SFU RENEWABLE CITIES

BEYOND ELECTRIC VEHICLES

THE IMPERATIVE TO THINK TOGETHER TO REACH OUR TRANSPORTATION AND CLIMATE GOALS

DISCUSSION PAPER

SFU RENEWABLE CITIES

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ABOUT US

Led by Simon Fraser University's (SFU) Renewable Cities, this discussion paper includes contributions from other SFU initiatives including ACT – Action on Climate Team and Moving in a Livable Region.

Renewable Cities is one of multiple climate solutions initiatives at the SFU's Morris J. Wosk Centre for Dialogue. We work to accelerate the transition to renewable, restorative and resilient cities through meaningful engagement, convening, applied research and policy innovation.

ACT – Action on Climate Team is a state-of-the-art research-to-practice hub for climate change and sustainability solutions, through the low carbon resilience and the Natural Solutions Initiative. ACT works across sectors to mobilize relevant knowledge to practice.

Moving in a Livable Region is a growing consortium based in the Metro Vancouver region of British Columbia that aims to build a more resilient, equitable, economically strong, and healthy region.

For more information on Renewable Cities, visit renewablecities.ca.

To sign up to receive updates, visit renewablecities.ca/updates.

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CONNECTING TRANSPORT EMISSIONS AND LIVABLE, RESILIENT COMMUNITIES

In its CleanBC Roadmap to 2030 climate plan, the Province of British Columbia committed to reduce carbon pollution 40% below 2007 levels by the end of this decade. Transportation contributes a larger share of greenhouse gas emissions than any other single sector. Recognizing this reality, the government subsequently legislated a sector-specific target to reduce transportation sector carbon pollution by as much as 32% by 2030.

The Roadmap includes several transportation-specific commitments including a goal to reduce total kilometers driven by personal vehicles 25% below 2020 levels by 2030. To reach that goal, the province aims to encourage, enable and incentivize British Columbians to walk, cycle, or take transit for at least 30% of their trips by 2030. The province's forthcoming Clean Transportation Action Plan, expected in fall 2023, will detail actions and investments to that end.

To foster and inspire constructive dialogue on transportation emissions, SFU Renewable Cities commissioned an initial analysis of provincial data on vehicle kilometers travelled, vehicle ownership trends, and current policies, to project likely greenhouse gas emissions from vehicles out to 2030, with an emphasis on non-commercial, light-duty vehicles. Without major changes to our land use patterns and despite public policies around electric vehicles, fuel standards and carbon taxes, from 2007 to 2030, we project:

- About 60% more personal vehicles
- About 50% more distance driven
- About 10% more emissions from personal vehicles
- Greater congestion
- Greater per-household spending on transportation

Rather than using these findings to prescribe solutions, our aim is that they act as a connection point for conversations, such as how to ensure less car-reliant land uses and more multimodal, equitable transportation options.

In the coming months, Renewable Cities, ACT—Action on Climate Team and Moving in a Livable Region plan to convene advocates, researchers, elected officials and practitioners to discuss how we can think together and support ongoing dialogue to create more livable and resilient communities. We invite you to bring your unique perspective to form a common understanding of

our challenges and to think of shared paths forward.[1] Our goal is that this paper and discussion questions help seed these collective conversations and inspire shared action.

B.C. HAS A SUITE OF TRANSPORTATION CLIMATE POLICIES

Though the Province of British Columbia has legislated ambitious climate targets, its overall greenhouse gas emissions continue to trend upwards—largely driven by transportation.

As of 2020, transportation contributed 40% of the province's emissions, and the sector's total carbon pollution was 13% higher than 2007 levels.[2] [3] To address these emissions, the province has largely focused its mitigation policies on a suite of technologies and price signals, including:

- **The carbon tax**, which as of April 2023, increased the price of a litre of gasoline by $0.14, and a litre of diesel fuel by $0.17;[4]
- **A zero-emission vehicle mandate** for manufacturers to ensure that 90% of new personal vehicles sold will produce no greenhouse gases by 2030;
- **The Go Electric Fleets program**, which provides rebates to help public and private fleets transition to zero-emission vehicles and support services for organizations seeking zero-emission solutions for their fleet needs;
- Investments in **electric vehicle charging stations**; and
- **The Low Carbon Fuel Standard (LCFS)**, which requires fuel suppliers to decrease the average carbon intensity of their fuels.[5]

