The role of regional planning for spatial climate mitigation actions

Regional governance of land use and transportation in the US, Canada and Germany

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Abstract:

The multi-level governance of land use and transportation shift into focus when trying to reduce carbon emissions from commuting. To reduce travel distances between home and work, experts suggest urban containment and transit-oriented development as spatial development strategies. However, land use and transportation are governed differently in nations across the globe making the implementation of these strategies challenging and regionally unique. Therefore this paper seeks to understand and compare the regional capacities to govern land use and transportation in Seattle (USA), Stuttgart (Germany), and Vancouver (Canada).

1. Introduction

Reducing the carbon footprint of urbanized areas is one of the key challenges for urban planners in the 21st century. Within the climate mitigation discourse, several sectors are relevant for reducing GHG emissions, including energy supply and efficiency, transportation, land use, and waste (Verbücheln & Dähner, 2016; DIFU, 2011; Boswell, et.al, 2012). Each sector has varying potentials for emissions-savings. For instance in Seattle, Vancouver and Stuttgart, transportation emissions account for between 18% and 50% of total emissions. These emissions can partly be reduced through better fuel efficiency and an increase in electric vehicles, but there are underpinning land use patterns that (re)create the need for transportation. Especially at the city-wide and regional level, the mix and density of activities impact the demand for transportation (Banister & Jillian, 2009, p. 58; Pizzaro, 2009; DIFU, 2011; IPCC, 2014, p. 947; SKKK, 2014). To reduce distances between jobs and housing, climate action plans suggest spatial development strategies such as urban containment and transit-oriented development. Theoretically, these strategies should be implemented at the regional level (IPCC, 2014, p. 959) but this can be a difficult task given multi-agency settings with non-aligned organizational responsibilities (IPCC, 2014; Fröhlich & Knieling, 2013; Brunnengräber, 2013; Boswell et al., 2012; Heinen, 2018). Therefore, the question is: What are the legal and organizational capacities at the regional (US-metropolitan) level to actually implement urban containment and transit-oriented development?

Comparing the metro-regions of Vancouver (British Columbia, Canada), Seattle (Washington State, USA) and Stuttgart (Baden-Württemberg, Germany), this paper examines land use and transportation governance at the metropolitan regional level. Particularly, the paper tries to understand the regional governance capacities, based on the planning system, to make integrated decisions in an effort to implement urban containment and transit-oriented development. The following sections examine the national and state climate efforts, review the statutory responsibilities of the metropolitan (regional) planning organizations, and analyze their commitment to climate action and the leveraged planning mechanisms. The paper will conclude by discussing implementation challenges and opportunities based in the planning system.

2. Method

The analysis focusses on three administrative regions from the federal[1] states of Canada, Germany, and the USA. Seattle, Stuttgart, and Vancouver are best-case scenarios with a climate commitment for almost 10 years (see Table 1 for selection criteria). The three cases are comparable because of their similarities in population in the core cities and administrative regions (See Table 2 for data). This paper presents the results of a review of official government documents. Interviews with planners and elected officials to gather further insights will be conducted in August and September 2018 and will be published in a forthcoming paper. For this paper, the author analyzed climate action, growth management (land use), and transportation plans at all levels of government as well as state and federal laws in all three countries. For the climate action plans, the review focused on land use and transportation related mitigation actions and is not a comprehensive review of actions in all sectors. Within the other documents, a particular focus was placed on climate objectives, urban containment, and transit-oriented development as well as funding for transit infrastructure.

Selection Criteria	**Explanation**
1) State government (*Landesebene*, Province) is committed to climate action.	E.g. has adopted GHG emission reduction targets or has signed the Under 2 MOU Coalition.
2) Region or core city has had a Climate Action Plan for at least 5 years.	This allows examining the actual implementation of actions committed in the Climate Action Plans.
3) Core city has more than 500,000 residents and regional administrative area covers more than 2 million people but less than 5 million.	This establishes commonalities in the scale of spatial issues. Furthermore, the ratio between core-city population and administrative region population often impacts voting within the regional organization. This ensures similarities in interest representations at the regional level.
4) There is some form of state planning legislation (Growth Management/ *Raumplanung*).	States without growth management usually delegate all land use authority to the local level, thus having no regional government with any land use authority.
5) The region is growing not shrinking.	Shrinking regions have many other challenges and face different planning conditions (population loss, financial constraint, vacancies of buildings and neighborhoods).

Table 1: Explanation of case study selection criteria

Core-City	**Country**	**State** (Province, *Bundesland*)	**Population 2010/2011 (Pop)**			**% of pop in core-city to admin. region**	**Area (in km²)**	
			Core-City	**Admin. region (MPO)**	**Statistical region** (MSA, CMA, statistische Regionen)		**City**	**Admin. Region**
Stuttgart	Germany	Baden-Württemberg	585.890	2.668.439	3.914.359	22%	207	3.654
Vancouver	Canada	British Vancouver	603.502	2.313.328	2.313.328	26%	115	2.883
Seattle	USA	Washington State	608.660	3.690.866	3.439.809	16%	217	16.534

Table 2: Data on Regions
(Sources: US Census 2010, Destatis - Statistisches Bundesamt 2011, Statistics Canada 2011)

3. National and state climate support

In each country we find very different starting conditions for climate mitigation actions (Table 3). While the federal governments in Canada and Germany support climate action through various measures, the US regions rely on mostly voluntary local and regional actions. For instance, the Pan-Canadian Framework (GoC 2016a) includes $25 billion set aside for investment in public transit (GoC 2016b, p. 13f.). Germany's National Transportation Program (Bundesverkehrswegeplan) commits 42% of the EUR 240 billion in funding for rail projects over the next 12 years (G-BVWP 2030; Klimaschutzplan 2050, p. 55). For the United States, there is currently no federal monetary support and most recently, under the current Trump Administration, the United States has withdrawn from the Paris Climate Agreement (in effect by 2020; Romo & Parkes 2017). In response to the national shift away from climate commitment, 2500 US businesses, government entities, and organizations signed the "We are still in" initiatives, including 9 US states of which one is Washington State (which itself has set emission targets as early as 2008).

