residents to anticipate and prepare to meet the new requirements. Home energy labelling and large building energy benchmarking will also be important tools to ensure buildings are achieving expected energy performance.

Support Local Government Efforts Aimed at Increasing Walking, Cycling, and Transit

Significant provincial investments in walking, cycling, and transit infrastructure, as outlined in the Mayor's Council Vision, will be a key to enabling the continued development of compact, livable, and low carbon communities. Sustainable long-term funding from the Province could potentially be funded through incremental increases to the carbon tax and/or through a road user pricing system.

Carbon Pricing

Whether through a carbon tax and/or a cap and trade system, the province should continue to increase the price of carbon to reflect the full cost of releasing GHGs into the atmosphere. A predictable schedule of increases would send a strong market signal across the economy while giving businesses and residents time to adopt low carbon technologies and practices. It may be necessary to create mechanisms to offset unintended consequences with specific initiatives to assist some industries or residents in making the transition (e.g. low income residents).

These suggested policies directly support many of the actions identified in Metro Vancouver's Integrated Air Quality and Greenhouse Gas Management Plan and the Regional Growth Strategy, and are considered essential to achieving the GHG reduction targets set out in those plans. They would also form a key part of a new Regional Climate Action Framework, the idea for which was introduced to the Committee in June, 2015.

In addition to these specific policies, the Province should remain committed to the 2008 Provincial GHG reduction targets. They are an important benchmark that helps governments and the public assess whether the actions across the Province are scaled to meet the climate challenge. In order to avoid the most serious effects of climate change, global climate models forecast that average global temperature rise must remain below 2°C above preindustrial levels. Meeting this target will require the phasing out most fossil fuels by 2050, as well as a commitment by the Province to maintain and expand its commitment to carbon neutral electricity and the shift toward local, renewable energy sources.

Although the end user emissions of exported fossil fuel are not included in British Columbia's GHG inventory, the Province should reconsider its support for the extraction and export of natural gas, thermal coal, and petroleum to other countries. As stated in latest Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report, in order to avoid dangerous climate change most of the existing fossil fuel reserves must remain in the ground.

The challenge of climate change is daunting; however, much of the technology and knowledge to achieve the GHG reduction targets currently exists and is available in the marketplace. The residents of the Metro Vancouver region will continue to live a high quality of life in a low carbon world. As well, in many cases the switch to low carbon will come with benefits related to job creation, improved air quality, more vibrant neighbourhoods, enhanced transportation options, more comfortable homes, and others.

Effective implementation the four actions outlined in this report will require enhanced funding and authority for local government climate initiatives. Specific needs include:

1. Expanded funding mechanisms for transportation infrastructure and other climate actions,
2. Delegation of greater authority to local governments to regulate building performance including enabling building energy benchmarking, and
3. Changes to legislation designed to allow local governments to extend support to businesses in achieving GHG reduction goals.

ALTERNATIVES

1. That the GVRD Board:
 - a) Send a letter to the Minister of Environment conveying the four foundational policies identified by Metro Vancouver staff in consultation with member municipalities, as input during the 30 day comment period on the discussion papers associated with the Provincial Climate Leadership Plan; and
 - b) Direct staff to report back in September 2015 with a detailed list of policy recommendations for the Climate Leadership Plan process.
2. That the GVRD Board receive the report dated June 30, 2015, titled "Provincial Climate Leadership Plan Process" for information.

FINANCIAL IMPLICATIONS

Staff efforts in 2015 toward the development of a broader regional climate action framework, including advocacy and influence with other orders of government, are included in existing program budgets. Resources required for work in 2016 and future budget years, including any expanded efforts for climate action within the region, will be identified and proposed to the Committee once additional information on the Provincial Climate Leadership Plan becomes available.

SUMMARY / CONCLUSION

The Province released progress reports in 2010, 2012 and 2014 and published GHG inventory reports to show its progress towards meeting the provincial GHG targets. Although there has been some successes in reducing GHGs in British Columbia, further measures will be necessary to keep pace with population and economic growth and to reach the provincial targets. In May 2015 the provincial government announced a process and timelines for the development of its second Climate Action Plan, now referred to as the Climate Leadership Plan. The Climate Leadership Plan process presents an opportunity for Metro Vancouver and its member municipalities to influence the provincial climate policy and request the tools necessary to reach the regional and municipal GHG reduction targets. Focusing on a few high impact actions will help guide the Province in determining its priorities.

Attachment:

The Climate Action Plan in Metro Vancouver: Quantifying the Effect of British Columbian Climate Policy on Metro Vancouver's Greenhouse Gas Emissions and Other Air Emissions – September 17, 2010 – MK Jaccard and Associates Inc. (Doc #11611598)

11595073

FINAL REPORT

The Climate Action Plan in Metro Vancouver:

*Quantifying the Effect of British Columbian Climate Policy
on Metro Vancouver's Greenhouse Gas Emissions and
Other Air Emissions*

September 17th, 2010

Prepared for:

The Metro Vancouver Policy and Planning Department

Prepared by:

MKJA

MK Jaccard and
Associates Inc



#520 - 580 Hornby Street
Vancouver, BC, V6C 3B6

Michael Wolinetz
Phone: (604) 683-1490
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Executive Summary

This analysis uses the CIMS energy-economy model to simulate how four policy scenarios will affect energy consumption and greenhouse gas (GHG) emissions in Metro Vancouver from the present to 2030. The first policy scenario is the British Columbia Climate Action Plan (CAP scenario) and the other three scenarios are additions to CAP: CAP with the Climate Action Team recommendations (CAT-rec scenario), CAP with additional Metro Vancouver policies (MV scenario), and CAP with all additional measures (All Measures scenario). The CIMS model used in this analysis is specific to Metro Vancouver (CIMS-MV) and was developed during the client's 2008/2009 contract. CIMS and the development of the CIMS-MV model are described in detail in the 2009 report.

The Baseline Emissions Forecast

Most baseline assumptions from the previous contract still apply and the current baseline emissions forecast is similar to the one produced in 2009 (Table ES 1). Note that the CIMS-MV baseline forecast does not include the Chevron refinery or the Burrard Thermal electricity plant since these facilities are linked to energy demands outside of Metro Vancouver. In 2007, the interpolated emissions from CIMS-MV are lower than what is reported in the Metro Vancouver inventory. However, in the forecasted years, the CIMS-MV baseline is higher than the inventory baseline. This difference exists primarily because the CIMS-MV baseline does not include any Climate Action Measures while the inventory baseline includes a vehicle emissions standard and a renewable fuel standard.

Table ES 1: Metro Vancouver baseline GHG emissions, MtCO₂e/year (excluding Chevron Refinery and Burrard Electricity Plant)

	2007*	2010	2015	2020	2025	2030
CIMS-MV (updated)	15.0	15.1	15.7	16.9	17.9	19.0
CIMS-MV (2009)	15.1	15.2	15.9	17.1	18.1	19.3
Metro Van Inventory	15.6	15.3	15.5	15.9	16.6	17.3

* CIMS solves in five year increments so the 2007 value from CIMS-MV is interpolated from the 2005 and 2010 values.

Policy Methodology

The CAP scenario includes a light-duty vehicle emissions standard that tightens to 2016, a renewable fuel standard that reaches 10% by energy in 2020, an expansion of transit services, changes to building codes, residential technology subsidies, the existing BC carbon tax that reaches \$30/tCO₂ by 2012, and a regional or national cap and trade on industrial emissions.

Compared to the CAP scenario, the CAT-rec scenario significantly strengthens the carbon tax, the building codes, and the renewable fuel standard. This scenario also includes an expansion of walking and cycling, a zero emissions standard for buildings, and incentives to retrofit commercial building shells.

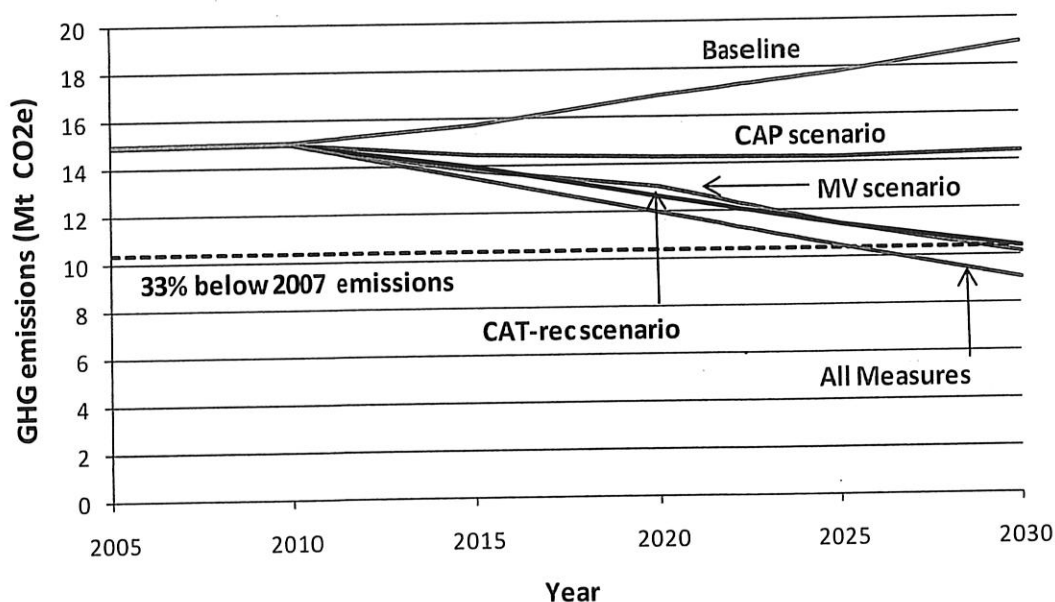
The MV scenario is also based on the CAP scenario. It strengthens the building codes, the renewable fuel standard, and the light-duty vehicle emissions standard. It also simulates a larger carbon tax; however, it is not as stringent as the tax in the CAT-rec scenario. The MV scenario includes distance-based auto insurance, a niche market for plug-in hybrid electric vehicles, a zero emissions standard for buildings and a requirement for building shell retrofits.

The strongest scenario in this analysis is the All Measures scenario. This scenario builds upon the CAP measures with the addition of all policies from the CAT-rec and MV scenarios. In the case where two similar policies could be applied, such as different schedules for the renewable fuel standard, the stronger version of the policy is used.

Results

Figure ES 1 compares the GHG emissions forecast for each policy scenario. The 2020 emissions target, 33% below 2007 emissions or approximately 10.4 MtCO₂e per year, is also shown on the figure. This target is based on the sectors included in CIMS-MV and does not account for the forecasted emissions from the Chevron or Burrard facilities.

Figure ES 1: Metro Vancouver's GHG emissions forecast, by scenario



The CAP scenario significantly reduces emissions below the baseline forecast, but emissions in 2020 are 14.3 MtCO₂e or roughly 4 MtCO₂e above the target. Although the CAT-rec and the MV scenarios contain different policies, the GHG forecast for both scenarios is very similar. While the CAT-rec scenario has a stronger market-wide carbon pricing policy, the MV scenario has additional regulatory policies. In 2020, the CAT-rec scenario reduces emissions to 12.6 MtCO₂e while the MV scenario reduces them to 13.0 MtCO₂e. The All Measures scenario has the lowest emissions forecast, falling to 12.0 MtCO₂e by 2020, still short of the 2020 target. This analysis assumes many of the



policies start in 2015 or later, leaving only five years to alter the course of GHG emissions before the date of the first emissions target. Even with policies that start earlier, such as the carbon tax, none of the scenarios achieve the target.

Incremental Policy Analysis

Additional Metro Vancouver policies (contained in the MV and All Measures scenarios) will be implemented in the context of provincial policy plans (CAP and CAT-rec). Therefore it is useful to understand how additional policies will interact with potential Provincial measures to further reduce GHG emissions. An incremental policy analysis demonstrates that adding additional policies and increasing the overall stringency of a policy scenario tends to increase the overlap of individual policy effects. For example, a strong carbon price might induce a consumer to install an air-source heat pump in their home, thus overlapping with the effect of the zero-emissions building standard. However, even with policy overlap, several policies will substantially increase abatement relative to the CAP or CAT-rec scenario. In the particular the larger carbon tax, the zero emissions standard for buildings, and the suite of vehicle regulations all reduce emissions further.

Energy Supply Emissions

The policies in this analysis will also affect the emissions from the energy supply sectors that provide energy to Metro Vancouver. This effect was estimated for each scenario by combining informed assumptions derived from other modelling projects with an understanding of how Metro Vancouver fits into the regional energy system.

Table ES 2 shows that upstream emissions increase in the baseline. However, in the policy scenarios the emissions produced for each unit of energy supplied and the amount of energy demanded in Metro Vancouver declines in response to policies. Therefore, emissions from the energy supply sectors also decrease in the policy scenarios.

