

# Urban transport systems best practices and experiences

Elements from a study trip in Vancouver, Seattle, Portland, and San Francisco

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# 1. EXECUTIVE SUMMARY

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Vancouver, Seattle, Portland and San Francisco can trigger various associations of ideas by their names alone. They can be imagined as very touristic, very high tech, populated by bicycle fans maybe, or by specific demographics attracted by their liveability. These images have some truth in them; however these cities face also similar challenges to what we observe in New Zealand, such as congestion, or improving liveability while accommodating growth.

Each of these cities has been implementing forward thinking actions, and saw their effects in terms of modal split, end users' system affordability, citizens' satisfaction, infrastructure and operating costs, network efficiency, growth, and land value, to name a few. A NZ study tour financed by NZPI in 2008 already examined and acknowledged some them. The recent successes include:

- **Access and congestion** – for instance 45,000 additional jobs downtown, with almost no increase of access by single occupancy vehicles (Seattle)
- **Growth and integration** – rapid growth within the urban areas' boundaries, infill coordinated with efficient PT systems, increasing the attractiveness of urban living, while cutting down sprawl (all four cities)
- **Modal shift** – for instance -20% of car trips accessing downtown between 1997 and 2015, even though this sector grew by +75% (residents) and +26% (jobs), in the same period (Vancouver).
- **Rethinking urban roadways and improving public spaces** – for instance dismantling of a waterfront highway with dramatic public space improvement, land value increase, as well as growth in jobs and retail (San Francisco)
- **Drastic improvements in road safety** – for instance -70% transport-related fatalities (Vancouver), and implementation of Vision 0

My aim was to observe the functioning and the implemented interventions, and gain insights from local practitioners. This study trip took place between 25 September and 22 October 2017. It was self-financed and done on my own terms. I was lucky to speak with 13 exceptionally interesting planners and academics, whose ideas about successes and challenges I relay here.

The main “take-away” from this trip is certainly that all the successes relied on a system approach encompassing aspects of land use, overall capacity, and adaptation of interventions to local needs. The successes leveraged a good combination of **integrated land use and transport planning** - cultivating short, walkable trips, and connecting efficiently the urban “villages”, **urban life quality** – density that is liveable and appealing to new residents and businesses, **efficient and integrated PT/walking/cycling systems**, and **active demand management**, re-allocating road space to provide for different needs.

This report should be seen as a snap shot, and a collection of interesting ideas that have been shared with me. I tried to understand and illustrate some actions-reactions, linking interventions and outcomes. It is however in no case a comprehensive analysis of these cities, each being a complex eco-system with its local particularities and a rich history. I hope to be forgiven for the omissions (numerous and necessary) and the possible inaccuracies.

## 2. INTRODUCTION

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### **WHY THESE CITIES?**

Vancouver, Seattle, Portland and San Francisco have been addressing, and continue to address, some of the challenges that we are faced with such as congestion, accommodating growth while improving liveability, changing demographics and needs, or funding. They also present similarities with some New Zealand cities, in terms of sizes or car-dominated system legacy.

Each of these cities has been implementing forward thinking measures, in the last decades, and saw their effects in a wide array of aspects, namely: modal split, end users' system affordability, citizens' satisfaction, infrastructure and operating costs, network efficiency, growth, public health, road safety, transport-related greenhouse gas emissions or land value. A NZ study tour financed by NZPI in 2008 already examined and acknowledged some them. An overview of the recent successes is presented below, page 6.

### **STUDY TRIP**

My aim was to observe these cities' transport-related interventions, and gain insights from local planners and academics. This study trip took place between 16 September and 22 October 2017. It was self-financed and done on my own terms. Its learnings rely on site visits, the cities' strategic documents, inputs from the Walk21 conference, and most importantly the insights of key practitioners.

I was lucky to speak with 13 exceptionally interesting people, listed below, whose ideas I will relay and quote here. I would like to thank again here for their time and insights. I asked them about the recent successes and their contributors, about the technical aspects that helped decision-making, and about the challenges ahead.