Climate Action Plans at	**Vancouver, BC, CA**	**Seattle, WA, USA**	**Stuttgart, BW, DE**
Federal-level	Pan-Canadian Framework on Clean Growth and Climate Change (2016)	NO	G-Klimaschutzplan 2050 (2016)
State-level (Provinces, *Länder*)	Climate Leadership Plan (BC CAP 2016; update to 2008 CAP)	NO (Executive orders Inslee 2014, Gregoire 2008)	Integriertes Energie- und Klimaschutzkonzept Baden-Württemberg (BW IEKK 2014)
Regional-level	NO (MV-Climate 2050-DP is underway)	NO	NO (Adaptation strategy VRS Klima 2016)
Core-city	Greenest City Action Plan (2012, new plan 2015)	Seattle Climate Action Plan (2013, new plan underway)	Klimaschutzkonzept (updates since 1997)

Table 3: Climate Action Plans (CAPs) by level of government

In the US context, state governments are usually very conscientious of local rights and avoid any infringement of the land use and zoning responsibilities of the local level. For instance, Washington State only committed state agencies to meet legislative GHG reduction targets (see RCW 70.235.020, 050 and 060; see Table 4), whereas British Columbia (BC) committed all levels of governments to reducing emissions (Bill 44 (2)(1)(a) and (b); see Table 4). In BC, the communities and regional districts are legally required to include targets, policies and actions to reduce greenhouse gas emissions in Official Development Plan and Regional Growth Strategies (Local Government Act Sections 473 and 429; Vancouver Charter 652.01). In addition, BC engages its local governments through the BC Climate Action Charter (BCCAC), a voluntary agreement which 187 of the 190 communities in BC have signed (BC CSCD 2018a). Signing the agreement is incentivized by funding through the Climate Action Revenue Incentive Program (CARIP; BC CSCD 2018b).

In Germany, climate action is voluntary for communities (G-Klimaschutzplan 2050, p. 77). The federal government does encourage communities with the German "National Climate Initiative". Since 2008, over 3,000 communities received a total of EUR 560 million for over 12.500 projects to create climate action plans and implement climate actions such as installing bike racks and switching to LED street lights (G-Klimaschutz 2018a). Baden-Württemberg finances 35 regional and countywide energy consulting agencies for home-owners (BW KEA 2018), funds increased energy efficiencies of public buildings at the local level (Program Klimaschutz Plus), and authorizes regional planning organizations to determine locations for wind energy plants and for other energy related facilities (BW Drucksache 15/3842, Artikel 2, §11; BW IEKK 2014, p. 145)

	Vancouver, BC, CA	**Seattle, WA, USA**	**Stuttgart, BW, DE**
Base-line year	2007	1990	1990
Relevant for	All public sector organizations (with state financial support to locals)	State agencies	All public sector organizations (with state financial support to locals)
Law at state level	BC Bill 44 (2)(1)(a) and (b) (2007)	RCW 70.235.020, 050 and 060 (2008)	§4 in BW Drucksache 15/3842 (2013)
Reduction targets…			
… by 2020	33%	to 1990 levels	25%
… by 2035	n/a	25%	n/a
… by 2050	80%	50%	90%
Estimated % emissions of transportation (F-Federal, S-State, R-Regional)	23% (F) 37% (14% personal + 23% commercial vehicles) (S)	50% (R)	18% (F)

Table 4: State-level GHG Reduction Targets and estimated emissions in transportation (Sources: BC CAP 2016, p. 14; G-Klimaschutz in Zahlen 2017, p. 37; PSCAA Strategic Plan 2014, p. 21; PSRC Vision 2040, p. 40)

In the transportation sector, Washington State is committed to climate mitigation but the implementation support for regions and communities is significantly lower than in Baden-Württemberg and BC. For example, the expansion of the regional transit systems is supported by state financing in BC and Baden-Württemberg, whereas it is supported by a regional tax levy in Seattle (WSDOT – VMT MPO Report 2011, p. 5; BC CAP 2016, p. 5 and p. 18; Sound Transit 2018; BW ÖPNV-Pakt 2014). In an effort to reduce emissions from transportation, the Washington State legislature set benchmarks (not requirements) to reduce vehicle miles travelled across the state by 18% by 2020 (RCW 47.01.440). As the agency responsible for building and funding federal and state roads, the Washington State Department of Transportation (WSDOT) funds transit with only 6.3% of a total operating and capital budget of $ 5.7 billion (WSDOT-Budget 2017, pp. 7, 40, and 64). In contrast, Baden-Württemberg is allocating 60% of transport funding for transit and bike infrastructure and 40% for regular road projects (BW IEKK 2014, p. 104; *Maßnahme* 69).

Overall, for communities in the Vancouver and Stuttgart regions there is strong support by state (and partly federal) government through regulations, funding and programs for climate action. While there is an intention at the state level in Washington State to reduce GHG emissions and Vehicle Miles Travelled, the available implementation support appears to be significantly lower. Washington State is pursuing other actions like capping emissions from large emitters and reduce emissions from state government operation but when it comes to implementing compact urban development (urban containment) and transit-oriented development, the responsibility is seen at the local level. While zoning is also a local responsibility in Canada and Germany, communities in these countries have financial and institutional support for implementation.