Table ES 2: Total upstream emissions by scenario, MtCO₂

	2010	2015	2020	2025	2030
<i>Baseline</i>	3.2	3.3	3.5	3.6	3.8
<i>CAP</i>	3.2	3.1	3.1	2.9	2.9
<i>MV</i>	3.2	2.8	2.8	2.3	2.0
<i>CAT-rec</i>	3.2	3.1	3.0	2.5	2.4
<i>All Measures</i>	3.2	2.8	2.7	2.1	1.9

This result is subject to four key assumptions:

- In the CAP and MV scenarios, the cap and trade policy applies to the energy supply sectors. For the CAT-rec and All Measures scenarios, the CAT-rec carbon tax applies to these sectors.



- In the baseline and all policy scenarios, the electricity sector follows the BC Energy Plan. It only develops new capacity with zero net GHG emissions, 90% of which is from renewable or zero-emissions sources.
- Crude oil consumed in Metro Vancouver is produced in Alberta and reductions in crude oil consumption result in a reduction in oil sands production. No policy or carbon pricing applies in Alberta.
- Cellulosic ethanol is not available until after 2020. The capital costs for this technology are initially high relative to corn ethanol, although they decrease with accumulated experience.

Limitations and Uncertainties

The first limitation of this study is the exclusion of energy-price feedbacks in the simulations. Therefore, the analysis does not simulate how energy prices will change as energy demand in Metro Vancouver changes. However, this analysis is still robust since the baseline electricity price in the model reflects the development of zero emissions electricity capacity that would have to occur in the policy scenarios. Furthermore, much of the fuel switching away from natural gas and petroleum fuels is driven by regulatory policies. Therefore, if energy prices change, it will not significantly affect the emissions forecast in each scenario.

The second limitation of this study is that it does not explore how changing urban form can reduce GHG emissions in Metro Vancouver. The capacity to model the effects of explicit urban planning policies using CIMS has recently been developed. Using this methodology, urban planning can reduce total transportation demand, explicitly support alternatives to transportation with cars, constrain the footprint of the urban area, decrease the heat load of new buildings by increasing the number of shared walls, and enhance opportunities for district energy systems that use alternative heat sources.

In addition to the limitations of this particular study other sources of uncertainty exist which are inherent to a modelling analysis. These include the representation of future technologies, of consumer and firm behaviour, and of macroeconomic feedbacks. Furthermore, the CIMS-MV analysis is based on external forecasts of population growth, fuel prices and activity in each sub-sector. These forecasts are uncertain, which adds uncertainty to the CIMS forecasts.



Introduction

The Metro Vancouver Policy and Planning Department has requested that M.K. Jaccard and Associates (MKJA) use the CIMS energy-economy model to simulate how four policy scenarios will affect energy consumption and greenhouse gas (GHG) emissions in Metro Vancouver. The first policy scenario is the British Columbia Climate Action Plan (CAP scenario) and the other three scenarios are additions to CAP: CAP with the Climate Action Team recommendations (CAT-rec scenario), CAP with additional Metro Vancouver policies (MV scenario), and CAP with all additional measures (All Measures scenario).

The impact of these policy scenarios are measured relative to a baseline forecast that describes how energy consumption and GHG emissions evolve in the absence of climate policy. This study will aid the Policy and Planning Department in understanding how current and proposed climate policies in British Columbia will contribute to Metro-Vancouver reaching the regional emissions target. This target is to reduce GHG emissions by 33% relative to 2007 levels by 2020, and 80% by 2050.

The analysis uses a CIMS model that is specific to Metro Vancouver (CIMS-MV). This model was developed during the client's 2008/2009 contract that explored the impacts of a policy package on the city's energy consumption and GHG emissions. CIMS and the development of the CIMS-MV model are described in detail in the 2009 report.¹ In this report, the additional policies in the MV scenario are derived from the policy package used in the original contract.

This report begins with a review of the CIMS-MV baseline forecast and a description of the methodology that details the assumptions made while simulating each of the policy scenarios. The results of the policy simulations follow, focussing on the energy consumption and emissions in Metro Vancouver under each policy scenario, the effect of the individual policies, the effect of implementing additional policies relative to the CAP and CAT-rec scenarios, and the effect the policy scenarios on emissions from energy supply sectors. The report concludes with a discussion of the limitations of the analysis and the uncertainties in the model. The changes to common air contaminant (CAC) emissions under each scenario are included in the Appendix.

Review of the Baseline Emissions Forecast

Baseline Assumptions

Although CIMS-MV has been adjusted to simulate the effect of the CAP and CAT-rec policy scenarios, the baseline assumptions from the previous contract still apply. The

¹ "Socio-Economic Impacts of Climate Change Mitigation Measures for Metro Vancouver", M.K. Jaccard and Associates, 2009



following list summarizes the key assumptions and results from the CIMS-MV baseline forecast. The baseline forecast describes how the Metro Vancouver economy, energy consumption and GHG emissions will likely evolve in the absence of climate policy. Note that the report produced during the previous contract provides more detail than is presented below.

- We use a population forecast specific to Vancouver from BC Stats, in which the population grows a nominal 0.2% faster than the provincial average. Average annual population growth is 1.6% from 2010 to 2015, dropping to 1.5% in 2020 and to 1.1% by 2030.²
- Energy prices are from the National Energy Board "Fortified Islands" scenario with the exception of the natural gas price (reduced to reflect shale gas and tight gas potential) and the electricity price (increased to reflect BC Hydro long-term rate increases).
- Baseline forecasts for sector activity and emissions are developed from the projections in the Metro Vancouver emissions inventory and several other data sources.
- None of the Climate Action Plan measures are included in the CIMS-MV baseline forecast. The emissions inventory includes some of the Climate Action Measures such as a light-duty vehicles emissions standards and a renewable fuel standard.
- The Burrard Thermal electricity plant and the Chevron refinery are excluded from the model given their linkages to energy demand systems outside of Metro Vancouver. Emissions from agriculture, open burning, gasoline marketing, solvent evaporation, natural sources, miscellaneous area sources, and bulk shipping terminals are also excluded since they are not represented in CIMS-MV. The total excluded emissions equalled 0.7 MtCO₂e in 2005 and come primarily from the power plant and the refinery.
- Emissions from the production of crude oil, electricity and natural gas are not included in the CIMS-MV baseline forecast. These "upstream" emissions from energy supply activities inside and outside of the region are explored in this report using assumptions about the GHG intensity of production through time (i.e., the GHG emitted per unit energy produced).

Changes to the Baseline

The following changes were made to CIMS-MV since the previous analysis:

² This is consistent with the population forecast used by the policy and planning department. The CIMS MV population forecast reaches 2,770,000 in 2020 and 3,121,000 in 2030, while the Metro Vancouver Regional Development forecast reaches 2,780,000 in 2021 and 3,129,000 in 2031.



- The emission coefficients of non-CO₂ GHGs (methane and nitrous oxide) for diesel combustion were adjusted. The methane coefficient was updated, and the nitrous oxide value was corrected (previous value was too large).
- The federal heavy-duty vehicle efficiency standards have been added to the baseline forecast. New heavy-duty vehicles must be 20% more efficient than the current fleet of freight trucks. The policy will be phased in between 2014 and 2018. In CIMS, this coincides with the 2015 to 2020 model period. This policy applies to all heavy-duty vehicles including delivery vehicles, buses, freight vehicles, garbage trucks, dump trucks and tractor trailers.
- The costs for building shell retrofits have been updated. The previous analysis did not include benefits of shell retrofits such as improved comfort and property value. Additionally we have assumed even greater heterogeneity in the costs and benefits of retrofitting. Consequently, the baseline simulation results in selected buildings being retrofitted without the influence of policy. This result is at least anecdotally reasonable compared to the previous outcomes where no building shells were retrofitted without strong policies. Overall, the potential for market driven shell retrofits is still highly uncertain in CIMS-MV and reducing this uncertainty is beyond the scope of the current project.
- Compared to the previous baseline forecast, the updated baseline is 0.1 MtCO₂e lower in 2010, and 0.2 MtCO₂e lower by 2020 (Table 1). These changes bring the forecasted emissions closer to the Metro Vancouver inventory value.

Baseline Results

The current base year for the Metro Vancouver inventory is 2007. Emissions in 2007, accounting for those sectors excluded from this analysis, were 15.6 MtCO₂e or 0.6 MtCO₂e higher than the CIMS-MV value determined by interpolation (Table 1). Actual emissions in 2007 are higher than the CIMS-MV output for two reasons. First, transportation emissions are growing faster than forecasted by the Metro Vancouver inventory, hence also faster than CIMS-MV forecast. Second, the growth of space heating emissions has been somewhat higher than in the CIMS-MV forecast.

Table 1: Metro Vancouver baseline GHG emissions, MtCO₂e/year (excluding Chevron Refinery and Burrard Electricity Plant)

	2007*	2010	2015	2020	2025	2030
CIMS-MV (updated)	15.0	15.1	15.7	16.9	17.9	19.0
CIMS-MV (2009)	15.1	15.2	15.9	17.1	18.1	19.3
Metro Van Inventory	15.6	15.3	15.5	15.9	16.6	17.3

*2007 values from CIMS-MV are interpolated from the 2005 and 2010 values. CIMS solves in five year increments.

CIMS is designed to simulate long-term trends rather than year-to-year variability in emissions, so it is not surprising that the simulation does not perfectly match the actual emissions in 2007. Furthermore, both transportation and space heating emissions in



CIMS increase more rapidly after 2010. If current trends continue, the CIMS-MV forecast may better match actual emissions.

The CIMS-MV baseline emissions reach 16.9 MtCO₂e in 2020 and 19.1 MtCO₂e in 2030. By 2020 and 2030, the CIMS-MV forecast is noticeably higher than the Metro Vancouver inventory forecast. The difference is primarily in the transportation sector, because CIMS-MV does not include the light-duty vehicle emissions standard or the renewable fuel standards that is part of the inventory forecast.

Policy Analysis

This section describes the methodology used to simulate the four policy packages and the results of these simulations. The methodology includes an explanation of how the CAP and CAT-rec policy packages were simulated and a review of the MV scenario used in the 2008/2009 contract. The results include forecasts of GHG emissions and energy consumption in Metro Vancouver under each of the four policy packages, as well as the effect of each individual policy. The incremental effect of policies relative to the CAP and CAT-rec scenarios are also included. These results quantify how each additional policy may further reduce emissions if a particular policy package is implemented while accounting for policy overlap. The results section concludes with an estimate of how the policy scenarios change the upstream emissions from the energy supply sectors.

Policy Methodology

Table 2 summarizes the individual policies used in the scenarios and the following sections contain a detailed explanation of the methodology used to simulate these policies. The first policy scenario is the British Columbia Climate Action Plan (CAP scenario) and the other three scenarios are additions to CAP: CAP with the Climate Action Team recommendations (CAT-rec scenario), CAP with additional Metro Vancouver policies (MV scenario), and CAP with all additional measures (All Measures scenario). The All Measures scenario is not included in the table as it is a combination of the more stringent policies in the CAT-rec and MV scenarios.