Table 1: List of local practitioners, whose insights are relayed in this report

Name	City	Role
<b>Steve Brown</b>	Vancouver	Manager, Rapid Transit Office, and former manager of the Traffic and Data Management Office
<b>Joanna Clarke</b>	Vancouver	Transport Planner, Transport 2040 strategy update
<b>Paul Krueger</b>	Vancouver	Urban planner, public spaces improvements and activation
<b>Carol Kong</b>	Vancouver	Transport planner, False Creek Flats revitalisation
<b>Maggie Buttle</b>	Vancouver	Manager, Arbutus Greenway project, and former NZTA (P&I, Wellington)
<b>Ben Bakkenta</b>	Seattle	Senior Program Manager – Regional Planning, Puget Sound Regional Council
<b>Heather Marx</b>	Seattle	Manager, Project and Construction Coordination Office, SDOT
<b>Michael Shaw</b>	Seattle	Disability action plan coordinator
<a href="#">Prof. Kelly Clifton</a>	Portland	Professor of Civil and Environmental Engineering, leading research on transport choices and the efficiency of integration and transport investments.
<a href="#">Peter Koonce</a>	Portland	Manager, Signals and Traffic Division
<b>Denver Igarta</b>	Portland	Multimodal urban planner and a principal author of the Portland Bicycle Plan
<a href="#">Prof. Jason Henderson</a>	San Francisco	Professor in Geography & Environment at SF State and author of <i>Street Fight: The Politics of Mobility in San Francisco</i>
<a href="#">Chris Carlson</a>	San Francisco	Historian, writer, Adjunct Associate Professor, California Institute of Integral Studies, author of numerous publications on San Francisco's recent history and contributor to the local wiki site <a href="http://www.foundsf.org/">http://www.foundsf.org/</a>

## THIS REPORT

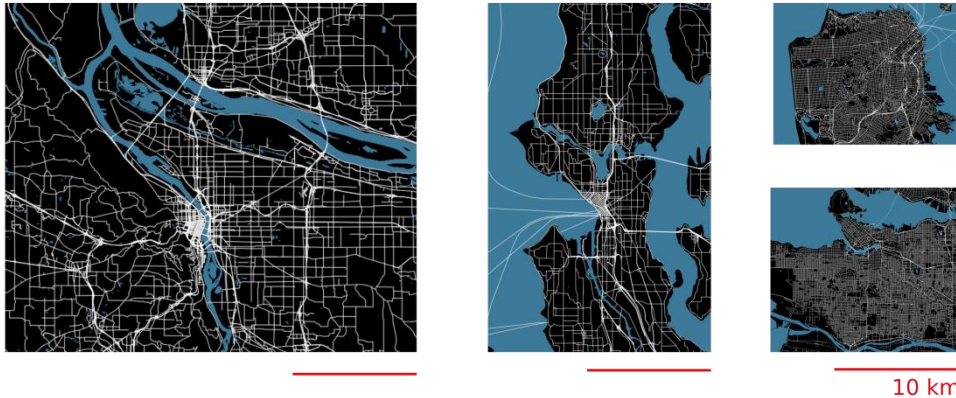
This report was written to report on the local practitioners' insights and the examples of implemented measures. It is therefore structured to provide:

- A snap shot of the cities and of some inspiring recent wins – Chapter Cities' snapshot and recent wins 3
- Observations of the local functioning, from a NZ perspective – Chapter 4
- Planners' insights, on what helped achieve successes – Chapter 5
- A personal wrap up of the responses by type of challenge – Chapter 6

**An important note to the reader** - while specific measures are presented individually, for an easier access, it is key to keep in mind that all successes were achieved through a system approach, with different modes playing different and equally important roles, and with a strong integration with the land use. Therefore, it wouldn't be right to associate successes with one or the other measure alone.

### 3. CITIES' SNAPSHOT AND RECENT WINS

#### CITIES' OVERVIEW



The cities' sizes range from 340,000 residents (Portland) to 650,000 (Vancouver), with Seattle and San Francisco a little above 500,000. The densities and footprints are however very different, Portland being the most dispersed and Vancouver the densest (see illustration left).

All cities have experienced and continue to experience rapid urban growth for both residents and jobs. Seattle added for instance 45'000 new jobs downtown, between 2000 and 2014

Figure 1: Urban areas at scale (from left to right: Portland, Seattle, San Francisco (top), Vancouver

#### A FEW INSPIRING ACHIEVEMENTS

- **Growth and liveability** - all 4 cities are increasing their density and their liveability in the same time. In Seattle's region (Puget Sound) for instance, 96% of new housing was built in the existing urban areas, compared to 72% in 1991 (<sup>1</sup>, 7). Seattle is now the fastest growing American large city<sup>2</sup>. For San Francisco, *Mode Shifting is key to City Livability*; the city is increasingly attracting the tech companies from the Silicon Valley and their employees, and is working on bringing the traffic to 50% of all trips, prioritizing people movement<sup>3</sup>.
- **Access and overall capacity** - the growth happened with a stabilization or a reduction of private vehicle traffic; Vancouver grew by +18%, and +75% for the downtown, in the last 20 years, but the traffic across the downtown cordon remained at its levels from 1960<sup>4</sup>. The uptake of PT, walking and cycling