Aside from the above provincial actions and investments, CleanBC's Roadmap to 2030 also identifies two strategies linked to local and regional government land use planning:

- **Reducing distance travelled**. The province plans to work with local governments to support more compact urban planning and increase active transportation and public transit. It will also continue to support remote work, and "work with ICBC to monitor vehicle kilometers travelled and develop additional ways to bring them down." [6]

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[1] This approach is informed by Isaacs, W. (1999). *Dialogue and the art of thinking together: A pioneering approach to communicating in business and in life*. Currency.
[2] Climate Action Secretariat, Province of British Columbia. (2023). *1990-2021 provincial inventory*. https://www2.gov.bc.ca/gov/content/environment/climate-change/data/provincial-inventory
[3] The province attributes much of the modest 8% drop in transportation emissions from 2019 to 2020 to COVID-19.
[4] "Carbon tax rates by fuel type. Province of British Columbia. (2023). *Carbon tax rates by fuel type*. https://www2.gov.bc.ca/gov/content/taxes/sales-taxes/motor-fuel-carbon-tax/publications/carbon-tax-rates-by-fuel-type
[5] In its original 2018 CleanBC climate plan, the province committed to reduce carbon intensity 20% by 2030; the Roadmap to 2030 plan increased that commitment to 30%, subject to further analysis and stakeholder consultation.
[6] Province of B.C. (2021). *CleanBC roadmap to 2030*. https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf

- **Encouraging mode shifting.** The province aims to establish energy intensity targets for personal and commercial transportation, and work with partners to steadily increase the number of trips made by walking, cycling and transit.

This discussion paper focuses on these latter two actions. Programs to reduce vehicle kilometers travelled are crucial for reducing transportation-related emissions, and must also consider opportunities to reduce infrastructure and ridership risks related to projected climate hazards such as floods, heat, extreme weather, etc. In addition, all solutions must be equitable and aim to multi-solve for regional health, access, affordability and other sustainability co-benefits. Considering reduction of both risks and emissions together ensures a more systemic evaluation of how to minimize emissions, protect infrastructure, users and investments, and identifies both synergies and trade-offs with other sustainability goals. As climate impacts accelerate and intensify, actions that multi-solve grow in importance to ensure low carbon, resilient and sustainable communities.

TRANSPORTATION EMISSIONS PERSIST THROUGH INTERCONNECTED TRENDS

SFU Renewable Cities projected current trends in the total number of registered vehicles, the average distance travelled per vehicle and average fuel efficiency and found that implementation of current provincial policy on zero-emission vehicles, the low carbon fuel standard, and the carbon tax[7] through to 2030 does not adequately address distances driven and associated emissions.

While the province legislated a goal to reduce the sector's carbon emissions by 32% below 2007 levels by 2030, our projections find that, by the end of this decade, transportation emissions are likely to be 11% higher than they were in 2007. This is a direct result of a steadily growing pool of drivers and vehicles as populations grow, continued trends in lower-density land use and the growing popularity of larger vehicles.

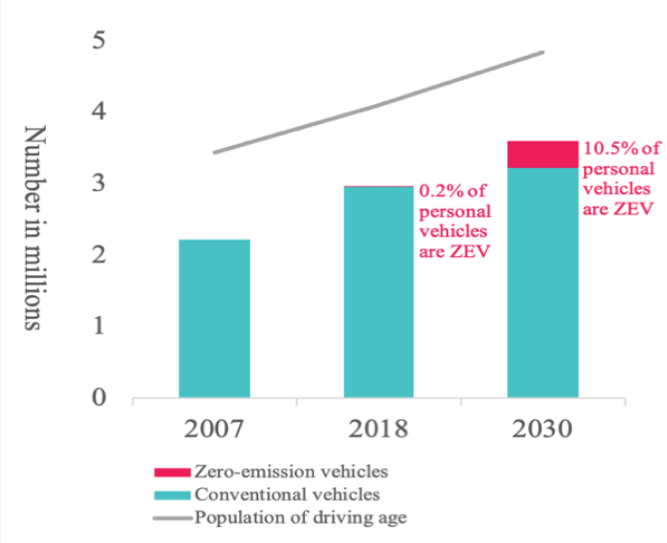
More vehicles and drivers ahead

Between 2018 and 2022, the pool of active class 5 driver's licenses increased by 180,000 (6.7%),[8] and total licensed passenger vehicles on the roads grew by about the same amount (180,000 or

[7] For reference, the Province plans for the provincial carbon tax to meet or exceed the federal benchmark of $170 by 2030.