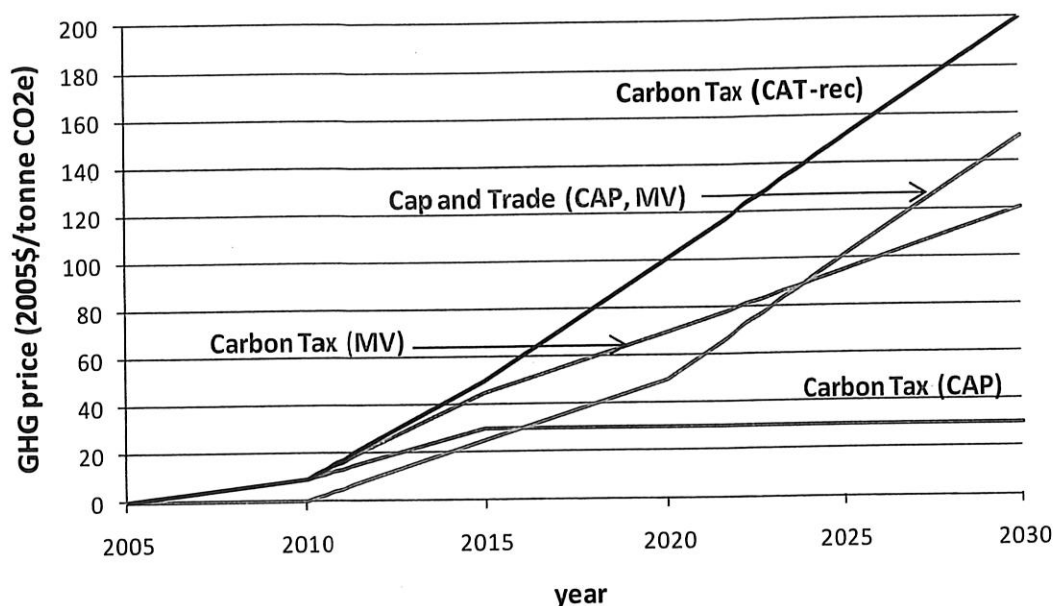
Table 2: Summary of the Metro Vancouver (MV), Climate Action Plan (CAP) and Climate Action Team recommendations (CAT-rec) policy scenarios

Policy	Policy Scenario		
	CAP	CAT-rec	MV
Light-duty vehicle emission standard	Follows California vehicle emissions 2011 to 2016.	Same as in CAP scenario	Same as in CAP scenario Extends to 2030.
Low-carbon transportation fuel standard	Renewable fuel requirement: 5% by volume after 2010, 10% by energy after 2020.	Same as in CAP scenario until 2020 when instead of 10%, the standard is 15%.	Same as in CAP scenario until 2020. Content must be 15% by 2025 and 20% by 2030
Transit expansion	Transit use doubles in 2020 relative to 2005.	Same as in CAP scenario	Same as in CAP scenario
Distance-based auto insurance			An annual variable cost (\$/km) to driving
Electrification of light-duty vehicles			Niche market for plug-in hybrid electric vehicles
Walking and cycling expansion		Double the mode share in 2020 relative to 2005	
Building retrofit standard			Buildings must retrofit to higher efficiency upon sale starting in 2015
Building code	Yes - least stringent	Yes- more stringent than in CAP in scenario	Same as in CAT-rec scenario
Zero emissions regulation for new buildings		Begins 2016 to 2020-excludes resistance electric heaters	Same as in CAT-rec scenario
Commercial building retrofit incentive		Retrofits of commercial buildings shells receive a 12% sales tax exemption	
Technology subsidies	Existing LiveSmart BC program.	Same as in CAP scenario	Same as in CAP scenario
Carbon tax (see Figure 1)	Existing BC carbon tax on combustion emissions: \$30/t from 2012 onward	BC carbon tax on emissions until 2012. Rises quickly after 2012 and applies to all emissions	BC carbon tax on combustion emissions until 2012. Keeps rising until 2030.
Cap and trade (see Figure 1)	Assumes a regional cap and trade for large industrial emitters	Replaced by carbon tax	Same as in CAP scenario

Figure 1 shows the specific price paths of the carbon tax and cap and trade policies used in this analysis.



Figure 1: Carbon price paths used in the policy scenarios



Climate Action Plan

This section describes the methodology used to model the CAP scenario that represents the Climate Action Plan measures announced by the government of British Columbia. It includes the key policies that form the Climate Action Plan, which also apply to Metro Vancouver. The landfill gas control regulation is not included since the active landfill in Metro Vancouver already has a landfill gas collection system. The methodology used here is consistent with the assumptions made for the modelling analysis in the Climate Action Plan.³ Some policies, such as the carbon tax, LiveSmart subsidies, and some transit improvements are already implemented, while we assume the policies that start after 2010 will be implemented according to the Plan.

Residential building code

British Columbia introduced changes to the building code that require all new houses to meet new energy efficiency standards equivalent to EnerGuide 77, effective September 2008. It is anticipated that the building code will also be updated periodically to increase efficiency requirements. This analysis incorporates these codes by modelling a requirement that houses built after 2010 have an EnerGuide rating of at least 80, which represents an energy efficiency improvement of roughly 27 to 30 percent compared to current standard homes. In CIMS-MV, this is modelled as a requirement that new buildings use the R2000 shell archetype. For a detached house, this requirement

³ Climate Action Plan, Government of British Columbia, 2008



represents a 30% improvement in energy efficiency relative to the current standard shell.⁴

Commercial/public sector building codes

We model a policy that requires new commercial buildings built after 2010 to meet ASHRAE 90.1-2004 standards, which represent an energy efficiency improvement of roughly 10% compared to the current standard practice. This policy also requires further improvement in building codes after 2015. Commercial building shells must be 20% more efficient and HVAC equipment must be 30% more efficient than current standard after 2015. Additionally, all new buildings built for the public sector are required to meet LEED Gold⁵ standards after 2010. This means that building shells are 33% more efficient and the HVAC systems are 30% more efficient than the current standard.

The BC LiveSmart program

This existing program is modelled as a subsidy that matches previous federal subsidies on energy efficient residential appliances and equipment. The federal subsidies are no longer in effect and are not included in the policy scenarios.

Renewable (low-carbon) fuel standard

We simulate a policy that requires gasoline and diesel fuel sold in British Columbia to have 5% renewable content by volume by 2015, starting after 2010, and 10% renewable content by energy from 2020 to the end of the simulation. The renewable fuel standard applies to the personal and freight transportation sectors and includes off-road vehicles.

Carbon tax

This policy simulates the existing British Columbian carbon tax on combustion emissions. The tax reaches \$30/tonne CO₂e in 2012 and remains constant for the rest of the forecast period.

Light-duty vehicle emissions standard for new vehicles

This standard is simulated such that it is consistent with the California emissions standards to 2016 that specify limits for average fleet GHG emissions. Currently, the Province has only passed regulations up to 2016 so we assume the standard remains constant from 2016 to 2030. The policy begins in 2011 and limits average fleet

⁴ Natural Resources Canada rates residential buildings on a scale of 0 to 100. A typical new house would achieve an EnerGuide rating of between 65 and 72, whereas an advanced house that does not require any purchased energy would achieve an EnerGuide rating of 100. A house that attains an EnerGuide rating of 80 or higher is considered to be highly energy efficient (<http://www.oee.nrcan.gc.ca/residential/personal/new-homes/upgrade-packages/energguide-service.cfm?attr=4>, Natural Resources Canada, 2007).

⁵ While commercial buildings can achieve LEED™ certification by incorporating several environmental improvements (e.g., improvements to waste management or reduction in water use), we only model the standard's effect on energy intensity (Canada Green Building Council, 2007).



emissions for 2011 to 2015 to less than 170 gCO₂/km. Average emissions must be less than 158 gCO₂/km from 2016 to the end of the simulation period.

Improvements to public transit

Consistent with the Provincial Transit Plan⁶, transit use (in person km travelled, or pkt) doubles between 2005 and 2020, reaching 17% of pkt in Metro Vancouver. The Transit Plan aims to increase rapid transit use by 70% by 2020. We assume rapid transit reaches 57% of transit pkt in 2020. The policy also regulates the use of hybrid electric motors for 75% of new buses after 2015. The increase in transit ridership represents the anticipated impact of transit funding from the provincial government and does not explicitly represent a future set of projects or policies. Improvements completed after 2005, such as the Canada line Skytrain route, are included in this expansion. The switch to public transit is simulated such that it can be made from either private vehicles or walking and cycling.

Emissions cap and trade for large industrial emitters

A regional or national cap and trade is established for large industrial emitters. The schedule of permit prices averages \$25/tonne CO₂e from 2011 to 2015, \$50/tonne CO₂e from 2016 to 2025 and \$150/tonne CO₂e from 2026 to 2030.

Policies no longer in effect

Provincial Sales tax exemptions for low emission vehicles and for energy efficient household technologies are not included in this analysis. These exemptions no longer apply due to the July 2010 sales tax reform.

Climate Action Team Recommendations

The following policy options have been under consideration by the Climate Action Team as additions to the Climate Action Plan.⁷ Several of these policies are incremental to the policies simulated in the Climate Action Plan while others strengthen the announced policies (e.g., revisions to the residential and commercial building codes). The policies simulated in this analysis do not include all the policy recommendations developed by the Climate Action Team. For example, some of the recommendations cannot be simulated in the current version of CIMS (e.g., CIMS does not currently simulate abatement opportunities in the BC agriculture sector). The methodology presented here is consistent with the publicly available analysis prepared for the Climate Action Secretariat that explored the same policy recommendations.⁸

⁶ The Provincial Transit Plan, Government of British Columbia, www.th.gov.bc.ca/Transit_Plan/index.html

⁷ Meeting British Columbia's Targets, A report from the B.C. Climate Action Team, 2008

⁸ A Quantitative Analysis of Selected Policies in British Columbia, MK Jaccard and Associates, 2008



Additional revision to the residential and commercial building codes

The building code changes are identical to those in the CAP scenario from 2011 to 2015. After 2015, all new residential buildings must be approximately 50% more energy efficient than current standard practices. As in the Metro Vancouver policy package, in CIMS new residences must use the LEED building shell archetype after 2015 (equivalent to a 40-60% improvement in efficiency relative to the standard archetype). Additionally, all new commercial buildings are required to meet LEED Platinum standards by 2020. This is a more stringent requirement than in the MV policy scenario (45% vs. 32% shell improvement by 2020).

A zero-emissions regulation for buildings

By 2020, all commercial and residential buildings are required to employ space and water heating technologies that do not produce direct GHG emissions (i.e. not involve fossil fuel combustion). Public sector buildings must comply with this regulation from 2016 onward. To limit new electricity demand, only technologies employing heat pumps and on-sight renewable energy, such as solar hot water, are permitted.

Incentives for retrofitting existing commercial buildings

These incentives are modelled as a subsidy towards retrofitting existing shells to more efficient shells. The subsidy is a 12% sales tax exemption on the cost of the retrofit. A retrofit reduces the space conditioning needs of a shell by 16% to 20%. Since the costs for shell improvements are uncertain and will vary greatly between buildings, the simulated impact of this policy measures is also quite uncertain.

Renewable (low-carbon) fuel standard

A renewable transportation fuel standard represents the low-carbon fuel regulation. This policy is an extension of the CAP renewable fuel standard. The policy is the same as the equivalent CAP policy until 2020, when the standard rises to 15% rather than 10%.

Increased trips by walking and bicycle

The mode share for walking and cycling (as a percent) is doubled relative to the 2005 value by 2020. Walking and cycling accounted for 8% of trips in Metro Vancouver in 2006⁹ and 3.3% of pkt in 2008¹⁰. The policy will raise this share to 6.5% of pkt by 2020. The trend continues to 2030 when the mode share reaches 9% of pkt. This change reflects anticipated improvements to infrastructure and changes in transit planning and city design that support a shift to walking and cycling. The simulation of this policy allows additional walking and cycling mode share to be taken from private vehicles and transit ridership based on the cost and preferences associated with these transportation modes in CIMS-MV.

⁹ 2008/2009 Cycling Statistics Update, City of Vancouver, 2009

¹⁰ 2008 Trip Diary, Translink



An extension of the announced carbon tax policy

After 2012, the carbon tax is extended to cover all combustion emissions and all process GHG emissions. The carbon tax rises to \$50/tonne CO₂e in 2015 and to \$100/tonne CO₂e in 2020. After 2020, the tax is scheduled to continue rising in \$50/tonne CO₂e increments every five years until the end of the simulation. This carbon tax on large industrial emitters replaces the cap and trade system from the CAP scenario.

Metro Vancouver Policy Scenario

Like the CAT-rec scenario, the MV policy scenario builds on the measures outlined in the Climate Action Plan. The MV policies were developed with the client during the previous contract and they are reviewed below. Discussion concerning the feasibility, outcomes and ranking of these policies is described in detail in the 2009 report completed for the client. The methodology for the freight truck efficiency standard (now applies to heavy-duty vehicles) has been changed in light of the potential federal policies in this sector, and it is now included in the baseline simulation. The renewable fuel standard is now an extension of existing policy past 2020. The start date for the hybrid bus regulation, the building retrofit regulation, the changes to the building code, and the zero-emissions building standard have been delayed until after 2015.

Distance-based auto insurance

This policy adds a 10 cent/km marginal cost to driving by 2015 for personal vehicles. This cost is modelled as an annual variable cost and the policy is revenue neutral meaning there is no net change in insurance costs.

Electrification of light-duty vehicles (plug-in hybrid regulation)

This policy regulates a minimum niche market for plug-in hybrid electric-vehicles. This regulation starts after 2015 at 5% of new vehicles sold in Metro Vancouver and rises to 10% of new vehicles after 2020. The policy applies only to personal vehicles and is additional to the vehicle emissions standard.

Renewable (low-carbon) fuel standard

A renewable transportation fuel standard represents the low-carbon fuel regulation. This policy is an extension of the CAP renewable fuel standard. The policy is the same as the equivalent CAP policy until 2020, after which the regulated renewable content of transportation fuels continues to rise. The renewable content of transportation fuels must be 15% by 2025 and 20% by 2030. This policy is simulated as additional to the vehicle emissions standard.