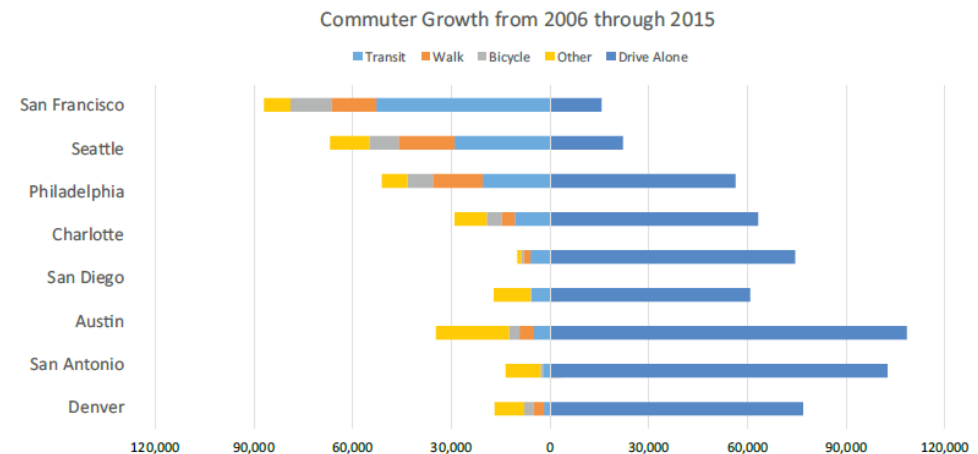
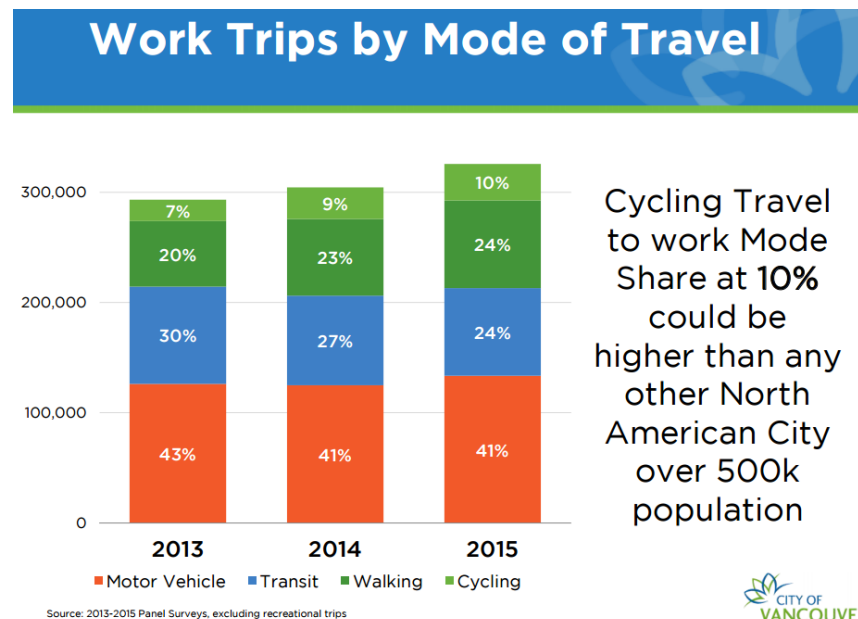


Figure 2: Commuter growth and used modes comparison; San Francisco, 2017 Transportation Sector Climate Action Strategy (CAS) <https://www.sfmta.com/projects/sustainability-climate-action>

played a major role. In Seattle, over 70% people working downtown commuted by PT, carpooling, walking or cycling in 2016, up from 65% in 2010<sup>5</sup>. Portland metro would have 47,000 more daily commuter cars, if the modal split was the same as in 2000<sup>6</sup>.

- **PT uptake** – Seattle is the fastest growing PT market in the US<sup>7</sup>, and the PT is growing in the 3 other cities as well. Light rail, tramways, and in general high quality direct services are playing an essential role. In Vancouver, the SkyTrain station at Commercial and Broadway gets more traffic than YVR airport (4)
- **Walking uptake** – the importance of walking is crucial in the urban areas. In Vancouver for instance, 27% of all trips are done on foot, and walking to work increased by 20% between 2013 and 2015. Downtown residents walk for half of their trips, and over 70% of the trips to work (30). The predominant reason for walking is the convenience, and the predominant concern relates still to drivers<sup>8</sup>.
- **Bicycle use uptake** – all cities are experimenting high increases in bicycle use. Portland has multiplied commuter bike trips by 6 between 1990 and 2009<sup>9</sup>, and bicycle use on four central bridges has grown 322% since 1991, while automotive trips have not increased at all<sup>10</sup>. In Vancouver, almost 6 times more people commute by bicycle, in comparison with 1996, and with 10% bike to work the city is the new North American leader (9,<sup>11</sup>). The use of the new seaside greenway (2014) was over 2 times the expected values<sup>12</sup>.
- **Road safety** – Vancouver divided the road fatalities by 3, in the last 20 years, for all road users (12). All the cities are committed to Vision 0 and make progress towards the objective, but the results can be different across the modes (for instance Seattle halved the total traffic fatalities, but the trend for the pedestrians and the bicycle users have remained flat. They now represent 38% and 10% of the DSIs<sup>13</sup>).

Below, some pictures of the observed elements, and insights of local planners about what has been done, and what led to successes.