[8] Insurance Corporation of British Columbia (ICBC). (2023). "Active driver licences – 2018." https://public.tableau.com/app/profile/icbc/viz/PublicDatasetDashboard-Activedriverlicencesroadtestsandknowledgetests/DriverLicensing
ICBC. (2023). "Active driver licences – 2022." https://public.tableau.com/app/profile/icbc/viz/PublicDatasetDashboard-Activedriverlicencesroadtestsandknowledgetests/DriverLicensing

Figure 1: Number of Personal Vehicles in B.C.[11]



Source: Renewable Cities analysis based on data from BC Stats, Natural Resources Canada and StatCan.

7.1%).[9] While electric vehicle sales are clearly growing in popularity, they are far from the new standard. As of 2022, electric vehicles constituted just 3.0% of all passenger vehicles in the province.[10]

Even if the province were to meet its target that 90% of new personal vehicles sold in 2030 are zero-emission vehicles, we find that British Columbians will still register 46% more gasoline- or diesel-fueled passenger vehicles than they did in 2007. This is because, on average, vehicles in British Columbia stay on the road for 14 years, which means that motorists collectively only retire about 7% of the provincial fleet each year.

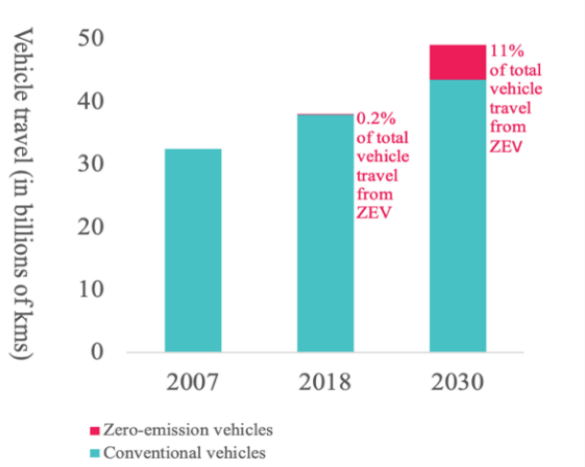
[9] ICBC. (2023). "Vehicle Population—Passenger Vehicles—2018." https://public.tableau.com/app/profile/icbc/viz/VehiclePopulationIntroPage/VehiclePopulationData.
ICBC. (2023). "Vehicle Population—Passenger Vehicles—2022." https://public.tableau.com/app/profile/icbc/viz/VehiclePopulationIntroPage/VehiclePopulationData.
[10] ICBC. (2023). "Vehicle Population—Passenger Vehicles—2022." https://public.tableau.com/app/profile/icbc/viz/VehiclePopulation-PassengerVehicles-2022/2022PassengerVehicles?publish=yes.
[11] Conventional vehicles include internal combustion engine-only vehicles and non-plug-in hybrid-electric vehicles (hybrids). Zero-emission vehicles include plug-in hybrid electric vehicles, battery-electric vehicles and hydrogen fuel cell vehicles. For details, see: Natural Resources Canada. (2023). *Choosing the right vehicle*. https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/personal-vehicles/choosing-right-vehicle/20998

Growing suburbs mean more driving

Then there are community land use and settlement patterns. Statistics Canada data shows that British Columbians are increasingly choosing to live in communities more than a 30-minute drive from regional cores.[12] While per capita vehicle kilometres travelled has remained constant,[12] the provincial total has increased by 17% between 2007 and 2018 (Figure 2). Projected to 2030, these trends show a 29% increase in distance driven in B.C above 2018 levels, and a 51% increase above 2007 levels.

Though Vancouver holds the title of having the most densely populated downtown in Canada, between 2016 and 2021 the city's distant suburbs grew more quickly (9.5%) than its overall census metropolitan area (7.3%).[13] [14] [15] This trend has multiple causes, such as housing unaffordability, low rental vacancies, etc., which require further analysis.