Light-duty vehicle emissions standard for new vehicles

This standard is simulated such that it is consistent with the California emissions standards to 2020 that specify limits for average fleet GHG emissions. We assume the standard continues along the same trend through to 2030. The policy begins in 2011 by



limiting average fleet emissions to less than 170 gCO₂/km from 2011 to 2015, falling to 140 gCO₂/km by 2020, and 120 gCO₂/km in 2030.

Building retrofit standard

Upon sale, existing residential and commercial building shells must be upgraded to a higher standard of energy efficiency. Based on sales data, 4% of existing buildings in the model undergo a retrofit each year after 2015. A shell retrofit results in a 20-35% improvement in residential buildings and a 16% to 20% improvement in commercial buildings relative to existing buildings stock. New buildings must be built to the higher standard from 2016 onward when this policy is simulated alone.

Carbon tax

This policy simulates an extension of the British Columbian carbon tax on combustion emissions. The tax begins at \$10/tonne CO₂e in 2008, rising by five dollars per tonne each year to 2012 when it reaches \$30/tonne CO₂e. In this policy, the carbon price keeps rising by \$5/tonne CO₂e each year thereafter, reaching \$70/tonne in 2020 and \$120/tonne in 2030. The carbon tax does not cover process emissions, landfill gases, or emissions from international marine freight vessels.

Emissions cap and trade

This policy is the same as in the CAP scenario. Note that in the previous analysis, the permit price path was accidentally made equal to the carbon tax. This error allowed emissions to be 0.02 Mt greater in 2020, although the difference grew to 0.3 Mt by 2030. This error has been corrected in the current analysis.

The following policies in the MV scenario are the same as in the CAT-rec scenario:

- Residential and commercial/public-sector building codes
- Transit expansion
- Zero-emissions regulation for new buildings

All Measures Policy Scenario

The strongest set of policies in this analysis is the All Measures scenario. This scenario builds upon the CAP measures with the addition of all additional policies from the CAT-rec and MV scenarios. In the case where two similar policies could be applied, such as different schedules for the renewable fuel standard, the stronger version of the policy is used.

This scenario includes the CAP scenario policies with the following substitutions:

- The renewable fuel standard follows the CAT-rec schedule to 2020, when the renewable content must reach 15%. From 2025 to 2030, it follows the MV schedule, with a requirement for 20% renewable content by 2030.
- The changes to the building code from the CAT-rec scenario are used.



- The carbon tax and cap and trade are replaced by the carbon tax from the MV scenario.
- The light-duty vehicle emissions standard from the MV scenario is used, extending the decline in maximum average fleet emissions from 2016 to 2030.

Additional policies from the CAT-rec and MV scenario include:

- The zero emissions standard for buildings
- The increase in walking and cycling mode share
- The commercial building retrofit incentive
- The building shell retrofit regulation
- The distance-based auto insurance, and
- The building retrofit standard

Results

This section presents the forecast of GHG emissions and energy consumption from the four policy scenarios. First, results from all of the scenarios are compared. Second, the scenarios are examined in more detail. An incremental policy analysis explores how the additional policies in the MV scenario can further reduce emissions from what the CAP measures achieves. Similarly, this analysis also explores how the additional policies in the All Measures scenario can further reduce emissions from what the CAT-rec scenario achieves. The results section concludes with an analysis of how the policy scenarios change the emissions coming from the energy supply sectors that provide energy to Metro Vancouver region.

Comparison of Policy Scenarios

Figure 2 and Table 3 compare the GHG emissions forecast for each policy scenario. The 2020 emissions target, 33% below 2007 emissions or approximately 10.4 MtCO₂e per year, is also shown on the figure. This target is based on the sectors included in CIMS-MV and does not account for the forecasted emissions from the Chevron or Burrard facilities.¹¹ The CAP scenario significantly reduces emissions below the baseline forecast, but emissions in 2020 are 14.3 MtCO₂e (Table 3), or roughly 4 MtCO₂e above the target. Although the CAT-rec and the MV scenarios contain different policies, the GHG forecast for both scenarios is very similar. While the CAT-rec scenario has a stronger market-wide carbon pricing policy, the MV scenario has additional regulatory and pricing policies (e.g., extended light-duty vehicle emissions standard and distance-based auto insurance). In 2020, the CAT-rec scenario reduces emissions to 12.6 MtCO₂e

¹¹ If all emissions are included, the 2020 target is 10.8 MtCO₂e. None of the policy scenarios achieve this target even with the exclusion of the Chevron and Burrard emissions from the forecast.



while the MV scenario reduces emissions to 13.0 MtCO₂e. The All Measures scenario has the lowest emissions forecast, falling to 12.0 MtCO₂e by 2020.

Table 3 also compares the MV scenario in the current analysis with the 2009 analysis. To maintain a realistic portrayal of policy implementation, several of the policies in the current MV scenario now start after 2015, whereas in the previous analysis they began in 2010 or 2011. Starting later means the policies have a shorter window in which to affect the decisions of consumers and firms, delaying the abatement they can achieve. Also, the current MV scenario does not affect landfill emissions while in the previous analysis we assumed the residual landfill gas emissions could be captured and sold as regulated emissions credits. Consequently the current MV scenario reduces emissions by less than in the previous analysis and the gap between the forecasted emissions and the 2020 target is larger. Even if all landfill emissions were prevented and used as offsets, the 0.34 MtCO₂e reductions would not close this gap.

Figure 2: Metro Vancouver's GHG emissions forecast, by scenario

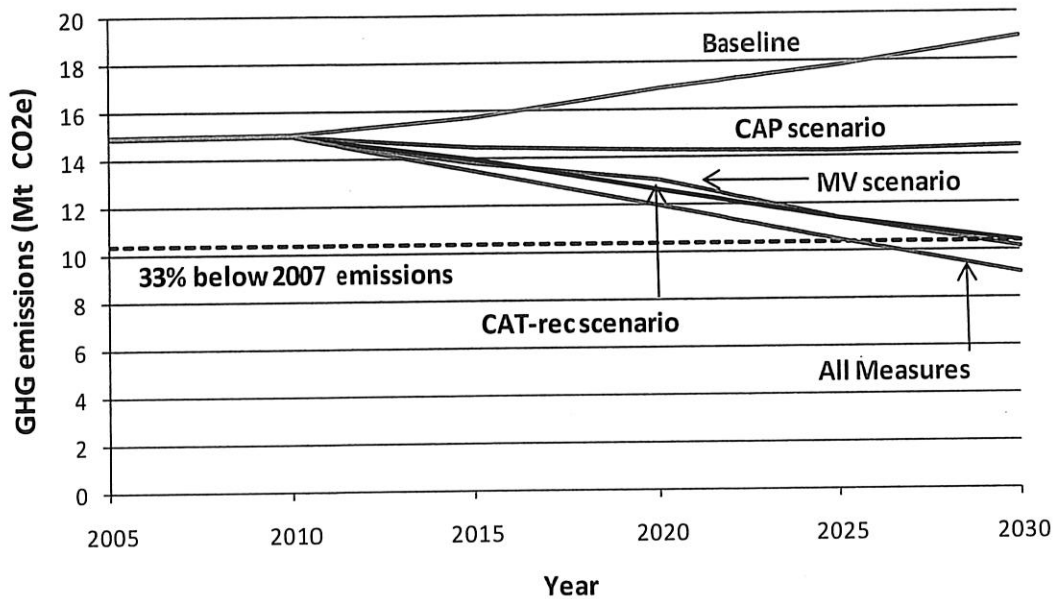




Table 3: Metro Vancouver's GHG emissions and abatement, by scenario

	2010	2015	2020	2025	2030
Emissions, MtCO₂e					
<i>Baseline</i>	15.1	15.7	16.9	17.9	19.0
<i>CAP</i>	15.0	14.5	14.3	14.2	14.4
<i>CAT-rec</i>	15.0	14.0	12.6	11.4	10.4
<i>MV</i>	15.0	13.8	13.0	11.4	10.1
<i>All Measures</i>	15.0	13.5	12.0	10.5	9.1
Abatement, MtCO₂e					
<i>CAP</i>	0.1	1.2	2.6	3.6	4.6
<i>CAT-rec</i>	0.1	1.7	4.3	6.5	8.6
<i>MV (updated)</i>	0.1	1.9	3.8	6.4	8.8
<i>MV (2009)</i>	0.5	3.1	6.1	7.9	9.3
<i>All Measures</i>	0.1	2.2	4.9	7.4	9.9

Figure 3 shows the electricity consumption forecast for each scenario. All of the policy scenarios show an increase in electricity consumption relative to the baseline forecast. Furthermore, the scenarios that achieve the greatest reduction in emissions show the largest increase in electricity consumption. The MV scenario and the CAT-rec scenarios have particularly high electricity consumption due to the zero emissions building standard that prevents new buildings from using fossil fuels for heat supply. Similarly, the stricter vehicle emissions standard in the MV and all measures scenarios and the plug-in hybrid regulation in the MV scenario induce electrification in the transportation sector. The higher carbon price in the CAT-rec and All Measures scenarios induces even more electrification than the MV scenario.

In the MV scenario, electricity consumption is 15 PJ/yr (17%) greater than the baseline in 2020, and 31 PJ/yr (30%) greater in 2030. The corresponding values for the CAT-rec scenario are 20 PJ/yr (22%) more in 2020 and 37 PJ/yr (37%) more in 2030. The All Measures scenario shows electricity consumption slightly above the CAT-rec scenario. Electricity consumption in the CAP scenario is only 5% above the baseline in 2020 and 9% in 2030 since the switch to electricity is only driven by a moderate carbon tax with a long-term price of \$30/tonne CO₂e. Additional electricity loads are primarily for thermal applications which include space heating (running heat-pumps) and process heating in miscellaneous manufacturing facilities.¹² Additional electricity loads are for transportation (Table 4), based on CIMS' explicit representation and tracking of all technologies, including plug-in hybrid vehicles which gain market share in the MV and all measures scenarios.

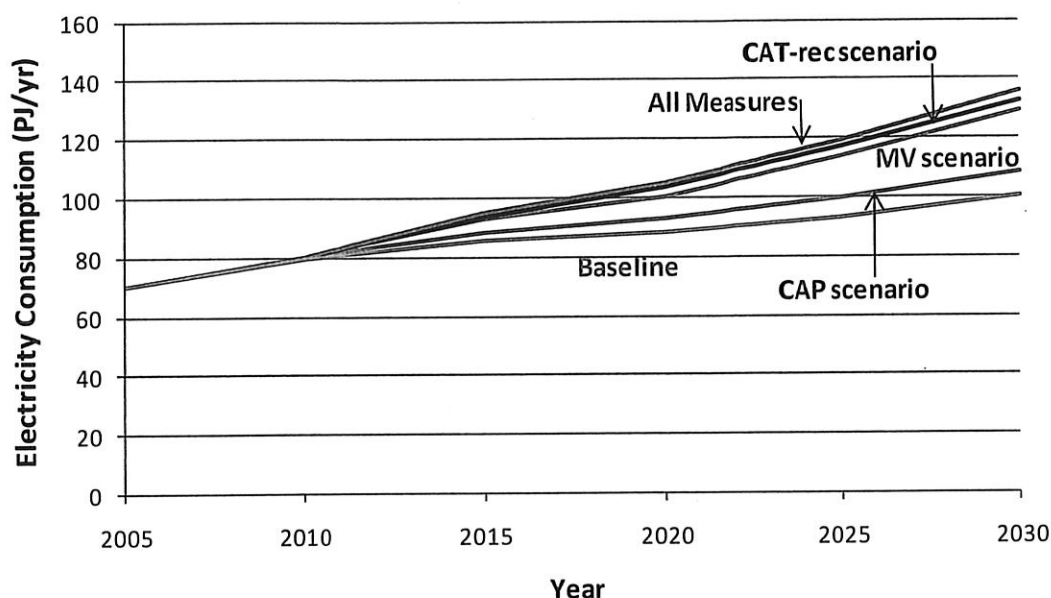
¹² A limitation of this study is that it does not include the provision of some thermal energy alternatives (biomass, biogas, waste heat) supplied on-site or via district energy. This could reduce electricity consumption for thermal needs in the policy scenarios.



Table 4: Increase in transportation electricity consumption, by scenario

	2010	2015	2020	2025	2030
<i>CAP</i>	0.0	0.9	1.7	2.5	3.3
<i>CAT-rec</i>	0.0	0.8	1.6	2.3	3.0
<i>MV</i>	0.0	2.2	3.7	6.0	8.0
<i>All Measures</i>	0.0	2.1	3.3	5.1	7.0

Figure 3: Metro Vancouver's electricity consumption, by scenario



The increased electricity consumption of the policy scenarios is a concern because of the quantity and cost of the additional generation capacity that will be required and the potential emissions from the electricity sector. For this analysis we assume that the province maintains its commitment from the BC Energy Plan¹³ to generate electricity from sources with zero net emissions and we use an electricity price consistent with this initiative.