4. Legal (statutory) responsibilities of regional planning

When it comes to reducing emissions by implementing transit-oriented development and urban containment, regional and metropolitan planning organizations are key actors to facilitate coordination across communities in a region. The following table (Table 5), highlights the statutory responsibilities and services (*Aufgaben/ Handlungskompetenzen*) provided by the three regional planning organizations. All three agencies are responsible for Broad Planning (growth management, spatial planning/ *Raumplanung*)[2]; Metro Vancouver bundles together the most additional services and PSRC the least.

		Broad Planning/ Growth Management/ Spatial Planning	Transportation Planning	Transit Operation	Water	Sewer	Waste	Housing	Parks	Clean Air	Economic Development
Vancouver region	**Metro Vancouver**	x			x	x	x	x	x	x	
	Trans Link		x	x							
Seattle region (Puget Sound)	**Puget Sound Regional District**	x	x								x
	Sound Transit			x							
	Other agencies				x	x	x	x		x	
Stuttgart region	**Verband Region Stuttgart**	x	x	(x)			x		x		x
	Deutsche Bahn AG			x							
	Stuttgarter Straßenbahn AG			x							

Table 5: Services provided by regional agency (statutory responsibilities)

4.1 Metro Vancouver and regional planning in British Columbia

Metro Vancouver is responsible for growth management, water, sewer and drainage, air quality management as well as housing (MV-Board Strategy, p. 6). Furthermore, Metro Vancouver approves the use of federal gas tax funds (Greater Vancouver Regional Fund), approximately $130 million per year (MV-Climate 2050-DP, p. 34). As a 2007 merger of previously separate organizations, each entity still has its own governing board composed of elected representatives from each participating municipality in the service areas. As a regional district under BC law, Metro Vancouver prepares regional growth strategies (RGS) in cooperation with 21 municipalities, one treaty first nation, one electoral area for matters that “spill across local government boundaries” (BC RGS Guide 2005, p. 33 and p. 15). The intent of BC’s “interactive planning system” is to foster local autonomy and achieve agreement between communities and the regional district. Prior to an RGS taking effect, each community has to accept the RGS and potential disputes have to be resolved through a set of state-defined procedures (BC RGS Guide 2005, pp. 2 and 17-20). For implementation of an RGS, municipalities have to include Regional Context Statements (RCS) with their Official Community Plan (also called Official Development Plan) which relates the local to the regional strategy.

4.2 Puget Sound Regional Council and metropolitan planning in Washington State

Puget Sound Regional Council (PSRC) is the designated Metropolitan Planning Organization (MPO by federal law) and the transportation planning organization (state law) of the Seattle region for the counties of King, Kitsap, Pierce, and Snohomish and the 86 local jurisdictions in these counties (PSRC – Plan Review 2014, p. v). Based on federal and state law, its primary responsibility is to plan the regional transportation system and to ensure cooperation between the state and local jurisdictions (USC 23 Sec 134; RCW 47.80.010). MPOs across the United States select regionally significant transportation projects within urbanized areas for federal transportation funding. Additionally, MPOs can be imbued with more powers if the state decides to grant them or if the locals decide to defer powers. The PSRC’s board of locally elected officials decided to develop a regional growth strategy as the multicounty planning

policy (Vision 2040 adopted 2008, Vision 2050 underway). Based in state law, multicounty planning policies establish a framework for county and city comprehensive plans (RCW 36.70A.100; RCW 36.70A.210 (1) and (7)) but cannot "alter the land-use powers of cities" (RCW 36.70A.210). For implementation of an RGS, PSRC can certify aspects of local and county plans (RCW 47.80.023, PSRC-Plan Review 2014, p. v).

4.3 Verband Region Stuttgart and regional planning in Baden-Württemberg

The Verband Region Stuttgart (VRS) is responsible for growth management (*Raumplanung*), open space planning (*Landschaftsrahmenplan*), transportation planning, waste management, economic development, and tourism marketing (GVRS §3(1)(1)-(7)). The VRS is governed by a board of 80 regionally elected officials (GVRS §8 und §12) and encompasses the city of Stuttgart and 178 local jurisdictions in 5 counties. Within Germany, VRS is in a special position as it has extensive authority for transportation planning and is governed by a body of regionally elected officials. VRS prepares the regional plan (*Regionalplan*) in collaboration with communities and the state government (ROG §7 and 13). Once finalized the regional plan is approved by the state (Fürst 2010, p. 71).

Additionally, VRS participates in the development of statewide goals, and participates in sectoral planning (Goppel 2005, p. 566; Fürst 2010, pp. 96f.). In Germany, regional planning acts as an intermediary between local and state interests (Schmitz 2005, 965). While the local governments control zoning and implementation of the land-use component of plans, the state controls sectoral agencies and infrastructure investments (Fürst 2010, p. 76; see Buehler and Schmidt for more detail). For implementation, VRS works with municipalities through the *Flächennutzungsplan* (Land Use Map prior to zoning code development) and with the state through specific procedures (*Raumordnungs- and Planfeststellungsverfahren;* ROG §15; Fürst 2010, p. 166)

5. Organizational capacity to regulate land use and transportation to mitigate climate change

Despite not having specific climate action plans[3], all three organizations include GHG reduction as primary objectives in their regional growth strategies (*Regionalplan*) and other plans (see Table 6 for a list). The three regional growth strategies promote development and mobility patterns that focus new growth within compact and complete centers along transit corridors[4] in existing communities. To achieve this, the recommended strategies include urban containment[5] and transit-oriented development.[6]