Figure 2: Total Vehicle Travel in B.C.[16]



Source: Renewable Cities analysis based on data from BC Stats, Natural Resources Canada and StatCan

[12] Natural Resources Canada. (2023). *Transportation sector – British Columbia and Territories*. https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_tran_bct.cfm
BCStats. (2023). *Population estimates & projections for British Columbia*. https://bcstats.shinyapps.io/popApp/
[13] Statistics Canada (StatCan). (2022, February 9). *Canada's large urban centres continue to grow and spread*. https://www150.statcan.gc.ca/n1/daily-quotidien/220209/dq220209b-eng.htm
[14] This trend is echoed across the country; vehicle-reliant suburbs farthest from the nation's city centres are generally growing at a faster pace than those on the urban fringe and those closer to downtowns.
[15] StatCan. (2022). *Census Profile, 2021 Census of Population*. Catalogue no. 98-316-X2021001. Ottawa. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E
[16] Conventional vehicles include internal combustion engine-only vehicles and non-plug-in hybrid-electric vehicles (hybrids). Zero-emission vehicles include plug-in hybrid electric vehicles, battery-electric vehicles and hydrogen fuel cell vehicles. For details, see: Natural Resources Canada. (2023). *Choosing the right vehicle*. https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/personal-vehicles/choosing-right-vehicle/20998

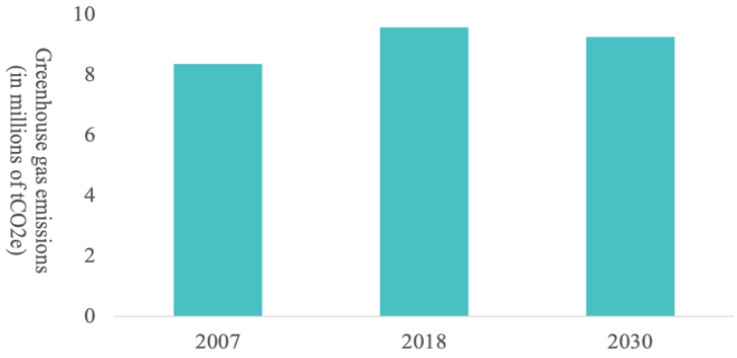
Both research and best practice in urban planning show that the further people are from amenities and destinations (e.g., jobs and shops), the more they drive. In dispersed, purely residential communities and neighbourhoods, people need to travel great distances to reach their preferred destinations and personal vehicles are persist as the most common mode of travel.

Transportation emissions persist, despite rising zero-emission vehicle sales

Other than growing populations and continued expansion of urban areas, another crucial issue is the persistent stock of gas- and diesel-powered vehicles. Despite provincial policies that incentivize sale and use of zero-emission vehicles, the current trajectory is that greenhouse gas emissions from personal vehicles in B.C will not drop below 2007 levels by 2030.[17]

Per-capita emissions from personal vehicles have declined 2% between 2007 and 2018 and may decline by another 17% out to 2030,[18] but total provincial emissions will likely persist, declining only by 3% from 2018 to 2030 (Figure 3).

Figure 3: Greenhouse Gas Emissions from Personal Vehicles in B.C.



Source: Renewable Cities analysis based on data from BC Stats, Natural Resources Canada and StatCan

While electric vehicles are undeniably increasing in popularity, gasoline and diesel fueled more than 80% of new vehicles sold in B.C. in 2022.[19] Further, most of those vehicles are larger,

[17] Zero-emission vehicles accounted for 0.004% of total emissions from personal vehicles in 2018 and are projected to account for 0.1% in 2030.

[18] Renewable Cities analysis based on data from BC Stats, Natural Resources Canada and StatCan.

[19] Includes B.C. and the Territories. StatCan combines data for B.C. and the Territories. Statistics Canada. (2023). *Table 20-10-0024-01 New motor vehicle registrations, quarterly*. https://doi.org/10.25318/2010002401-eng

cancelling out much of the gains in vehicle fuel efficiency over the past few decades.[20] [21] This past year, heavier-duty vehicles such as sport-utility vehicles, vans, light and heavy-duty trucks constituted close to eight in ten motor vehicles sold in British Columbia.[22]

Zero-emission vehicles are not enough. In the absence of further and more effective policies and investments to reduce distance travelled and shift trips to sustainable modes, B.C. is likely to miss its transportation sector greenhouse gas emissions target.