Figure 4 shows the natural gas consumption forecast for each scenario. The scenarios that achieve the greatest reduction in emissions also show the largest decrease in natural gas consumption. For a given scenario, the decline of gas consumption relative to the baseline scenario is larger than the corresponding increase in electricity consumption. This is indicative of efficiency gains in the consumption of natural gas, such as the building shell and furnace/boiler improvements in all scenarios, as well as efficiency gains (at the point of energy consumption) from switching to electric devices from gas-fired devices. The CAT-rec and All Measures scenarios show the greatest decrease in gas consumption. The additional decrease relative to the MV scenario is

¹³ BC Energy Plan, Government of British Columbia, 2008

due to the higher carbon price that affects technology choices for all sectors including small manufacturing facilities.

Figure 4: Metro Vancouver's natural gas consumption, by scenario

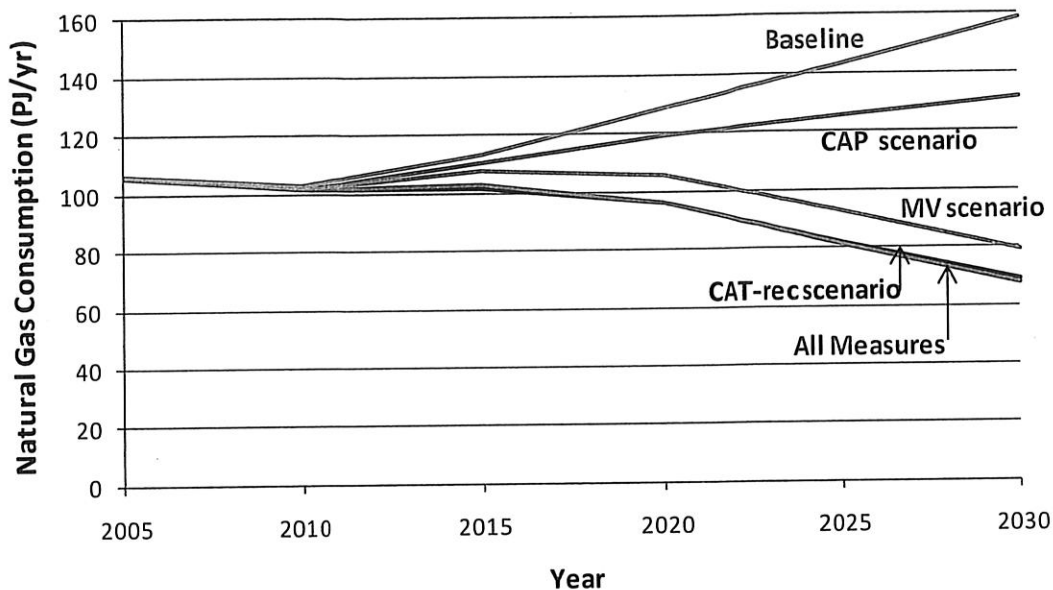
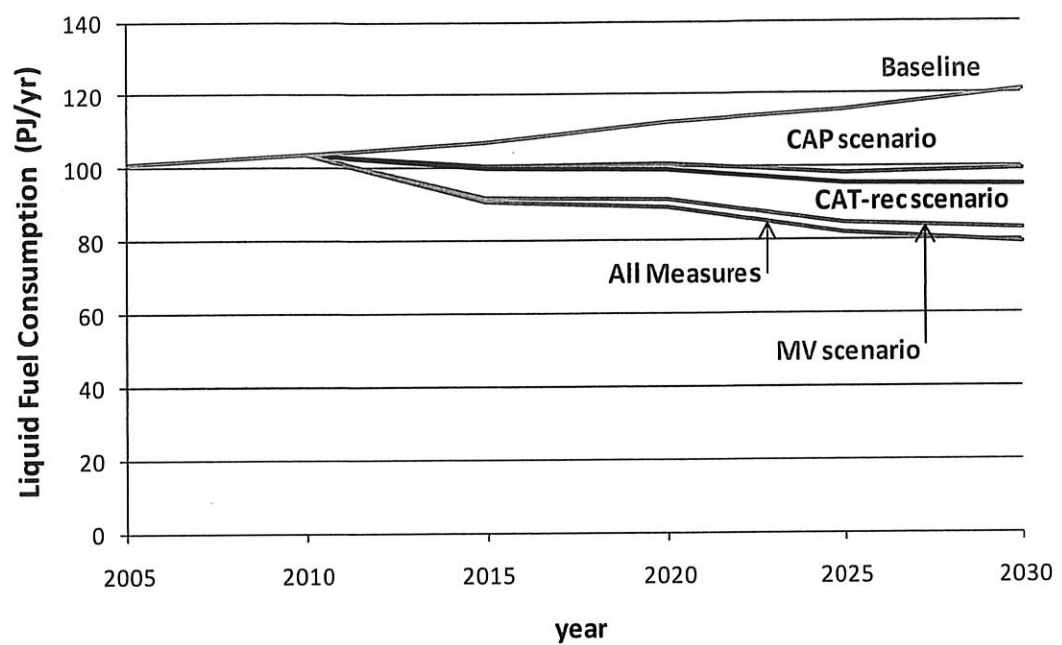


Figure 5 shows the forecasted consumption of liquid fuels in Metro Vancouver for each scenario. These fuels include gasoline, diesel, other fuel oils, ethanol and biodiesel, consumed primarily by personal and freight vehicles. For all the policy scenarios, the fuel mix is 5% biofuel by 2015. In the CAT-rec scenario, this fraction rises to 15% by 2020 whereas the renewable content rises to 15% in 2025 and 20% in 2030 in the MV scenario. The consumption of these fuels is indicative of efficiency of the vehicle fleet and the demand for transportation.



Figure 5: Metro Vancouver's Liquid fuel^a consumption, by scenario



^a Liquid fuels include refined petroleum products, ethanol and biodiesel.

The CAP scenario consumption is lower than the baseline because of the light-duty vehicle efficiency standard and the transit expansion. Consumption in the CAT-rec scenario is lower yet again due to the additional improvements to cycling and walking infrastructure. The liquid fuel consumption in the MV scenario is lower than in the other two scenarios due to the extended light-duty vehicle emissions standard and the reduction in vehicle kilometres travelled resulting from the distance-based auto insurance. The All Measures scenario reduces liquid fuel consumption further by adding the walking and cycling improvements of the CAT-rec scenario.

Climate Action Plan Scenario

This section describes the results of the Climate Action Plan in more detail. The CAP policy scenario reduces emissions by 2.6 MtCO₂e from the baseline in 2020 (Table 5). Policy overlap is small at 0.3 MtCO₂e, approximately 12% (Table 6).

Much of the abatement is from the personal transportation sector because it is targeted by several strong policies and the capital stock is replaced more quickly relative to that of other sectors (e.g., the average life span of a vehicle is much less than that of a building). The policies encourage several abatement actions, including mode switching to transit, improvements in energy intensity (vehicle emissions standard), and improvement to emissions intensity (renewable fuel standard).

Abatement from freight transportation is limited because it is affected only by the renewable fuel standard and the existing carbon tax. Similarly, the other manufacturing



sector shows limited abatement. Annual baseline emissions from this sector are approximately 1 MtCO₂e from 2020 to 2030 and abatement in the CAP scenario is less than 10% relative to the baseline.

The building code changes, the carbon tax and the LiveSmart subsidies target the building sectors and achieve significant abatement in the commercial and public sector. However, abatement from the residential sector is limited. The building code improvements for this sector are less stringent and the LiveSmart program achieves few reductions (Table 6).

The carbon tax achieves slightly more abatement than the cap and trade policy. Reductions from the tax are 0.5 MtCO₂e in 2020, while reductions from the cap and trade are 0.4 MtCO₂e (Table 6). Although the former policy puts a lower price on carbon, it covers emissions from almost all sectors and reduces emissions further.

Table 5: Abatement by sector under the Climate Action Plan scenario, MtCO₂e

	2010	2015	2020	2025	2030
Residential	0.1	0.2	0.3	0.4	0.5
Commercial/public sector	0.0	0.1	0.4	0.8	1.2
Transportation personal	0.0	0.5	1.1	1.5	1.9
Transportation freight	0.0	0.1	0.2	0.3	0.3
Chemical products	0.0	0.0	0.0	0.0	0.0
Cement	0.0	0.2	0.3	0.5	0.7
Paper manufacturing	0.0	0.0	0.0	0.0	0.0
Other manufacturing	0.0	0.1	0.1	0.1	0.0
Waste	0.0	0.0	0.0	0.0	0.0
Total abatement from baseline	0.1	1.2	2.6	3.6	4.6

Table 6: Abatement by policy under the Climate Action Plan scenario, MtCO₂e

	2010	2015	2020	2025	2030
Vehicle emission standard	0.0	0.3	0.5	0.8	1.0
Transit expansion	0.0	0.1	0.2	0.4	0.5
Renewable fuel standard	0.0	0.2	0.7	0.8	0.9
Building codes	0.0	0.1	0.5	0.9	1.3
LiveSmart subsidies	0.0	0.1	0.1	0.1	0.1
Cap and trade	0.0	0.2	0.4	0.6	0.8
Carbon tax	0.1	0.3	0.5	0.6	0.8
Sum individual policy effects	0.1	1.4	2.9	4.1	5.3
Total abatement from baseline	0.1	1.2	2.6	3.6	4.6
Policy overlap	0.0	0.2	0.3	0.5	0.7

Climate Action Team Recommendations Scenario

This section describes the CAT-rec scenario results in more detail. The CAT-rec scenario reduces emissions by 4.3 MtCO₂e from the baseline in 2020. Because the policies in the CAT-rec scenario are stronger, policy overlap is greater at 0.9 MtCO₂e in 2020, or 18% (Table 8). As a set of policies becomes more stringent, the overlap of policies tends to



increase. For example, a strong carbon price might induce a consumer to install an air-source heat pump in their home, thus overlapping with the effect of the zero-emissions building standard.

The strong carbon price leads to substantial abatement across all sectors, even in the industrial sectors that are not affected by other policies (Table 7). Independent of all other policies, this tax reduces emissions by 2.1 MtCO₂ below the baseline in 2020, more than any other policy in the CAP and CAT-rec scenario.

More stringent building codes achieve double the abatement by 2020 in the CAT-rec scenario relative the CAP scenario. These improvements to the building code and the zero emissions building regulation ensure that emissions from the building sectors, including the residential sector, are substantially reduced (Table 7).

Table 7: Abatement by sector under the Climate Action Plan with the Climate Action Team recommendations (CAT-rec scenario), MtCO₂e

	2010	2015	2020	2025	2030
Residential	0.1	0.4	0.9	1.4	1.9
Commercial/public sector	0.0	0.2	0.7	1.5	2.3
Transportation personal	0.0	0.6	1.5	1.9	2.3
Transportation freight	0.0	0.1	0.4	0.5	0.5
Chemical products	0.0	0.0	0.0	0.0	0.0
Cement	0.0	0.2	0.5	0.7	0.9
Paper manufacturing	0.0	0.0	0.0	0.0	0.0
Other manufacturing	0.0	0.2	0.4	0.5	0.6
Waste	0.0	0.0	0.0	0.0	0.0
Total abatement from baseline	0.1	1.7	4.3	6.5	8.6

Table 8: Abatement by policy from the Climate Action Plan with the Climate Action Team recommendations (CAT-rec scenario), MtCO₂e

	2010	2015	2020	2025	2030
Building codes	0.0	0.1	0.7	1.2	1.8
Zero emissions buildings	0.0	0.1	0.4	1.6	2.9
Walking/cycling expansion	0.0	0.1	0.2	0.2	0.3
Commercial retrofit incentive	0.0	0.0	0.1	0.1	0.1
Carbon tax extension	0.1	1.0	2.1	3.4	4.7
Renewable fuel standard	0.0	0.2	1.1	1.2	1.3
<i>Policies also in CAP Scenario:</i>					
Vehicle emission standard	0.0	0.3	0.5	0.8	1.0
Transit expansion	0.0	0.1	0.2	0.4	0.5
LiveSmart subsidies	0.0	0.1	0.1	0.1	0.1
Sum individual policy effects	0.2	1.9	5.2	8.9	12.7
Total abatement from baseline	0.1	1.7	4.3	6.5	8.6
Policy overlap	0.1	0.2	0.9	2.4	4.1



Metro Vancouver Scenario

This section describes the MV scenario results in more detail. The MV scenario reduces emissions by 3.8 MtCO₂e from the baseline in 2020. Like in the CAT-rec scenario, individual policies are strong and there are numerous policies. Consequently policy overlap is large at 1.5 MtCO₂e, or 28% (Table 10).