	Metro Vancouver	**PSRC**	**VRS**
Regional Plans: Growth Strategies (Regionalplan)	Regional Growth Strategy: Metro Vancouver 2040 – Shaping our Future (MV-RGS 2011)	Vision 2040	VRS-Regionalplan 2009
Regional Transportation Plans		Transportation 2040 (includes 4-Part GHG Strategy)	VRS-Verkehrsplan 2016
Air Quality Plan	Integrated Air Quality and Greenhouse Gas Management Plan (MV Air Quality 2011)		
Others	Regional Parks Plan; Board Strategy 2015-2018		VRS-Klimaatlas 2008; VRS Klima 2016

Table 6: Plans at regional planning organization containing climate objectives

In all regions, there has been a prior commitment to this type of development (PSRC Vision 2040, p. 15; VRS-Regionalplan 2009; MV-RGS 2011). With increasing concerns over climate change, the three regional planning agencies stress the importance of reducing vehicle miles travelled by changing development and mobility patterns. However, the implementation of these changes looks very different across all three regions. In all cases, implementation depends to some extent on transit providers and local jurisdictions, but the legal planning frameworks provide different mechanisms to ensure plan consistency, solve disagreements, and provide financial resources for transit investments.

5.1 Implementation for Metro Vancouver

> "Metro Vancouver and its member municipalities are working to reduce GHGs by focusing growth in a network of transit-oriented urban centres and building compact, complete communities that offer amenities close to home." (MV-Climate 2050-DP 2018, p. 45)

In implementing the regional growth strategy, Metro Vancouver relies on its member jurisdictions' land use and zoning authority and on TransLink for long-term investments in transit and regional roads (MV-Climate 2050-DP 2018, p. 18 and 35; MV-RGS 2011, p. 52; TL 2018). Metro Vancouver can work with municipalities through the Regional Land Use Designation Map which is part of the RGS (MV-RGS 2011, p. 46). Within their Regional Context Statement, municipalities have to interpret the Regional Land Use Designation Map for their own Official Community Plan and identify the Urban Containment Boundary, Frequent Transit Development Areas and Urban Centers (MV-RGS 2011, p. 9). Furthermore, Metro Vancouver does have direct authority over sewer and water extensions, therefore in implementing the RGS they do "not allow connections to regional sewerage services to lands with a Rural, Agricultural or Conservation and Recreation regional land use designation" with a few exceptions (MV-RGS 2011, p. 14).

Metro Vancouver works with TransLink through the authorization of federal gas tax funds and by commenting on TransLink's transportation plans (MV-RGS 2011, p. 53; MV-FGT 2016, pp. FGT 6). But overall TransLink has a multitude of funding sources including property taxes, fuel tax, charges and fees, and a tax on parking rights (Part 3 of TransLink Act). TransLink works toward integrating land use and transportation decisions and references climate objectives at the Metro Vancouver and state level without setting out its own climate objectives (TL-RTS 2013, p. 2, 3 and 14). The performance measures (headline targets) of the agency are to make "it possible to make half of all trips by walking, cycling and transit; and […] to reduce the distances people drive by one-third" (TL-RTS 2013, p. 14).

5.2 Implementation at Puget Sound Regional Council

> "The region will focus growth within already urbanized areas to create walkable, compact, and transit-oriented communities that maintain unique local character. […] Rural and natural resource lands will continue to be permanent and vital parts of the region." (PSRC Vision 2040, p. xi)

For implementation, PSRC relies on communities, counties, and Sound Transit (the transit provider in the region). PSRC voluntarily set up a certification process for county and community comprehensive plans that go beyond the conformity requirements of state law (PSRC – Plan Review 2014, p. v). By state law, PSRC can certify if the transportation component of local plans is consistent with the regional transportation plan (RCW 47.80.023). Based on an internal agency policy, PSRC can also certify countywide planning policies which are usually developed by the counties in cooperation with communities but that do not alter the land use powers of communities (PSRC – Policy 2003, p. 1; PSRC's Interlocal Agreement 1993, p. 10f.; RCW 36.70A.210). To establish the consistency of countywide policies, local comprehensive plans and Vision 2040, PSRC set up their own procedures engaging communities early in their planning process (PSRC-Plan Review 2014, p. iv; WAC 468-86-150). Only jurisdictions with certified plans are eligible to apply for funding for transportation projects (PSRC Vision 2040, pp. 29f).

Additionally, PSRC can use its powers in the transportation sector by prioritizing investment in pedestrian, bicycle and transit-oriented facilities in urbanized area (PSRC Vision 2040 Goals MPP-T-11 to 16 and MPP-EN-21 and 23 on pp. 41 and 83). For the implementation of the long-range transportation plan, PSRC selects projects proposed by local governments for funding and adds the selected projects to the Transportation Improvement Program (USC 24 Sec 134). Furthermore, PSRC engaged its communities and Sound Transit in the Growing Transit Communities effort. This was a 2-year planning effort funded under the Obama administration's Sustainable Communities Initiative that created a transit-oriented development strategy for the region, identified new corridors and stations, and identified land use changes (PSRC-GTC 2013). Communities are committed to implementing the Growing Transit Communities effort through the Regional Compact – a voluntary memorandum of understanding among participating communities. As part of implementing Growing Transit Communities, Sound Transit will build 62 miles of new rail between 2021 and 2035. Funding for the new rail construction was approved by voters in 2016 who agreed to a slight increase in sales and property taxes (Sound Transit 2018). Furthermore, Sound Transit also has the Transit Oriented Development Program which coordinates the development of land near transit stations on Sound Transit owned land with community zoned land.

5.3 Implementation at Verband Region Stuttgart

> "The regional plan is a key mechanism to protect open spaces to bring fresh air into the communities, to foster compact urban development along transit corridors and to identify wind energy sites" (own translation; VRS-Klimaatlas 2008, p. 5 and 10).