MORE DRIVING MEANS MORE CONGESTION AND COSTS

As demonstrated, a sole emphasis on zero-emission vehicles, fuel standards and carbon taxes does not sufficiently reduce transportation-related greenhouse gas emissions in the timelines needed. Furthermore, it does not address other negative impacts connected with driving, such as road construction and maintenance costs, time lost to congestion, local air and noise pollution, mental health impacts, or the loss of natural habitats and ecosystem services from roads and parking lots. While not all of these impacts are accounted for here, we project:

- **Worse traffic congestion.** With a forecasted 29% increase in personal vehicle travel from 2018 to 2030, there will be ever-greater pressure on city roads and streets, contributing to costly expansion where possible, and/or increased congestion.
- **Increased transport costs.** In 2018, the average British Columbia household, composed of 2.6 people, spent $11,000 on private vehicle transportation.[23] We forecast that, by 2030, increasing costs of ownership—specifically purchase, maintenance, and insurance costs—will raise that number more than $2,000 per year, not accounting for inflation or increases in fuel costs.[24]
- **Increased cost of living.** Transportation comprises 14% of household expenditure and is the second largest expense for B.C. households after housing (at 28%), closely followed by food

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[20] Sivak, M. (2021). *Actual fuel economy of cars and light trucks: 1966-2019*. Green Car Congress. https://www.greencarcongress.com/2021/01/20210107-sivak.html.

[21] Tchir, J. (2020). *Vehicles are more fuel-efficient than ever - but that doesn't mean we're consuming less gas*. The Globe and Mail. https://www.theglobeandmail.com/drive/mobility/article-vehicles-are-more-fuel-efficient-than-ever-but-that-doesnt-mean-we/

[22] Includes data for the Territories. StatCan combines data for B.C. and the Territories. StatCan. (2023). *Table 20-10-0002-01 New motor vehicle sales, by type of vehicle*. https://doi.org/10.25318/2010000201-eng

[23] Includes costs associated with vehicle purchase, fuel, repair and maintenance, and parking but not public transportation, air travel, rail travel, water transport, taxis and other transport services. Sources: StatCan. (2022). *Detailed household final consumption expenditure, provincial and territorial, annual (x 1,000,000)*. https://doi.org/10.25318/3610022501-eng
BCStats. (2023). *Population estimates & projections for British Columbia*. https://bcstats.shinyapps.io/popApp/

[24] Figures in 2021 dollars. Note that fuel costs remain flat.

(14%).[25] This does not include indirect costs of driving such as municipal road maintenance or provincial health services to deal with long- and short-term health impacts. British Columbians spend the vast majority (83%) of their transportation budget on private, as opposed to shared or public transport.[26]

WE NEED TO EMPHASIZE EFFICIENT AND EQUITABLE ALTERNATIVES FOR LAND USE AND TRANSPORTATION

This preliminary analysis shows that despite the popularity of electric vehicles and mitigation policies such as fuel standards and carbon taxes, our car-dependent transport systems and growing population will lead to persistent carbon emissions as well as growing transportation congestion and costs.

If current measures are insufficient to achieve B.C.'s climate goals, what else can be done? Additional measures are needed.

Among the many options, we believe the province needs bolder land use and transport policies, specifically to 1) reduce the need for private vehicle travel by ensuring people are closer to destinations and 2) provide lower-carbon and equitably funded travel options. According to the Intergovernmental Panel on Climate Change (IPCC), coordinated efforts to transition existing vehicle-reliant cities to compact, mixed-use, and transit-oriented communities could globally reduce greenhouse gas emissions between 23% and 26% by 2050.[27] The climate benefits of reducing vehicle use are also recognized by CleanBC's Roadmap to 2030.

Applying holistic frameworks such as a low carbon resilience approach solves for multiple problems at once, including climate mitigation, adaptation and social resiliency.[28] What is often under-reported when it comes to smart land use and transportation are the myriad of co-benefits—beyond greenhouse gas reductions—associated with such a transition:

- **Mixed-use, smart communities** can reduce congestion and local air pollution, increase health and safety, protect environmental quality, encourage social connectedness and vibrancy,

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[25] StatCan. (2022). *Detailed household final consumption expenditure, provincial and territorial, annual (x 1,000,000)*. https://doi.org/10.25318/3610022501-eng. Transportation includes transportation of all kinds. Food includes food and non-alcoholic beverages themselves as well as services related to them.
[26] Ibid.
[27] Lwasa, S. et. al. (2022). Urban systems and other settlements. In IPCC. *Climate change 2022: Mitigation of climate change; Contribution of working group III to the sixth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
[28] For more on this kind of approach, see: Action on Climate Team. (2023). *Low carbon resilience*. https://www.sfu.ca/act/low-carbon-resilience.html

promote affordability and economic development, and justify more efficient and accessible transport.