## 4. OBSERVATIONS

Seeing the 4 cities from a New Zealand perspective, I noted a lot of interesting elements - playing a role in those changing mobility patterns, or simply different from our known environments. Here are ones I saw as key, before the planners' views (next point).

- **Dense, mixed and pleasant neighbourhoods, well connected to the centre;** often old streets, built around the streetcars, and with “the right” densities, character and amenity. They have been maintained through “acupuncture” types of interventions, and provide a lot of services to the residents (groceries, other shops, cafes, etc.). Their density makes them precisely adapted to a PT service, and they are serviced by efficient tram, bus, or light rail lines. They tend to become gentrified, a challenge in terms of affordability but also participation (the basic local supermarket might have been pushed out and replaced by smoothie bars, attractive to the new population but not necessarily to the historic one).
- **Diverse populations who walk, cycle or take the PT.** Young, old, going to work, shopping, bringing the children to school, walking the dog, meeting a friend at their neighbourhood café, etc. In Vancouver and Portland, the bicycle populations are particularly diverse (people with young children, etc) while in Seattle the profile is rather young and sporty.
- **Re-imagined streets** – road space can be re-allocated (bus lanes or bike lanes), narrower roadways (3 or 3.5m lanes), moderated speeds, improved public spaces. This is particularly striking in San Francisco, at places where elevated freeways used to be (Embarcadero and Octavia). Unlike in New Zealand, in the centres there are no painted shoulders, stripped medians, slip lanes, or push buttons for pedestrian crossings.
- **Different mobility patterns** – walking to the local shop and buying one bag of groceries, using the shared bicycles, working remotely, combining bicycle and PT, using electric skate boards, etc.



Figure 3: terrace replacing 2-3 car parks, SF; Portland: Barber Block now and then (illustration, Gracie Campbell)



## 5. LOCAL INSIGHTS - WHAT WORKED? WHAT HELPED?

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These are the insights gained from local planners with whom I have spoken. They are organized by topics, for an easier read.

### SHIFTING AWAY FROM THE STATUS QUO

According to Prof. Kelly Clifton, 5 elements contributed to change, in Portland:

1. **Legislation** – the federal Intermodal Surface Transport Infrastructure Act<sup>14</sup> (1991) relaxed the rules around the gas taxes allocation, allowing the funding of multi modal projects and conferring more power to the local organizations.
2. **No more money for the highways** – over time, investing in car infrastructure became more and more complicated, as it was better understood how other modes can deliver against the objectives in a cheaper and more popular way. It became also clearer that trade-offs needed to be made.
3. **New interest in urban living**, simpler commutes and local destinations. In a completely free economy however, this can lead to gentrification and housing affordability issues.
4. **Leadership** – “people interested in liveability moved across leadership to positions of power (ex. Janette Sadik-Kahn, ...)”
5. **New style of governance** – with emphasis on a democratic process and engagement

This topic came in conversation with all the interviewed practitioners. Here are some main ideas as of what helped the shift:

- **A common vision** of the development is seen as an essential foundation for evaluating and prioritizing interventions – in Vancouver, the 1990s “Livable Region” played that role, and has since then been updated by metropolitan and local strategies (**Error! Bookmark not defined.**); in the Puget Sound region, the land use and transport strategy is the essential reference for the land use and transport system development (7); In Portland, Vision 0 shifted thinking the most, impacting on how the resources are focused and what data is collected<sup>15</sup>.
- **Clear understanding of the causes & effects, clear linkage between the strategies** – for instance in San Francisco, the Climate Action strategy links directly to the strategies regarding health or equity, outlining the common causes of harm and the interventions synergies<sup>16</sup>.
- **Regional or national legislation** giving new rules or incentives. For instance: preservation of the agricultural land, focusing the growth in the urban areas (Vancouver, Portland, Seattle), commute trip reduction law (Oregon), or environmental responsibility (California’s Sustainable Communities and Climate Protection Act, SB375).
- **Turning point moments facilitating change**
  - In Portland, the decaying Portland hotel was bulldozed in 1951 and its footprint (in the centre of the city) was temporarily used as a parking lot. In 1969, with a backdrop of declining air quality, a 800-car parking structure was proposed but rejected by Portland Planning Commission<sup>17</sup>. Peter Koonce sees this episode as a turning point in terms of vision – the city was designed for cars, and the parking would have been part of that paradigm. That space became the Pioneer Square, now Portland’s “living room”.