VRS operates within the *Raumordnungsgesetz* (Federal Spatial Planning Law) which stresses the importance of preserving open spaces and concentrating development in urban and rural centers (ROG §2(2)(2))[7]. From the state level the regional planning organization is charged with two tasks regarding climate mitigation: to increase wind energy production (reserve land for wind energy) and to help foster compact urban patterns that reduce VMT (BW IEKK 2014, p. 101). The implementation of regional plans is a collaborative process between state-run sectoral agencies, the regional planning organization, and local communities. The *Gegenstromprinzip* is supposed to achieve a balance of statewide and local interests (ROG §1(3)). While it is mandatory (§4 Abs. 1 ROG) for sectoral agencies to comply with regional and state-wide plans, there are procedures for variances because sectoral plans (and local zoning codes) do have strong autonomy in the German constitution (Art. 65 GG (constitution); see also Fürst, 2010, p. 48f; §14 and §15 ROG). Therefore when preparing more detailed plans like *Flächennutzungspläne* and transportation studies, there is an extensive set of legally defined procedures to ensure coordination across levels and sectors of government (Fürst 2010, p. 137). A core concern is to make decisions that balance the various interests of using space in a way that will better the region overall. Coordination is mandatory across levels (vertical) and sectors (horizontal) of government.

Expanding the transit network has been an issue in the Stuttgart region since 1996 (VRS-Verkehrsplan 2016, p. 18). In an effort to increase transit ridership by 20% by 2025, the state government, VRS, county governments and the city of Stuttgart formed the "ÖPNV – Pakt" (transit alliance) in 2014 (BW ÖPNV Pakt 2014). The efforts primarily focus on increasing the service and reliability of the existing lines, adding park and ride stations, and improving the multi-modal infrastructure of the last mile of getting to and from the train stations. The transportation plan also stresses the need to more rigorously align developed land with existing infrastructure and to increase density and mix of uses along existing transit corridors (VRS-Verkehrsplan 2016, p. 22). To identify future transportation projects, the transportation plan assesses the emissions of 10 potential scenarios for the development of the transportation system (VRS-Verkehrsplan 2016, p. 64). The implementation of the project is the responsibility of Deutsche Bahn AG and Stuttgarter Straßenbahn AG.

6. Implementation challenges and opportunities for regional planning organizations

When it comes to implementation of urban containment and transit-oriented development to reduce GHG emissions, all three regional agencies rely on the land use and zoning powers of local governments and transit operators for transit expansions. While VRS and PSRC have control over transportation planning, Metro Vancouver almost entirely depends on TransLink for planning and implementation. For Metro Vancouver, there is no horizontal (across-sectors) integration of decision-making for growth management and transportation. VRS and PSRC have the ability to coordinate both sectors based on state law.

In the land use sector, Metro Vancouver pursues an interactive planning process (based on state law) and VRS pursues the *Gegenstromprinzip* ensuring procedural coordination (based on federal and state law). Metro Vancouver can negotiate with communities on land use issues through the interactive planning process which makes coordination mandatory (vertically integrated). VRS has the ability to engage in implementation procedures with statewide sectoral agencies and local communities based on federal and state law. Coordination is mandatory across sectors and levels of government (*Gegenstromprinzip*; ROG §1(3)). Both systems are designed to ensure consistency of goals and efforts across different levels of government. In both instances, state laws are designed to help resolve conflicts between levels of governments and to balance different interests through a set of predefined collaboration procedures. Therefore, both systems have mandatory vertical (across levels of government) integration of decision making.

For PSRC in Seattle, decision making is voluntarily integrated for growth management and mandatory for transportation. As the MPO, the planning process has to be collaborative, comprehensive, and continuous (Also referred to as the 3C-Process) (USC 23 Sec 134(c)(3)). Based on state law, the regional certification process of local and countywide plans is mandatory for the transportation component but not for the land use components. However, PSRC has voluntarily set up a certification process that also covers growth management aspects. This makes vertical coordination on growth management voluntary. If the certification process is based on municipalities giving the MPO these rights, there may be a reverse incentive for the MPO to strongly enforce compliance.

Overall, in the Seattle region the regional level has been very inventive with implementation tools such as the Regional Compact, the Plan Review Process, and the tax levy for transit funding. In a way, the lack of state support, requires broader expertise and capacities at the regional and local level, including procedural (administrative), tax, and legal in addition to spatial planning and transportation needs. Therefore, a key difference for implementation is the additionally required capacities at the regional level. Furthermore, differences are the state support for spatial climate mitigation actions, as well as legislative coordination requirements across levels of government (vertical integration) and across sectors/ scales (horizontal integration).

7. Conclusion

This paper reviewed the commitment and capacities to implement climate friendly regional development and mobility patterns at the regional level in Seattle, Vancouver and Stuttgart. While Vancouver and Stuttgart have national and state support for climate action, the institutional structures in the United States leave metropolitan regions to take mostly voluntary actions. In an effort to reduce emissions, all three regions are committed to spatial development patterns that protect open space and focus growth in mixed-use centers along transit-corridors, however, the implementation of these patterns follow different pathways.

In Germany coordination on implementation is mandatory (legally defined procedures) across sectors and levels of government; in British Columbia coordination is mandatory across levels of government; in the US coordination is voluntary (regional policy defined procedures) across sectors and levels, except for the transportation sector. There is a need to further study the actual coordination and implementation of urban containment and transit-oriented

development in each region to fully grasp the relevance of the state planning system. Furthermore, there needs to be more research to understand if the climate discourse has led to systematic changes in the planning system or if climate mitigation efforts benefited from existing systems. Furthermore, the underpinning cultural context of the planning system needs to be examined to understand the differences in outcomes. Understanding potentials and challenges at the regional level may help improve conditions for more collaborative climate actions across sectors and levels of government as part of a multi-level climate governance reforms.