Abatement from the transportation sector in this scenario is greater than in the CAT-rec scenario by 2025 and 2030. Although the carbon price is lower in the MV scenario, the distance-based auto insurance, the plug-in hybrid regulation, and the extended light-duty vehicle emissions standard and renewable fuel standard ensure emissions from transportation continue to decline throughout the simulation. On the other hand, abatement from the industrial sectors in the MV scenarios is less than in the CAT-rec scenarios. These sectors are only affected by carbon pricing (tax or cap and trade), and the carbon price is higher in the CAT-rec scenario.

Table 9: Abatement by sector under the Metro Vancouver policy scenario (MV scenario), MtCO₂e

	2010	2015	2020	2025	2030
Residential	0.1	0.3	0.7	1.3	1.8
Commercial/public sector	0.0	0.1	0.6	1.4	2.3
Transportation personal	0.0	1.0	1.7	2.5	3.2
Transportation freight	0.0	0.1	0.3	0.4	0.6
Chemical products	0.0	0.0	0.0	0.0	0.0
Cement	0.0	0.2	0.3	0.5	0.7
Paper manufacturing	0.0	0.0	0.0	0.0	0.0
Other manufacturing	0.0	0.1	0.2	0.2	0.3
Waste	0.0	0.0	0.0	0.0	0.0
Total abatement from baseline	0.1	1.9	3.8	6.4	8.8



Table 10: Abatement by policy under the Metro Vancouver policy scenario (MV scenario), MtCO₂e

	2010	2015	2020	2025	2030
Distance-based insurance	0.0	0.5	0.6	0.6	0.7
Plug-in hybrid regulation	0.0	0.0	0.1	0.2	0.4
Renewable fuel standard	0.0	0.2	0.7	1.2	1.7
Building retrofit regulation	0.0	0.0	0.3	0.4	0.5
Carbon tax	0.1	0.7	1.3	1.9	2.6
Vehicle emission standard	0.0	0.3	0.7	1.2	1.5
<i>Policies also in other Scenarios:</i>					
<i>Transit expansion</i>	<i>0.0</i>	<i>0.1</i>	<i>0.2</i>	<i>0.4</i>	<i>0.5</i>
<i>LiveSmart subsidies</i>	<i>0.0</i>	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>
<i>Building codes</i>	<i>0.0</i>	<i>0.1</i>	<i>0.7</i>	<i>1.2</i>	<i>1.8</i>
<i>Zero emissions buildings</i>	<i>0.0</i>	<i>0.1</i>	<i>0.4</i>	<i>1.6</i>	<i>2.9</i>
<i>Cap and trade</i>	<i>0.0</i>	<i>0.2</i>	<i>0.4</i>	<i>0.6</i>	<i>0.8</i>
Sum individual policy effects	0.2	2.4	5.3	9.3	13.4
Total abatement from baseline	0.1	1.9	3.8	6.4	8.8
Policy overlap	0.1	0.4	1.5	2.9	4.5

All Measures Scenario

The All Measures scenario is the most stringent policy scenario and it reduces emissions by 4.3 MtCO₂e below the baseline by 2020 (Table 11). Abatement by policy is not shown for this scenario since the policies are all derived from other scenarios. This scenario reduces emissions by an additional 0.6 MtCO₂e in 2020 and 1.3 MtCO₂e in 2030.

Additional abatement beyond the CAT-rec scenario occurs primarily in the transportation sector due to the stronger renewable fuel standard, the extended light-duty vehicle emissions standard, and the distance-based auto insurance.

Table 11: Abatement by sector under the All Measures policy scenario, MtCO₂e

	2010	2015	2020	2025	2030
Residential	0.1	0.4	0.9	1.5	2.0
Commercial/public sector	0.0	0.2	0.7	1.5	2.3
Transportation personal	0.0	1.1	2.0	2.7	3.4
Transportation freight	0.0	0.1	0.4	0.5	0.7
Chemical products	0.0	0.0	0.0	0.0	0.0
Cement	0.0	0.2	0.5	0.7	0.9
Paper manufacturing	0.0	0.0	0.0	0.0	0.0
Other manufacturing	0.0	0.2	0.4	0.5	0.6
Waste	0.0	0.0	0.0	0.0	0.0
Total abatement from baseline	0.1	2.2	4.9	7.4	9.9

Incremental Policy Analysis

Of the four scenarios in this analysis, two are based on provincially implemented measures and two are based on a Metro Vancouver extension of the provincial



measures. The CAP scenario represents the announced policies of the Provincial government and the CAT-rec scenario represents a stronger provincial plan. The other two scenarios – MV and All Measures - represent additions to the provincial policy plans. If CAP is implemented, then the addition of the Metro Vancouver policies forms the MV scenario. If the CAT-rec scenario is implemented, then the addition of the Metro Vancouver policies forms the All Measures scenario. The Metro Vancouver policies will be implemented in the context of what happens provincially, so it is important to understand the incremental effect of additional policies that would be implemented only at the regional level.

Table 12 summarises the abatement of the four scenarios and presents the incremental abatement of individual MV policies beyond the two policy scenarios that could be implemented at the provincial level.

Table 12: Incremental Abatement from Metro Vancouver Scenario Policies (MtCO₂e)

	2010	2015	2020	2025	2030
CAP abatement	0.1	1.2	2.6	3.6	4.6
CAT-rec abatement	0.1	1.7	4.3	6.5	8.6
MV abatement	0.1	1.9	3.8	6.4	8.8
All measures abatement	0.1	2.2	4.9	7.4	9.9
Incremental abatement of MV scenario policies relative to the CAP scenario					
<i>Distance-based insurance</i>	0.0	0.4	0.4	0.4	0.5
<i>Plug-in hybrid regulation</i>	0.0	0.0	0.0	0.2	0.2
<i>Renewable fuel standard</i>	0.0	0.0	0.0	0.3	0.6
<i>Building retrofit regulation</i>	0.0	0.0	0.1	0.2	0.2
<i>Carbon Tax</i>	0.0	0.2	0.5	0.8	1.1
<i>Vehicle emission standard</i>	0.0	0.0	0.2	0.4	0.6
<i>Building Codes</i>	0.0	0.0	0.1	0.3	0.4
<i>Zero emissions buildings</i>	0.0	0.2	0.3	1.1	1.9
Incremental abatement MV scenario policies relative to the CAT-rec scenario					
<i>Distance-based insurance</i>	0.0	0.5	0.4	0.4	0.5
<i>Plug-in hybrid regulation</i>	0.0	0.0	0.0	0.1	0.2
<i>Renewable fuel standard</i>	0.0	0.0	0.0	0.0	0.3
<i>Building retrofit regulation</i>	0.0	0.0	0.1	0.1	0.1
<i>Vehicle emission standard</i>	0.0	0.0	0.2	0.4	0.6

The sum of the incremental abatement of the individual policies is more than the difference between a provincial policy scenario and that scenario with MV policies. This is because several extra policies would create additional policy overlap. For example, the distance-based auto insurance reduces emissions by reducing the number of vehicle kilometres travelled. If it is implemented in addition to CAP, it yields roughly 30% less abatement than if it were used alone since the CAP renewable fuel standard and light-duty vehicle emissions standard have reduced the emissions intensity of each vehicle kilometre travelled.

Even with policy overlap, each MV policy reduces emissions further than the CAP policies alone. In particular, the extension of the carbon tax and the zero emissions



regulation for buildings are strong policies that significantly reduce emissions relative to the CAP scenario. The incremental abatement of the MV policies increases towards the end of the simulation period because their stringency generally increases during the simulation. For example, in the MV scenario, light-duty vehicle emissions must continue decreasing and the renewable fuel content must continue increasing to 2030 whereas these policies are static after 2016 and 2020, respectively, in the CAP scenario.

The distance-based auto insurance has the same incremental effect whether it is applied in addition to the CAP scenario or the CAT-rec scenario. One would expect that the stronger carbon price and renewable fuel standard of the CAT-rec scenario would reduce the incremental benefit of implementing the distance-based auto insurance. However, the CAT-rec contains improvements to walking and cycling infrastructure while the CAP scenario does not. This policy plays a supportive role by providing an alternative to driving, thus enhancing the effect of distance-based auto insurance. Therefore, the net incremental effect of the insurance policy remains the same if it is applied to the CAP scenario or the CAT-rec scenario.

Similarly, the incremental effect of the light-duty vehicle emissions standard should be lower when it is applied with the stronger CAT-rec policy scenario. However, the difference is less than 10% and is not significant at the level of precision in this analysis.

The plug-in hybrid regulation and the building shell retrofit standard both show reduced incremental benefits when applied with the CAT-rec scenario as opposed to the CAP scenario. In particular, the effect of the building retrofit standard overlaps with the incentive to retrofit buildings and the effect of the higher carbon price that is already in the CAT-rec scenario.

Energy Supply Emissions

Metro Vancouver is a part of a larger effort to reduce GHG emissions, so it is important to know how the policies that are implemented in Metro Vancouver may affect emissions in the rest of the province or country. The policies in this analysis will affect the emissions from the energy supply sectors that have not been modelled by changing the quantity and type of energy demanded in the Metro Vancouver. Without developing and running several models concurrently, it is difficult to simulate a city-sized energy system that simulates how the policy scenarios will change emissions globally. However, this analysis can be done by combining informed assumptions derived from other modelling projects with an understanding of how Metro Vancouver fits into the regional energy system.

Using the British Columbia and Alberta regions from the national CIMS model, we forecasted the upstream emissions intensities (tCO₂e/GJ) that would apply to the CIMS-MV scenarios. To forecast the intensities for the CAP and MV scenarios, the cap and trade policy applies to the energy supply sectors. For the CAT-rec and All Measures scenarios, the CAT-rec carbon tax applies to the energy supply sectors. Forecasts of



upstream emissions were determined using these emissions intensities and the energy consumption forecasts produced from the CIMS-MV simulations.

The following assumptions apply to this analysis of upstream emissions:

- In the baseline and all policy scenarios, the electricity sector follows the BC Energy Plan. It only develops new capacity with zero net GHG emissions, 90% of which is from renewable or zero-emissions sources.¹⁴
- Natural gas consumed in Metro Vancouver is produced in British Columbia.
- Crude oil consumed in Metro Vancouver is produced in Alberta and the average emissions intensity of the crude sector is used to determine the upstream emissions. Changes in crude oil consumption result in a reduction in oil sands production since it is the marginal resource in Alberta. Therefore, the emissions intensity of synthetic oil production is used to determine the change in upstream emissions in the policy scenarios.
- No policy or carbon pricing applies in Alberta.
- The amount of crude oil consumed is equal to the amount of petroleum products consumed in terms of energy.
- Since the price of natural gas and crude oil are determined by continental and global factors, we assume the price rebound effect for these fuels is negligible. This means we assume the change in demand for fossil fuels in British Columbia and from Metro Vancouver is not large enough to reduce the price of these fuels such that demand in other regions would increase. Thus, we are assuming the decline in production of natural gas and crude oil is equal to the simulated decline in demand.
- All future technology assumptions that are in the CIMS model used for Provincial and National analyses apply here. Specifically, cellulosic ethanol is not available until after 2020. The capital costs for this technology are initially very high, although they decrease with accumulated experience.
- We make no assumptions regarding the location of petroleum or biofuel refining. Given that there is a refinery in Metro Vancouver, one could assume that the changes to upstream emissions from liquid fuel production (except crude oil extraction) occur in Metro Vancouver. In CIMS, roughly 70% of the emissions from biofuel production are associated with refining the biomass rather than producing it.
- Biofuel emissions do not include the emissions associated with the production of fertilizers, pesticides, or from land conversion (e.g., forest to farmland).

¹⁴ BC Energy Plan, Government of British Columbia, 2007



Likewise, crude oil production does not account for land conversion emissions (e.g., forest to open-pit mine).

Table 13 shows the resulting emissions intensity for energy production for each scenario, disaggregated by the fuel type. The results in this table show the following:

- The baseline emissions intensity of natural gas production remains roughly constant, but declines by 50% in response to either the cap and trade or the CAT-rec carbon tax.
- In all scenarios, the emissions intensity of electricity production declines since the sector acquires only zero-emissions capacity, according to the BC Energy Plan.
- The emissions intensity of petroleum refining rises in the baseline scenario as the feedstock shifts from lighter crude oil to heavier crude oil. Carbon pricing has a small effect on the emissions intensity of the refining sector.
- The average emissions intensity of the Alberta crude oil sector remains constant to 2030. The intensity of oil sands production and upgrading is almost 70% higher than the average for the sector throughout the simulation period and is not affected by the policy scenario since we assume neither carbon price policy affects the sector.
- Ethanol production is very emissions intensive in the baseline until 2030 when cellulosic production becomes commercialized and replaces corn based production. Under the influence of carbon pricing, cellulosic ethanol becomes viable by 2020. Biodiesel production is less emissions intensive than ethanol production in the baseline but the intensity does not decline substantially in response to carbon pricing.