- In San Francisco, earthquakes damaged significantly portions of elevated freeways. They forced the discussion around two central portions that were finally destroyed and replaced by at grade streets, public spaces, and even housing, between 1996 and 2006
- In Vancouver, the Olympics prompted the development of the new Skytrain Canada Line (built 2005-2010), together with brownfield redevelopment (<sup>18</sup>, 30). The event is probably a great example of the need to provide a significant increase in throughput and connectivity.
- **Public opinion** - the 4 cities also had citizens' revolts or protests against the highways, forcing to re-examine the projects and examine again the question – *Who is this for?*<sup>19</sup>. The residents protested against the destruction of neighbourhoods, the poor air quality, the traffic violence or the barriers to access, and they played an important part in the shift<sup>20, 21</sup>, 22.
- **Extensive engagement and monitoring**, ensuring the users', businesses' and decision-makers' needs are assessed and taken on board, clear linkages between the heard needs and how the options deliver against them (1, 7, 15, 18, 23, 23, 24, 30, <sup>22</sup>).
- **Trialling instead of overthinking** – trials were seen as powerful tools. For road space redesign, they can demonstrate how spaces can work, allow for monitoring and offer users' hands on experience, providing a good decision support for further investments (1, 15, 15, 18, <sup>23, 24</sup>, 28, 30).
- **Using the momentum of successes** – in Vancouver, *the SkyTrain showed what transit can actually do* (28). In Seattle, a 25 year, 54 billion\$ plan for public transport has been approved by the voters in November 2016. The success is attributed to positive experiences of the existing system<sup>25</sup>. The road space allocation plays a key role in making the most of the gained capacities, facilitating further modal shift (1, 15, 15, 18, 24, 28, 30).
- **Interventions' affordability**, via a better use of the existing infrastructure (ex. carriageway reallocation or mixed use through speeds control - 15, 15, 18, 24, 28, 30), the consideration of broader costs and benefits, for instance health, wellbeing, end user affordability<sup>26</sup>, or a more **efficient delivery** - “dig once”, interventions grouping <sup>27</sup>.

## LAND USE: MIX, DENSITY, INTEGRATION, LIVEABILITY

### *Desirability of urban living, liveable neighbourhoods and downtowns, local intensification*

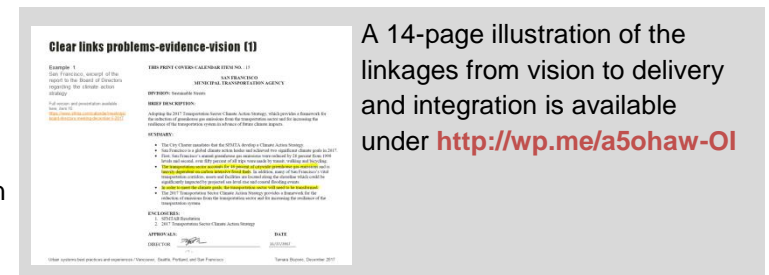
The land use and development strategies are strongly linked with the transport, affordability, energy efficiency visions and action plans. There is a high transparency of the linkages between actions give effect to them (see as illustration Vancouver's walking and cycling improvements strategies).

**At the metropolitan level**, there is a strong focus on developing brownfield areas that are serviced by efficient PT, and planning PT networks aiming at serving dense developments. In Vancouver, these aspects are now part of the Regional Growth Strategy (growth nodes). The developments linked with efficient PT have proven attractive for residents and investment, leveraging amongst others public-private-partnerships (PPP) and developers' participation in the infrastructure improvements (7, 18, 23, 1, 28, 30). This mechanism has been used for instance for Vancouver's SkyTrain Canada Line, realized together with the development of brownfields (Olympic village, Cambie corridor).

In Oregon, the growth boundaries have been fixed at the state level, to protect the agricultural land and the landscapes (<sup>28</sup>, <sup>29</sup>). The successes are seen especially with developments near PT or bicycle corridors. The Puget Sound region has also a strong focus on integration, linking development within urban boundaries (96% of all the developments) and an ambitious, \$54billion extension of the public transport network, voted late 2016 (7). There is a clear and shared view of the growth nodes and of the relationship between growth and transport system development.

**At the local level**, the neighbourhood centres play an important role in providing services for local residents. The planning seeks to maintain or improve their land use mix and accessibility on foot or by bicycle. The downtowns have even more this need of mixed use – in Vancouver for instance, the city centre use mix has been highly developed. It is now estimated that 70-80% of people living downtown walk to work<sup>30</sup>, and the overall mode share of walking is over 45% of trips [11]. Denser land use is seen as key for continuing to support shorter trips & sustainable transportation choices<sup>31</sup>, but also for healthy communities<sup>32</sup>.

**Good public spaces** are widely used in the improvement of the urban life quality and support walking, especially via Complete Streets redesigns and space reallocation trials.