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References

Banister, D. & Jillian, A. (2009) Transport Policies and Climate Change, in S. Davoudi, J. Crawford & A. Mehmood (Eds.) *Planning for Climate Change - Strategies for Mitigation and Adaptation for Spatial Planners,* London & Sterling, VA: Earthscan.

BC - British Columbia

BC CAP 2016, Climate Leadership Plan, viewed May 23, 2018 from https://climate.gov.bc.ca/app/uploads/sites/13/2016/10/4030_CLP_Booklet_web.pdf

BC CSCD 2018a, BC Climate Action Charter, viewed May 22, 2018 from https://www.toolkit.bc.ca/BC-Climate-Action-Charter

BC CSCD 2018b, Climate Action Revenue Incentive Program, viewed May 22, 2018 from https://www2.gov.bc.ca/gov/content/governments/local-governments/grants-transfers/climate-action-revenue-incentive-program-carip

BC Bill 44 – 2007, Bill 44 – 2007 – Greenhouse Gas Reduction Targets, 38th Parliament, 3rd Session, first reading, viewed May 22, 2018 from https://www.leg.bc.ca/pages/bclass-legacy.aspx#/content/legacy/web/38th3rd/1st_read/gov44-1.htm

BC Local Government Act 2018, viewed July 6, 2018 from http://www.bclaws.ca/civix/document/id/lc/statreg/r15001_00

BC Vancouver Charter 195), viewed July 6, 2018 from http://www.bclaws.ca/civix/document/id/lc/statreg/vanch_00

BC RGS Guide 2005, Regional Growth Strategy – An Explanatory Guide, Ministry of Community Services, viewed May 23, 2018 from http://www.cscd.gov.bc.ca/lgd/intergov_relations/library/RGS_Explanatory_Guide_2005.pdf

Boswell, M.R., Greve, A.I., & Seale, T.L. (2012) *Local Climate Action Planning,* Washington, D.C.: Island Press.

Brunnengräber, A. (2013) Multi-Level Climate Governance: Strategic Selectivities in International Politics, in J. Knieling& W. Leal Filho (Eds.) *Climate Change Governance: Series Climate Change Management* (pp. 70-85). Heidelberg: Springer.

BW - Baden-Württemberg

BW IEKK 2014, Integriertes Energie- und Klimaschutzkonzept Baden-Württemberg (IEKK), viewed June 18, 2018 from https://um.baden-wuerttemberg.de/fileadmin/redaktion/m-um/intern/Dateien/Dokumente/2_Presse_und_Service/Publikationen/Klima/140715_IEKK.pdf

BW KEA 2018, Regionale Energieagenturen in Baden-Württemberg, Klimaschutz- und Energieagentur Baden-Württemberg GmbH, viewed June 18, 2018 from https://www.kea-bw.de/service/energieagenturen/regionale-agenturen/

BW Drucksache 15/3842 – 2013, Drucksache 15/3842. Gesetzesbeschluss des Landtags. Gesetz zur Förderung des Klimaschutzes in Baden-Württemberg, Landtag von Baden-Württemberg. 15. Wahlperiode, viewed June 18, 2018 from https://um.baden-wuerttemberg.de/fileadmin/redaktion/m-um/intern/Dateien/Dokumente/4_Klima/Klimaschutz/Klimaschutzgesetz/Gesetzesbeschluss_Klimaschutzgesetz.pdf

BW ÖPNV-Pakt 2014, ÖPNV-Pakt für die Region Stuttgart, Ministerium für Verkehr Baden-Württemberg, viewed June 21, 2018 from https://vm.baden-wuerttemberg.de/de/mobilitaet-verkehr/bus-und-bahn/oepnv-pakt-stuttgart/

DIFU -·Deutsches Institute für Urbanistik (2011, Ed.) *Klimaschutz in Kommunen. Praxisleitfaden,* viewed April 18, 2016 from http://www.leitfaden.kommunaler-klimaschutz.de/sites/leitfaden.kommunaler-klimaschutz.de/files/pdf/klimaschutzleitfaden.pdf

Fröhlich, J., &Knieling, J. (2013) Conceptualizing Climate Change Governance, in J. Knieling & W. Leal Filho (Eds.) *Climate Change Governance: Series Climate Change Management*, Heidelberg: Springer, pp. 14-31.

Fürst, D. (2010) Raumplanung – Herausforderungen des deutschen Institutionensystems [Spatial planning – challenges of the German institutions], Detmold: Verlag Dorothea Rohn.

G - Germany

G-BVWP 2030 – 2017, Bundesverkehrswegeplan 2030, Federal ministry of transport and digital infrastructure, viewed June 18, 2018 from http://www.bmvi.de/DE/Themen/Mobilitaet/Infrastrukturplanung-Investitionen/Bundesverkehrswegeplan-2030/bundesverkehrswegeplan-2030.html

G - Klimaschutz 2018b, Allgemeine Informationen. Zahlen und Fakten, Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, viewed June 18, 2018 from https://www.klimaschutz.de/zahlen-und-fakten

G- Klimaschutzplan 2050 – 2016, Klimaschutzplan 2050 - Klimaschutzpolitische Grundsätze und Ziele der Bundesregierung, Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, viewed June 13, 2018 from https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzplan_2050_bf.pdf

G - Klimaschutz in Zahlen 2017, Klimaschutz in Zahlen Fakten, Trends und Impulse deutscher Klimapolitik, Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, viewed June 13, 2018 from https://www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/klimaschutz_in_zahlen_2017_bf.pdf

GoC - Government of Canada

GoC 2016a, Pan-Canadian Framework on Clean Growth and Climate Change: Canada's plan to address climate change and grow the economy, Environment and Climate Change Ministry, viewed May 17, 2018 from http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf

GoC 2016b, Federal actions for a clean growth economy. Delivering on the Pan-Canadian framework on clean growth and climate change, viewed May 17, 2018 from https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170119-en.pdf

Goppel, K. (2005) Landesplanung [state planning], in ARL - Akademie für Raumforschung und Landesplanung (Ed.) *Handwörterbuch der Raumplanung Dictionary of Spatial Planning],* Hannover: VSB Verlagsservice Braunschweig, pp. 561-573.