Table 13: Energy production emissions intensity (ktCO₂e/PJ)

	2010	2015	2020	2025	2030
Baseline					
Natural Gas	9	8	8	8	8
Electricity	3	2	2	1	1
Petroleum Refining	6	6	6	7	7
Average Alberta Crude Oil	14	14	14	14	14
Ethanol	45	44	44	46	26
Biodiesel	11	13	12	11	11
Under the CAP cap and trade (applies to CAP and MV scenario)					
Natural Gas	9	6	5	5	4
Electricity	3	2	2	1	1
Petroleum Refining	6	6	6	6	6
Synthetic Oil	23	23	23	23	22
Ethanol	45	44	45	20	10
Biodiesel	11	14	11	10	9
Under the CAT-rec carbon price (applies to the CAT-rec and All Measures scenario)					
Natural Gas	9	6	5	4	4
Electricity	3	2	2	1	1
Petroleum Refining	6	6	6	6	6
Synthetic Oil	23	23	23	23	22
Ethanol	45	44	44	8	6
Biodiesel	11	14	10	9	8

Table 14 shows the energy consumption forecast for Metro Vancouver by scenario, disaggregated by the fuel type. As discussed previously, the scenarios with the most stringent policies tend to show a large decline in natural gas consumption and an increase in electricity consumption. The MV scenario and the All Measures scenario have a greater decline in liquid fuel consumption due to the extended light-duty vehicle emissions standard. These scenarios also have the greatest consumption of biofuel due to their higher renewable fuel requirements.


Table 14: Energy consumption by scenario, disaggregated by fuel type

	2010	2015	2020	2025	2030
Energy consumption, baseline (PJ)*					
Natural Gas	103	113	129	143	159
Electricity	79	85	88	93	100
Refined Petroleum Products	103	106	112	115	120
Crude Oil	103	106	112	115	120
Energy consumption, CAP scenario (PJ)					
Natural Gas	101	110	119	125	131
Electricity	80	89	93	100	109
Refined Petroleum Products	103	97	91	88	89
Crude Oil	103	97	91	88	89
Ethanol	0	2	6	6	6
Biodiesel	0	1	4	4	4
Energy consumption, MV scenario (PJ)					
Natural Gas	101	108	106	93	79
Electricity	80	93	100	114	129
Refined Petroleum Products	103	89	82	71	66
Crude Oil	103	89	82	71	66
Ethanol	0	2	5	7	9
Biodiesel	0	2	4	6	8
Energy consumption, CAT-rec scenario (PJ)					
Natural Gas	101	102	96	82	69
Electricity	80	93	103	114	129
Refined Petroleum Products	103	96	85	81	80
Crude Oil	103	96	85	81	80
Ethanol	0	2	9	8	8
Biodiesel	0	2	6	6	7
Energy consumption, All Measures scenario (PJ)					
Natural Gas	101	103	96	81	67
Electricity	80	94	104	117	132
Refined Petroleum Products	103	88	77	69	62
Crude Oil	103	88	77	69	62
Ethanol	0	2	7	7	9
Biodiesel	0	2	6	6	9

*Biofuel emissions in the baseline are negligible and are not shown.


Table 15: Metro Vancouver Upstream Emissions

	2010	2015	2020	2025	2030
Upstream emissions, baseline (MtCO₂e)*					
Natural Gas	0.9	0.9	1.0	1.1	1.3
Electricity	0.3	0.2	0.2	0.1	0.1
Petroleum Refining	0.6	0.7	0.7	0.8	0.8
Crude Oil	1.5	1.5	1.5	1.6	1.6
Change in upstream emissions, CAP scenario (MtCO₂e)					
Natural Gas	0.0	0.0	0.0	-0.1	-0.1
Electricity	0.0	0.0	0.0	0.0	0.0
Petroleum Refining	0.0	-0.1	-0.1	-0.2	-0.2
Crude Oil	0.0	-0.2	-0.5	-0.6	-0.7
Ethanol	0.0	0.1	0.3	0.1	0.1
Biodiesel	0.0	0.0	0.0	0.0	0.0
Change in upstream emissions, MV scenario (MtCO₂e)					
Natural Gas	0.0	0.0	-0.1	-0.2	-0.4
Electricity	0.0	0.0	0.0	0.0	0.0
Petroleum Refining	0.0	-0.1	-0.2	-0.3	-0.3
Crude Oil	0.0	-0.4	-0.7	-1.0	-1.2
Ethanol	0.0	0.1	0.2	0.1	0.1
Biodiesel	0.0	0.0	0.0	0.1	0.1
Change in upstream emissions, CAT-rec scenario (MtCO₂e)					
Natural Gas	0.0	-0.1	-0.2	-0.3	-0.4
Electricity	0.0	0.0	0.0	0.0	0.0
Petroleum Refining	0.0	-0.1	-0.2	-0.2	-0.3
Crude Oil	0.0	-0.2	-0.6	-0.8	-0.9
Ethanol	0.0	0.1	0.4	0.1	0.0
Biodiesel	0.0	0.0	0.1	0.1	0.1
Change in upstream emissions, All Measures scenario (MtCO₂e)					
Natural Gas	0.0	-0.1	-0.2	-0.3	-0.4
Electricity	0.0	0.0	0.0	0.0	0.0
Petroleum Refining	0.0	-0.1	-0.2	-0.3	-0.4
Crude Oil	0.0	-0.4	-0.8	-1.0	-1.3
Ethanol	0.0	0.1	0.3	0.1	0.0
Biodiesel	0.0	0.0	0.1	0.1	0.1

*Biofuel emissions in the baseline are negligible and are not shown.

Table 16: Total upstream emissions by scenario, MtCO₂e

	2010	2015	2020	2025	2030
Baseline	3.2	3.3	3.5	3.6	3.8
CAP	3.2	3.1	3.1	2.9	2.9
MV	3.2	2.8	2.8	2.3	2.0
CAT-rec	3.2	3.1	3.0	2.5	2.4
All Measures	3.2	2.8	2.7	2.1	1.9

Table 15 shows the estimated upstream emissions for Metro Vancouver under all scenarios, disaggregated by the source of those emissions. Table 16 show total upstream emissions for each scenario. In the baseline, upstream emissions from natural



gas production, crude oil extraction and refining all increase as the demand for fossil fuels in the region increases. The upstream emissions from the electricity sector decrease even though electricity demand increases. This is due to the decline in the emissions intensity of the sector during the simulation as the remaining fossil fuel plants are closed and the sector expands with new renewable resources.

In the policy scenarios, upstream emissions decrease, although the emissions from biofuel production increase slightly. For a given fuel, the emissions intensities for its production does not differ substantially between the four policy scenarios since similar carbon prices are in effect (e.g., the cap and trade price is not much lower than the CAT-rec carbon price) (see Table 13). Instead, the amount and type of energy consumed is what creates the difference between upstream emissions in the policy scenarios. The All Measures scenario shows largest decrease in upstream emissions (Table 16) and it is also the scenario with the greatest switch to electricity and the lowest consumption of petroleum products (Table 14). High electricity demand still results in low upstream emissions since the electricity sector maintains its low GHG emissions intensity. This outcome requires a substantial expansion of renewable power in British Columbia, especially if the rest of the province is also increasing its electricity demand. In the policy scenarios, electricity demand in Metro Vancouver increases by at most 6 TWh (20PJ) between 2010 and 2020, and 16 TWh (50PJ) between 2010 and 2030. For comparison, the 2008 BC Hydro Long-Term Acquisition Plan identifies 21 TWh of wind, small hydro, geothermal, and biomass energy that could be brought online by 2020.¹⁵

The switch to biofuel from petroleum fuels also reduces upstream emissions. Although biofuel production can be more emissions intensive than petroleum fuel production, in this analysis it is not. This result is in part due to biofuel displacing oil sands production which is also very emission intensive. However, this alone would not result in a reduction in upstream emissions when ethanol is used. The baseline production intensity of ethanol is roughly 44 ktCO₂/PJ compared to 29 ktCO₂/PJ for petroleum fuel (oil sands extraction plus refining) (Table 13).¹⁶ To reduce upstream emissions, the emissions of biofuel production must be constrained with a policy. The carbon price in the policy scenarios serves this purpose. In particular, carbon pricing makes cellulosic ethanol viable sooner in the simulation, which further drives down its cost through accumulated experience.

¹⁵ 2008 Long Term Acquisition Plan, BC Hydro, 2008. Available at:
www.bchydro.com/planning_regulatory/long_term_electricity_planning/2008_ltap.html

¹⁶ The emissions coefficient for the combustion of petroleum fuels is 72 ktCO₂/PJ compared to zero for ethanol. Total emissions coefficients for gasoline would be 101 ktCO₂/PJ compared to 44 ktCO₂/PJ for ethanol. According to the conditions of this analysis, corn ethanol consumption would still result in a net reduction of GHG emissions if it displaced fuel derived from oil sands.



Limitations

When interpreting these results, it is important to understand the key simplifications used in the analysis and how a different methodology might change the results. First, this analysis does not simulate how energy prices may change under the influence of the policy packages. Second, this analysis has not explicitly considered the spatial elements that can affect the GHG emissions of a city. In particular, the model does not capture how urban design and density may affect total transportation demand, the viability of transportation without a private vehicle, opportunities for using district energy systems and constraints on the form and size of buildings.

Energy Price Feedbacks

While this analysis now includes forecasts of upstream emissions, it does not simulate how energy prices will change as energy demand in Metro Vancouver changes. However, this analysis is still robust for the following reasons:

- Developing the zero-emissions electricity capacity that is needed in the policy scenarios would increase the electricity price in Metro Vancouver. However, the price forecast included in this analysis, which increases by 50% in real terms from the present to 2025, is already consistent with the acquisition of higher cost zero-emissions sources of electricity.¹⁷
- Much of the electrification is driven by the zero-emissions standard for buildings. Therefore, a different electricity price may change the cost of complying with a policy, but it will not significantly affect the abatement in each scenario.
- We assume that the price rebound for natural gas and petroleum products will be negligible, so the price of these fuels will not drop if demand for these fuels declines. However, if there were a price rebound, regulations in the residential, commercial and transportation sectors ensure that most fuel switching to electricity and biofuel will occur. On the other hand, the industrial sectors, especially small manufacturing, would be less likely to switch away from fossil fuels since that action is governed by price based policies (cap and trade and carbon tax).

Urban Planning Policy

This analysis does not consider how urban density and design in Metro Vancouver may affect emissions. Although transit policy and the walking/cycling policy implicitly assume changes to city infrastructure that will encourage mode switching away from personal vehicles, this analysis makes no explicit estimate of the mechanism by which urban planning could contribute to GHG abatement. Specifically, this analysis does not estimate how urban planning could facilitate the provision of alternative sources of

¹⁷ 2008 Long Term Acquisition Plan, BC Hydro, 2008



thermal energy that could reduce emissions without creating additional electricity loads. We have recently developed the capacity to model the effects of explicit urban planning policies with CIMS. Using this methodology, urban planning can:

- Encourage mixed-used zoning and higher density neighbourhoods that would reduce overall transportation demand and explicitly encourage transit, walking and cycling.
- Reduce the trend towards larger dwellings and encourage buildings with more shared walls, thus reducing the amount of space heating needed for a given population.
- Enhance opportunities for district energy using alternative energy sources such as biomass gasification, biogas, waste heat, and sewer source heat pumps. These energy sources provide alternatives to natural gas fuelled heat without the addition of new electricity loads. Although CIMS-MV does not currently model district energy systems, this capacity could be added to a future versions of this model in order to allow it to model the full effect of urban planning policies on GHG emissions.

Our modelling experience has demonstrated that reducing GHG emissions by changing urban form is a long-term process. Even with strong urban planning policies implement in the near-term, changes to urban form are unlikely to have a large effect on emissions by 2020 when the first regional target is to be achieved.

Uncertainties

Like all models, CIMS-MV is an imperfect representation of the real world. In addition to the limitations of this particular study described in the previous section, other sources of uncertainty exist which are inherent to a modelling analysis:

Technological detail and dynamics

The technological detail of CIMS enables it to show accelerated market penetration of alternative technologies in response to an energy or climate change policy. However, uncertainty exists regarding the appropriate cost and operating parameters of specific technologies, especially novel technologies. This uncertainty becomes larger over time, especially under strong climate policy that can encourage the development of unforeseen technologies.

Behavioural realism

CIMS uses empirically-derived parameters to represent consumer and firm behaviour and preferences for technology choices. The complexities associated with estimating behavioural parameters, combined with the fact that information cannot be collected for all the technology competitions in CIMS, and that preferences change over time, creates uncertainty in the behavioural parameters.