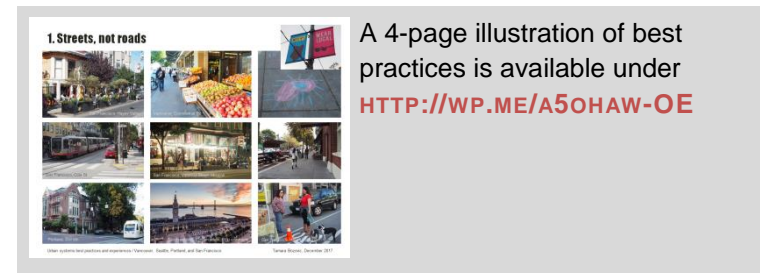
## OVERALL CAPACITY – MOVING PEOPLE AND GOODS, IMPROVING LIVEABILITY

For major corridors, the **capacity in terms of people and goods** moved is typically assessed when evaluating options. It is acknowledged that public transport, walking and cycling have high potential in terms of throughput and travel times, and that the right conditions are needed to leverage them. All four cities have experienced benefits of an efficient system integrated PT-walking-cycling system, at different levels. All four are also using the momentum of the reduction of car trips to drive further modal shift, and improve liveability. Providing alternatives to car that are efficient and attractive leads them to create new services, but it also often means a re-allocation of road space, for a better overall network use.

The result of this approach is seen in population and employment growth that doesn't imply traffic growth. The case of Vancouver has been noted above (same cordon traffic as in 1960). Seattle has added 45,000 jobs downtown from 2010 to 2016, or +22%, but hardly any additional traffic. The SOV commute decreased from 35% to 30% of the trips. 90% of the growth was absorbed by PT, walking and cycling<sup>33</sup>. This was possible thanks to important improvements in PT and cycling options, the location of intensifications near the centre and the PT nodes, and a demand management programme coordinated regionally<sup>34</sup>.

Overall capacity is improved through:

- Better PT connections – ex. Vancouver, where light rail is preferred for access to the centre even “by those who have 2 cars at home” simply because it is seen as more efficient and comfortable than driving (30).
- Better walking and cycling connections – ex. Portland, success of Livable Streets projects, looking at re-purposing the street space, allow for seating and improving amenity and networks adapted to the biggest part of users (15, 28). Complete Streets Policies are typically applied in all major projects. These confirm the analysis done by Pucher and Buehler (9). In all cities, providing for disabled access is seen as a necessity (and not an “amenity”; , 15, 15,18, 19, 20, 23, 24, 28).
- The provision of competitive advantages to PT, walking and cycling, for the important connections (planning informed by a sound understanding of the customers' needs – origin-destination, levels of service, etc.)

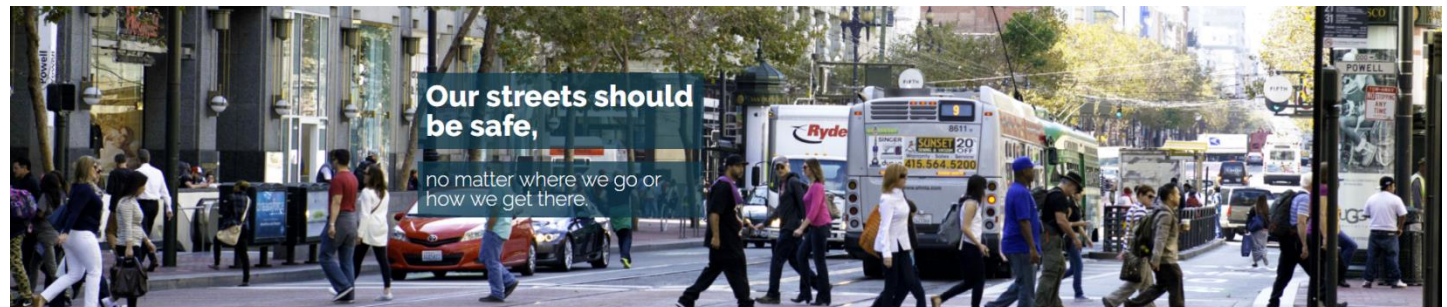


## ROAD SAFETY: UNDERSTANDING, SYSTEMIC APPROACH, AND MONITORING

All four cities are committed to Vision 0 and show a great consistency in understanding the problems and addressing them in a systemic way.

Amongst their best practices, I noted:

- **Ownership** - acknowledging the importance of the system on the traffic deaths and serious injuries, taking responsibility to improve it. This is also true for speeding or red-light running for instance, where a better enforcement (red light cameras for instance) shows positive results<sup>35</sup>.
- **Commitment** to address difficult aspects of road safety, such as for instance pedestrian deaths and serious injuries (often stagnating, while the overall DSIs decrease). This is seen through increased efforts to understand the patterns and target improvements. Seattle's Bicycle and Pedestrian Safety Analysis is a good example of this<sup>36</sup>.
- **Data** to inform prioritization and assess effectiveness. All cities publish prioritized action plans and Vision Zero tracking.
- **Targeted interventions** – these can be simple to realize, for instance by reducing cornering speeds and improving mutual visibility through painted curb extensions enforced with cheap urban furniture (bollards, planters, etc). The cities apply the design guidelines developed by NACTO<sup>37</sup> and pioneered by New York, because of their proven efficiency and effectiveness. They target in particular the deadly overlaps between traffic speed, complexity, and presence of people walking and cycling. Commitment comes in line here, because while some interventions are simple to realize, they can fuel some users' dissatisfaction and require a political will to pursue improving the system (suppress turning movements across oncoming traffic lanes and/or pedestrian and bicycle movements). Some examples of interventions are presented in the illustrated appendix.