Gregoire, Christine (2009) Executive Order 09-05 – Washington's leadership on climate change, viewed May 15, 2018 from http://governor.wa.gov/sites/default/files/exe_order/eo_09-05.pdf

GVRS. Gesetz über die Errichtung des Verbands Region Stuttgart (GVRS) Vom 7. Februar 1994, viewed June 19, 2018 from http://www.landesrecht-bw.de/jportal/?quelle=jlink&query=RegStuttgG+BW&psml=bsbawueprod.psml&max=true&aiz=true

Heinen, D. (2018) Comparing planning systems – A framework to analyze how land-use and spatial activities are governed, in J. Knieling (Ed.) *Wege zur großen Transformation. Herausforderungen für eine nachhaltige Stadt- und Regionalentwicklung [Pathways to transitions – challenges for sustainable urban and regional development]*, Ahrensburg: Oekam.

Heinz, W. (2000) Interkommunale Kooperation in Stadtregionen – ein internationaler Vergleich [Cooperation between communities in city regions – an international comparison], in Heinz, W. (Ed.) *Stadt & Region – Kooperation oder Koordination? Ein internationaler Vergleich [Cooperation or Coordination – an international comparison]*, Stuttgart, Berlin, Köln: Kolhammer – Dt. Gemeeindeverlag, pp. 31-60.

Inslee, Jay (2014) Executive Order 14-04 – Washington carbon pollution reduction and clean energy action, viewed May 15, 2018 from https://www.governor.wa.gov/sites/default/files/exe_order/eo_14-04.pdf

IPCC - The Intergovernmental Panel on Climate Change (2014) *Fifth Assessment Report. Climate Change 2014: Mitigation of Climate Change, viewed* March 15, 2015 from http://www.ipcc.ch/report/ar5/wg3/

MV - Metro Vancouver

MV-Board Strategy 2015-2018, Board Strategic Plan 2015 to 2018, viewed May 25, 2018 from http://www.metrovancouver.org/about/aboutuspublications/BoardStrategicPlan2015-2018.pdf

MV-Climate 2050-DP 2018, Climate 2050 Discussion Paper. Presented in April 2018, viewed May 25, 2018 from http://www.metrovancouver.org/services/air-quality/AirQualityPublications/AQ_C2050-DiscussionPaper.pdf#search=%22Integrated%20climate%22

MV-FGT 2016, Greater Vancouver Regional District – Intergovernment and finance committee – Federal gas tax task force – regular meeting on Friday, April 29, 2016 1:30 p.m, viewed May 28, 2018 from http://www.metrovancouver.org/boards/FederalGasTax/FGT_Apr_29_2016_Agenda.pdf#search=%22Greater%20Vancouver%20Regional%20FUnd%22

MV-RGS 2011, Regional Growth Strategy – Bylaw No. 1136, 2010. Metro Vancouver 2040. Shaping Our Future. Adopted by the Greater Vancouver Regional District Board on July 29, 2011. Updated to July 28, 2017, viewed May 28, 2018 from http://www.metrovancouver.org/services/regional-planning/PlanningPublications/RGSAdoptedbyGVRDBoard.pdf

Pizzaro, R. (2009) Urban Form and Climate Change: Towards Appropriate Development Patterns to Mitigate and Adapt to Global Warming, in: S. Davoudi, J. Crawford & A. Mehmood (Eds.) *Planning for Climate Change - Strategies for Mitigation and Adaptation for Spatial Planners.* London & Sterling, VA: Earthscan.

PSRC - Puget Sound Regional Council

PSRC – GTC 2013, Growing Transit Communities. https://www.psrc.org/sites/default/files/gtcstrategy.pdf

PSRC – Interlocal Agreement 1993, Interlocal agreement for regional planning in the central Puget Sound area, viewed May 30, 2018 from https://www.psrc.org/sites/default/files/interlocal.pdf

PSRC – Plan Review 2014, Plan Review Manual - A Resource to Assist with Plan Development and Review - including Certification, viewed May 30, 2018 from https://www.psrc.org/plan-review-manual

PSRC – Policy 2003, Appendix A: Puget Sound Regional Council Adopted policy and plan review process, viewed May 30, 2018 from https://www.psrc.org/sites/default/files/appendix_a.pdf

PSRC – Vision 2040 - 2009, Vision 2040 – People. Prosperity. Planet, viewed May 30, 2018 from https://www.psrc.org/sites/default/files/7293-v2040_0.pdf

RCW Revised Code of Washington, Titles 36.70A (Growth Management), 47 (Public Highways and Transportation), 70 (Public Health and Safety), viewed May 15 to 28, 2018 from http://apps.leg.wa.gov/rcw/

ROG Raumordnungsgesetz 2017, viewed July 6, 2018 from https://dejure.org/gesetze/ROG

Romo, V. & Parkes, M. (September 16, 2017) Confusion Continues: The United States' Position On The Paris Climate Agreement. National Public Radio, viewed May 14, 2018 from https://www.npr.org/sections/thetwo-way/2017/09/16/551551083/u-s-still-out-of-paris-climate-agreement-after-conflicting-reports.