- **Lower-carbon transport options** such as biking, walking and transit, can slow greenfield development, promote physical activity, increase transport capacity without expanding road space, and enable the mid- and higher-density land uses needed for reducing travel distances.

Discussion questions

Complex problems require knowledge sharing and collaboration from a diverse array of actors and community members to ensure that solutions meet their needs and address their concerns. To that end, we offer discussion questions to garner collective understanding of challenges and our shared paths forward to renewable, restorative and resilient communities.

- We collectively have many objectives, including equity, environmental sustainability and resilience to climate risks. How can we reduce B.C.'s transport emissions and meet targets while also advancing other valued objectives?
- Sometimes actions in one sector can interfere with goals in another sector. How can we ensure that actions in various sectors (e.g., transport, land use, finance) complement rather than compete with or counteract each other?
- How do we address both short-term needs and long-term likely realities (e.g., demographic, climatic, technological)?
- Emissions-reducing actions can bring other benefits. How can we best understand and communicate co-benefits, and how can we maximize them?
- People value objectives and timelines differently. How do we make collective decisions given our diversity of values? How do we uphold diverse values while working towards a common vision of shared values, which may include increasing choice and improving liveability?

WE NEED TO COLLECTIVELY IMPLEMENT SOLUTIONS

Solutions, even when collectively generated and holistically considered, can still encounter obstacles to their implementation. In B.C., various actors and organizations are already advancing efforts to accelerate the shift towards compact land use but have encountered challenges such as how to:

- Bring about larger-scale, coordinated action while allowing sufficient local and individual decision-making to meet unique circumstances and the need for self-determination;
- Make changes while meeting the needs of stability, such as in financing, regulations and sense of place;
- Create safe, livable and productive places without compromising on affordability and accessibility;

- Equitably address benefits and losses of changes, such as among central and peripheral landowners, landowners and those without land, and new and existing residents.

Some challenges in advancing lower-carbon mobility include how to:

- Secure capital funds to expand public transit; for instance, TransLink and the Mayors' Council on Regional Transportation's 10-year plan for the Metro Vancouver region is facing a significant funding shortfall;
- Ensure long-term support, including stability in operating finances for transit, cycling, and pedestrian infrastructure;
- Ensure decisions incorporate the voices of and work for those with a variety of mode preferences/uses, wealth, geographies, physical ability, skills, etc.;
- Address social norms in communities and households, such as views of safety and assumptions that travel should be done primarily by car..[29]

Discussion questions

Understanding and addressing these implementation challenges and others will also require the collective knowledge and creativity of a wide variety of actors through dialogue and collaborative solutions-building. We hope these questions help spur those conversations.

- What additional conditions need to be met to make these actions possible? In other words, what are the barriers to implementing and promoting these changes?
- How can we address those barriers? For example:
    - Actors may work in silos. How can we encourage different sectors to work together towards less vehicle-reliant land use patterns (e.g., transit-oriented development)?
    - There may be insufficient political support for the developed solutions. How can we garner enough political support?
    - Practitioners and decision makers may not be adequately equipped to implement or promote these changes. What support or conditions (e.g., data/info, legislation, incentives, community support) could help them?
    - Impacted and interested parties may not be aware of the facts or have false information. How can we best communicate facts to set the stage for more productive discussions, and how do we constructively and effectively navigate challenges of misinformation?

[29] For example: Walker I, Tapp A, Davis A. (2022). Motornormativity: How social norms hide a major public health hazard. 10.31234/osf.io/egnmj.

MOVING THE DIAL MEANS THINKING TOGETHER

We hope this work serves as a constructive contribution to connect the dots across our urban landscape to advance climate action, affordability, congestion management, resilience and fiscal responsibility. We also hope it seeds discussions underway across the province between governments, stakeholders, researchers and advocates engaged on sustainable transportation and land use planning.

In the coming months, Renewable Cities, ACT—Action on Climate Team and Moving in a Livable Region plan to convene advocates, researchers, and practitioners to discuss next steps, and we are interested in engaging with other impacted and interested groups. We welcome you to share with us about other crucial and challenging conversations that can move toward shared understanding and action.

For details about this initiative, and to learn how you can get involved please visit renewablecities/ca/transportationfutures.

Want to continue the conversation?

Email us at renewable_cities@sfu.ca and connect with us on LinkedIn.