**That's what Vision Zero SF is all about.**

City officials, city employees and community members working together and committing to create safer streets.

Figure 4: Printscreen from San Francisco's Vision zero page; <http://visionzerosf.org/>



## TAILORING THE SOLUTIONS TO THE LOCAL NEEDS

### *Understanding what matters to the customers, engaging with them in the solutions design, providing the right alternatives*

The cities put effort into understanding what matters for different demographics, how they move around now, how this changes, or what their barriers are. These elements are then directly linked to the delivery of adapted solutions, and seen as key given the change in demographics, needs, and mobility patterns. Examples:

- Vancouver tracks mode share, vehicle-kilometres travelled (VKT), and other key parameters annually, for *a better understanding of the emerging car sharing sector, preferences by people [walking], cycling, and bike/vehicle parking trends*<sup>38</sup>. This evidence is used to shape measures that target major/emerging needs. They resulted in a massive uptake of PT, walking and cycling, as modes of choice, especially for going downtown.
- Seattle went from being sued by the disabled community over inaccessibility and discrimination to collaborating on the walking realm. Michael Shaw, Seattle Disability action plan coordinator, sees there a result of an improved outreach and shared understanding of the needs, barriers and city's processes.
- Arbutus Greenway, Vancouver: wide community engagement from the start of the project, and involvement of 100 participants representing all ages and neighbourhoods in a two day "design jam", where participants worked with experts on the design and presented preferred solutions (24, <sup>39</sup>).

## GOVERNANCE, PLANNING AND FUNDING

### GOVERNANCE

The local visions and strategies are crafted by multiple partners, generally:

- The core city, often presenting more acute needs to address access and provide liveable environments for living and doing business, ones that residents and companies are likely to choose, and therefore often more progressive in the strategies implementation (Vancouver for instance)
- Suburban municipalities, with larger greenfield development potentials and lesser network pressure, with the challenge of focusing growth especially around transport nodes
- The region, often managing the public transport and ensuring a coordination role (for instance Vancouver, regional growth strategy, identifying growth nodes to be prioritised against sprawl)

Some good practices were implemented to help with the challenge of multi-party environments:

- Vancouver's Mayors' Council<sup>40</sup> appointed a private board, similarly to the model being successful for the Vancouver International Airport. The Board is in charge of preparing and submitting to the Mayors' Council program options that aim to address the issues in an equitable way, across the 22

Council areas (30).

While the City does not own or operate the transit system (TransLink is responsible for the region's transit planning and delivery), it can support high ridership and improved, cost-effective service by building transit-supportive streets and public spaces, by protecting corridors and sites for future routes and stations, and through transit-supportive land use. A project office supports the development of new light rail lines. A Transport Design group works on the accessibility of the future stations, especially on foot or by bicycle – these are the “last mile(s)” modes, shaping directly the reach of each station (30, 30).

- In the Puget Sound region, a good model of collaboration has been developed between the regional council, coordinating the overall planning (in particular designation of the regional growth centres and the regional transport network) and the municipalities, planning local developments. The important number of partners requires an important effort in terms of consensus research, but the model is seen as functioning well, mainly because all the actors are motivated to collaborate, understanding the efficiency that can be reached together. This efficiency relates to a better transport system, but also to limiting the sprawl, consuming valuable farm land (7).

## BROADER COSTS BENEFITS EVALUATION

All the cities examine broader transport costs and benefits. Vancouver illustrates well this approach, considering<sup>41</sup>:

- Climate change mitigation through reductions in fossil fuel usage
- Avoided costs of vehicle operation and crashes
- Health benefits associated with incorporated physical activity into daily routines and localized reductions in Criteria Air Contaminants (CACs);
- Enhanced community liveability when taking into account:
  - Social connectedness – residents more engaged within their own neighbourhoods
  - Improved security – following Crime Prevention Through Environmental Design (CPTED) principles – due to greater use of the public realm;
- Reduced transportation costs when factored into the housing affordability equation.
- Postponement of investments in infrastructure renewal due to lesser demand, which can be redirected to more pressing City and regional needs.

Maggie Buttle, who worked as a transport planner in New Zealand and is now the project manager for the Arbutus Greenway in Vancouver, sees this as an important difference of approach, with the risk, in a purely BCR evaluation, to prioritize solutions not necessarily aligning well with other strategies. Addressing the challenges – a personal wrap-up

## FUNDING CHALLENGES AND SOLUTIONS

The budgets are difficult to compare because of a diverse structure of agencies and roles. This is especially true for the PT. For instance, in San Francisco, the SFMTA plans, designs, builds, operates, regulates, and maintains the municipal PT system, as well as walking, bicycling and road networks and the public parking. The BART (Bay Area Rapid Transit) is funded and operated regionally, but shares the core city stations with the SFMTA light rail system. In Vancouver on the other hand, the PT system is operated by a metropolitan agency, TransLink, having also the responsibility over some roads and bridges. Additionally, the PT operators can have different levels of ownership or management of the infrastructure, and the financials can differ in the ways they integrate or not the amortisation of infrastructure assets into the costs, for instance, and the systems are in various stages of development / maintenance / renewals of infrastructure and fleet, adding to the interpretation risk of a simple “snap shot”. We won’t compare the budgets, but only report ideas about funding challenges and future-proofing.