Equilibrium feedbacks

While CIMS is technologically detailed, it is less useful for predicting the macro-economic effects of climate policy. CIMS is unable to predict how investment and growth will change outside of the energy intensive sectors, thus underestimating the structural response of the economy to climate policy.

External inputs

CIMS requires external forecasts of macroeconomic activity in each sub-sector, population growth forecasts and fuel price forecasts on which to base the analysis. These forecasts are uncertain, hence increasing uncertainty of the CIMS forecasts.

Conclusions

This analysis used the CIMS MV energy-economy model to simulate how four policy scenarios can affect energy consumption and greenhouse gas (GHG) emissions in Metro Vancouver. The first policy scenario is the British Columbia Climate Action Plan (CAP scenario) and the other three scenarios are additions to CAP: CAP with the Climate Action Team recommendations (CAT-rec scenario), CAP with additional Metro Vancouver policies (MV scenario), and CAP with all additional measures (All Measures scenario). The conclusions of this analysis are:

- Without policy, baseline emissions in Metro Vancouver will rise to roughly 17 MtCO₂e by 2020, and could reach 19 MtCO₂e by 2030.
- The CAP scenario significantly reduces emissions below the baseline forecast, but emissions in 2020 are still 14.3 MtCO₂e. This is roughly 4 MtCO₂e above the 2020 GHG emissions target for the region.
- If instead the CAT-rec scenario were implemented, emissions would fall to 12.6 MtCO₂e by 2020.
- If the Metro Vancouver policies were applied with the Climate Action Plan (MV scenario), emissions would fall to 13.0 MtCO₂e by 2020. Additional abatement beyond the CAP scenario is induced by a stronger carbon tax, more stringent vehicle regulations, a stronger building code and a zero emissions standard for new buildings. Although the carbon price in the MV scenario is not as large as in the CAT-rec scenario, the additional regulatory policies ensure the MV scenario achieves similar abatement.
- If the Metro Vancouver policies were applied with the Climate Action Plan (All Measures), emissions would fall to 12.0 MtCO₂e by 2020, still short of the target.
- Abatement in the policy scenarios is achieved by reducing energy consumption and switching to between fuels, such as from natural gas to electricity. These changes affect the emissions in the energy supply sectors that provide energy to Metro Vancouver. In the policy scenarios the emissions produced for each unit



of energy supplied and the amount of energy demanded in Metro Vancouver declines in response to policies. Therefore, the policy scenarios also reduce the emissions from the energy supply sectors. This result assumes that the energy supply sectors (excluding crude oil) are affected by carbon price policies, the electricity sector develops zero emissions capacity, and cellulosic ethanol can be commercialized after 2020.



Appendix: Changes to Common Air Contaminant Emissions

The baseline CAC emission forecast from CIMS-MV is calibrated to the forecast from the Metro Vancouver Air Emissions Inventory. The changes to these emissions are simulated under the four policy scenarios described in the GHG analysis: The climate action plan (CAP), the climate action plan with the Climate Action Team Recommendations (CAT-rec), the Metro Vancouver policy package (MV), and the All Measures scenario. This analysis covers particulate matter, oxides of nitrogen and sulphur, volatile organic compounds and carbon monoxide. Ammonia emissions have been added to key sectors in CIMS-MV and they are now covered in this analysis.

This analysis primarily covers emissions that are associated with fuel combustion and includes the same emissions sources as the GHG analysis. This means that the Burrard thermal plant and the oil refinery are not included in these CAC emission forecasts. Emissions from agriculture, open burning, gasoline marketing, solvent evaporation, natural sources, miscellaneous area sources, and bulk shipping terminals are also excluded. These latter sources are not significant sources of GHG emissions; however, they are important sources of CAC emissions. For example, solvent evaporation and natural sources account for almost half of all volatile organic compound emissions while miscellaneous area sources are large contributors of particulate matter. Road dust is not included in this analysis.

We do not expect the simulated policies to have a significant effect on these excluded emissions, although there may be some exception. For example, the addition of ethanol to gasoline, as required by the renewable fuel standard, can increase the volatility of the mixture¹⁸, which in turn could increase the emissions of volatile organic compounds from gasoline marketing. In the Metro Vancouver emissions inventory, these emissions represent only 2% of total VOC emissions in forecasted years, so the absolute change in emissions caused by the policy would be small.

Table 17, Table 18, and Table 19 show the forecasts of particulate matter emissions for each scenario. Of the particulate emissions in Metro Vancouver, CIMS-MV covers approximately 40% of total particulate matter emissions, 50% of inhalable particulate matter (PM₁₀) emissions and, 65% of fine particulate matter (PM_{2.5}). The majority of the excluded emissions are in the miscellaneous area sources category which is not simulated with CIMS-MV.

Baseline particulate emissions increase slightly over the forecast period. A decrease in natural gas space heating in buildings reduces PM_{2.5} emissions in the CAT-rec, MV,

¹⁸ For example see: V. F. Andersen, J. E. Anderson, T. J. Wallington, S. A. Mueller and O. J. Nielsen (2010) Vapor Pressures of Alcohol-Gasoline Blends, *Energy Fuels*. Gasoline and ethanol blends tend to have a higher vapour pressure than either pure compound. However, the addition of a second alcohol compound can return the vapour pressure to its original value. On the other hand, ethanol is an oxygenated compound which reduces incomplete fuel combustion in an engine. Consequently, ethanol blending can reduce VOC emissions from tailpipes.



and All Measures scenarios. The remaining particulate matter is mostly from the freight sector (notably non-road and marine vehicles) and industry. Energy efficiency improvements and some fuel switching between diesel and biofuels further reduce particulate emissions from these sectors.

Table 17: Total particulate matter (kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	5.4	5.4	5.6	5.8	5.8
<i>CAP</i>	5.4	4.6	4.5	4.6	4.7
<i>CAT-rec</i>	5.4	4.4	4.1	3.9	3.7
<i>MV</i>	5.4	4.5	4.3	4.2	4.0
<i>All Measures</i>	5.4	4.4	4.0	3.8	3.6

Table 18: Inhalable particulate matter (PM_{<10}, kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	4.0	4.0	4.3	4.5	4.6
<i>CAP</i>	4.0	3.6	3.7	3.8	3.9
<i>CAT-rec</i>	4.0	3.5	3.4	3.3	3.2
<i>MV</i>	4.0	3.6	3.5	3.5	3.4
<i>All Measures</i>	4.0	3.5	3.4	3.2	3.1

Table 19: Fine particulate matter (PM_{<2.5}, kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	2.9	3.0	3.2	3.5	3.6
<i>CAP</i>	2.8	2.8	3.0	3.2	3.3
<i>CAT-rec</i>	2.8	2.7	2.7	2.7	2.7
<i>MV</i>	2.8	2.7	2.8	2.8	2.8
<i>All Measures</i>	2.8	2.7	2.7	2.7	2.7

Table 20 shows the nitrogen oxide (NO_x) emission forecast for each scenario. CIMS-MV covers 98% of total NO_x emissions in Metro Vancouver. Improvements in vehicle emissions controls result in declining NO_x emissions in the baseline scenario. The policy scenarios further reduce fuel consumption from light-duty vehicles, decreasing NO_x emissions further. However, the baseline improvements in vehicle emissions controls reduce the marginal benefit of improved vehicle energy efficiency or reduce vehicle travel, thus NO_x emissions in the policy scenarios are only slightly below the baseline. By 2030, most of the remaining NO_x emissions are from ocean-going vessels which are not affected by the policy scenarios. CIMS-MV uses a higher NO_x coefficient for biodiesel than for diesel, therefore the renewable fuel standard will increase the NO_x emissions from diesel vehicles as the biodiesel blend increases. However this increase is small compared to the other NO_x reductions that occur.


Table 20: Nitrogen oxides (kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	36.6	32.5	33.6	34.4	35.6
<i>CAP</i>	36.5	31.8	31.8	31.8	32.2
<i>CAT-rec</i>	36.5	31.3	30.2	28.9	28.2
<i>MV</i>	36.5	31.1	30.8	29.5	29.0
<i>All Measures</i>	36.5	30.9	30.0	28.5	27.7

Table 21 shows the forecasted sulphur oxide (SO_x) emissions for each scenario. CIMS-MV covers roughly 90% of total SO_x emissions in Metro Vancouver. The excluded emissions are primarily from the oil refinery. The majority of SO_x emissions in the CIMS-MV forecast come from ocean-going vessels. Increased marine transportation results in rising baseline SO_x emissions. Given that most marine vehicles are not affected by climate policy, SO_x emissions increase in the policy scenario forecasts. Some abatement of SO_x emissions occurs when vehicles switch from diesel to biodiesel fuel and as the industrial minerals sector switches to natural gas from solid fuels. Stronger carbon pricing and more stringent renewable fuel standards result in greater SO_x abatement.

Table 21: Sulphur oxides (kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	5.5	6.0	6.7	7.3	7.8
<i>CAP</i>	5.5	5.8	6.1	6.7	7.1
<i>CAT-rec</i>	5.5	5.7	5.9	6.3	6.7
<i>MV</i>	5.5	5.7	6.1	6.4	6.7
<i>All Measures</i>	5.5	5.7	5.8	6.3	6.5

Table 22 shows the forecasted volatile organic compound (VOC) emissions for each scenario. CIMS-MV accounts for 50% of total 2005 VOC emissions in Metro Vancouver, but this fraction falls below 40% by 2030. Excluded VOC emissions are from solvent evaporation and natural sources while the emissions included in CIMS MV are primarily from vehicles. Baseline emissions in CIMS-MV decline slightly as existing vehicle emission controls improve and older vehicles are retired. Abatement of VOC emissions occurs as climate policies improve the energy efficiency of light-duty vehicles relative to the baseline. Specifically, the vehicle emissions standard induces the electrification and hybridization of these vehicles, resulting in less fuel combustion and fewer VOC emissions. Carbon pricing generally reduces fuel combustion in all sectors relative to the baseline, which further reduces VOC emissions. Finally, any policy that reduces the number of vehicle kilometres travelled, such as the transit improvements or the distance based auto insurance, will also reduce VOC emissions.



Table 22: Volatile organic compounds (kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	20.7	18.1	18.6	19.4	20.2
<i>CAP</i>	20.6	17.5	17.6	17.6	17.8
<i>CAT-rec</i>	20.6	16.8	16.2	15.6	15.2
<i>MV</i>	20.6	16.8	16.6	16.0	15.6
<i>All Measures</i>	20.6	16.2	15.7	14.8	14.1

Table 23 shows the forecasted carbon monoxide (CO) emissions for each scenario. CIMS-MV covers 99% of total CO emissions in Metro Vancouver. These emissions come primarily from vehicles and baseline emissions increase as transportation demand rises. CO abatement is induced by the same policies that induce VOC abatement.

Table 23: Carbon monoxide (kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	290.4	285.5	298.2	307.8	317.5
<i>CAP</i>	288.6	283.7	283.7	273.3	264.9
<i>CAT-rec</i>	288.6	274.1	271.4	257.1	247.5
<i>MV</i>	288.6	285.3	283.3	264.8	245.4
<i>All Measures</i>	288.6	272.6	269.2	248.8	230.9

Table 24 shows the forecasted ammonia (NH₃) emissions. CIMS-MV only covers 25% of NH₃ emissions, two thirds of which come from light-duty vehicles while the remainder is from combustion for space and water heating. The other 75% of NH₃ emissions are not included in this analysis since they are related to agriculture activities such as fertilizer application.

NH₃ emissions from vehicles sources are not mitigated by emission controls and are mostly a by-product of catalytic conversion of NO_x emissions in light-duty vehicles.¹⁹ Therefore, baseline emissions rise as transportation demand increases. Baseline emissions also rise somewhat as the residential and commercial sectors grow, creating new demand for space heating. NH₃ emissions are reduced by policies that induce hybridization and electrification of light-duty vehicles, and by the carbon tax and policies that reduce combustion based space heating. In particular, the stringent vehicle emissions standard that is applied in the MV and All Measures scenarios reduces NH₃ emissions by more than half relative to the baseline. However, given that CIMS MV covers only a quarter of baseline NH₃ emissions, this represents only a modest reduction in total emissions.

¹⁹ Estimating Ammonia Emissions from Anthropogenic non-Agricultural Sources, Emissions Inventory Improvement Program, Environmental Protection Agency Emissions Factor and Inventory Group, 2004.

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Table 24: Ammonia (kt/yr)

	2010	2015	2020	2025	2030
<i>Baseline</i>	1.44	1.56	1.69	1.78	1.91
<i>CAP</i>	1.44	1.43	1.42	1.36	1.37
<i>CAT-rec</i>	1.44	1.39	1.31	1.14	1.06
<i>MV</i>	1.44	1.24	1.15	0.93	0.81
<i>All Measures</i>	1.44	1.21	1.09	0.87	0.75