All the cities have a challenge of funding sources. This is however seen as a point to work on, and in no case as a barrier. **The Bay Area** long term plan underlines the *desire to put priorities before projects* and before the budget (see excerpt on the right side).

**Vancouver** has adopted an ambitious 10-year vision in 2014. The transit funding is evolving. Currently funding comes from all 3 levels of government, as well as PT system and road users. It will also include a fee on developments, a tax increase on Metro Vancouver residents and fare increases<sup>42</sup>.

Sustainable PT funding was an integral part of the 2040 action plan, with a list of possibilities to be explored (below). This task is undertaken by the Mayors’ Council (30).

**The Puget Sound Region** is future-proofing the funding stream, in particular by transitioning away from the fuel taxes. The thinking is that:

- The federal fuel tax is decreasing in volume, given that it had never been adjusted for inflation, since the 1990s (18 c/gallon)
- The state fuel tax is one of the highest in the country (total: 64 c/gallon). However, a decrease of fuel consumption in more modern vehicles means also a decrease in the fuel tax. There is also a disparity between high end electric vehicles, paying no tax, and cheap and old vehicles consuming more and therefore paying more taxes, without relation with their actual use of the roads. Lastly, these taxes don’t allow any subtlety in terms of for instance taxing differently the use of freeways and local roads.

## 6. ADDRESSING THE CHALLENGES – A PERSONAL WRAP-UP

The main “take-away” from this trip is certainly that all the successes relied on a system approach encompassing aspects of land use, overall capacity, and adaptation of interventions to local needs. Strategic vision, good governance, innovative funding and alignment of actions on a longer term, between the agencies, formed the necessary backdrop. In this point we will present an overview of the system approach of the technical interventions, against the major challenges.

The main “take-away” from this trip is certainly that all the successes relied on a system approach. A personal wrap up is presented below.

Challenge	Elements of system interventions		
	Land use: mix, density, integration	Overall network capacity – moving people and goods	Tailoring the solutions to the local needs
<b>Congestion, network efficiency, air pollution</b>	<b>De-centralization.</b> Development of well inter-connected local activity centres. <b>Infill development</b> , with nearby destinations and efficient PT.	Development of alternatives that <b>increase the overall capacity and travel demand management</b> , encouraging the use of the most efficient modes.	Provision of alternatives to driving with the <b>right levels of service</b> , attractive for users to choose. Main characteristics: travel times, PT frequencies, accessibility, legibility, continuity, affordability.
<b>Transport system affordability</b>	<b>De-centralization and urban infill</b> (see above); for the end user - lesser need to own or use a car; for the authorities - PT patronage and revenues increase, lesser traffic capacity investment, leverage of incremental developer fees.	<b>Good understanding of the needs (geographic, or by user – surveys, interventions monitoring);</b> prioritisation of space to address them the most efficiently – for instance bus lanes providing efficiency for direct routes, servicing specific origin-destination connections.	
<b>Growth and sprawl</b>	<b>Infill development</b> (see above); <b>TODs</b> (transit-oriented developments), with easy access to major PT connections.	<b>Growth coordinated with multi modal systems</b> , providing efficient solutions for different journeys / needs (efficiency for the user but also from the system perspective).	<b>Good understanding of the needs of the new residents</b> in terms of destinations or parameters of modal choice, and provision of transport solutions that are likely to be chosen.
<b>Affordability – housing</b>	Considering <b>overall affordability of housing and transport</b> – development of housing in areas where a car is not necessary and the transport costs can be reduced.	<b>Efficient and attractive alternatives to car.</b> PT, high quality walking environment and bicycle network, for short trips.	<b>Suppression of parking minima</b> , allowing for buildings with low or no parking provision; provision of <b>attractive alternatives to driving</b> (left)
<b>Public health and road safety</b>	<b>Mix and density</b> - local activity/service centres, allowing for short trips from home, together with an <b>environment that encourages walking and cycling</b> as everyday means of transport, or as access to PT.	<b>Leveraging active modes and PT</b> (use correlated with higher walking), achieving less sedentary lifestyles, less air pollution and less road trauma.	Walking and cycling networks <b>actively encourage movement</b> (attractive to wider demographics), linked with <b>traffic management</b> (lower stress, more comfort for walking and cycling). <b>Targeted safety interventions</b> – traffic speed and complexity reduction, prioritization taking into account pedestrian and bicycle volumes (context).

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