Schmitz, G. (2005) Regionalplanung [Regional planning]. In ARL - Akademie für Raumforschung und Landesplanung (Ed.): *Handwörterbuch der Raumplanung [Dictionary of Spatial Planning],* Hannover: VSB Verlagsservice Braunschweig, pp. 963-973.

SKKK - Service- und Kompetenzzentrum Kommunaler Klimaschutz (2014) Klimaschutz mit Konzept, viewed April 19, 2016 from http://www.klimaschutz.de/sites/default/files/page/downloads/skkk_einleger_klimaschutzkonzepte_sep14_barrierefrei.pdf

Sound Transit (2018). Regional Transit Taxes, viewed June 14, 2018 from https://www.soundtransit.org/About-Sound-Transit/Taxing-district

TL - TransLink

TL 2018, About Us, viewed May 28, 2018 from https://www.translink.ca/About-Us.aspx

TL–RTS 2013, Regional Transportation Strategy. Strategic Framework, viewed May 28, 2018 from www.translink.ca/-/media/Documents/plans_and_projects/regional_transportation_strategy/rts_strategic_framework_07_31_2013.pdf?la=en&hash=0A459174FB44A8870D00EFCE54124A01078D0698

TransLink Act – British Columbia (2018) South Coast British Columbia Transportation Authority Act, viewed May 29, 2018 from http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_98030_01

USC 23 Sec 134 – United States Code 23 Section 134, viewed May 5, 2018 from https://www.law.cornell.edu/uscode/text/23/134

Verbücheln, M. & Dähner, S. (2016, Eds.) *Klimaschutz in der Stadt- und Regionalplanung - Erneuerbare Energien und Energieeffizienz in der kommunalen Planungspraxis.* Part of the EU-funded

project SPECIAL - Spatial Planning and Energy for Communities in all Landscapes, viewed April 10 from http://www.difu.de/publikationen/2016/klimaschutz-in-der-stadt-und-regionalplanung.html

VRS - Verband Region Stuttgart

VRS Klima 2016, Klima – Stadt – Wandel Strategien und Projekte für die Klimaanpassung in der Region Stuttgart. Schriftenreihe Verband Region Stuttgart Dezember 2016 / Nummer 32, viewed June 5, 2018 from https://www.region-stuttgart.org/index.php?eID=dumpFile&t=f&f=5806&token=1dddabcc77765b8c82b4a4e2fac9491b6951e1bc

VRS - Klimaatlas 2008, Klimaatlas Region Stuttgart, viewed June 19, 2018 from https://www.region-stuttgart.org/index.php?eID=dumpFile&t=f&f=1957&token=4d8347ada273d2478550cec0cacdf602dfb15412

VRS – Regionalplan 2009, Region Stuttgart - Regionalplan, viewed June 19, 2018 from https://www.region-stuttgart.org/index.php?eID=dumpFile&t=f&f=682&token=5d584afc521d2491a202126da5d2d600e8192c77

VRS-Verkehrsplan 2016, Regionalverkehrsplan Region Stuttgart. Entwurf vom 21.12.2016, viewed June 5, 2018 from https://www.region-stuttgart.org/video/20161221_Entwurf_Regionalverkehrsplan.pdf

WIV 11617 – 2017, Sitzungsvorlage Nr. 116/2017 - Ausschuss für Wirtschaft, Infrastruktur und Verwaltung am 08.03.2017 zur Beschlussfassung 10.02.2017 - Öffentliche Sitzung - 116 - WIV-Ö - 257/2016, viewed June 19, 2018 from https://gecms.region-stuttgart.org/gdmo/Download.aspx?id=62964

WSDOT – Washington State Department of Transportation

WSDOT VMT MPO Report 2011, Governor's Executive Order 09-05 Washington's Leadership on Climate Change - Report on Section 2(b) Regional Greenhouse Gas and Vehicle Miles Traveled Reduction Strategies December 1, 2011, viewed May 29, 2018 from https://www.wsdot.wa.gov/NR/rdonlyres/F06E9BFD-36FB-4D5A-B5EE-C4F42BF9DFB0/0/FinalExecutiveOrder09052bReport.pdf

WSDOT-Budget 2017, Supplemental Budget for 2015-17 and 2017-19 Enacted Budget, viewed May 31, 2018 from https://www.wsdot.wa.gov/sites/default/files/2018/01/12/Budget-Enacted2017-19-BudgetBook_0.pdf

Endnotes

[1] Canada, Germany, and the USA are organized as federations with strong state governments (Province, Landesebene) in contrast to central states such as France and the Netherlands (Heinz, 2000, p. 3)

[2] Broad planning is the Canadian term, growth management the US-American term and spatial planning (Raumplanung) the German/ European-English term. PSRC is actually in a fairly unique position in the US to be responsible for growth management. In most US states, all planning responsibilities reside at the local level. Metro Vancouver is a special case in Canada, too, as the BC Local Government Act is not common in the other provinces. In Germany, having growth management (spatial planning) authorities is a core responsibility of regional planning. VRS is a special case having transportation planning responsibilities by state law.

[3] Metro Vancouver is currently working on an Integrated Regional Climate Action Strategy (MV-Climate 2050-DP 2018). VRS has a climate adaptation strategy but no mitigation strategy.

[4] To reduce emissions, Metro Vancouver's RGS plans to accommodate the anticipated population growth of 1 million residents by 2040, "in a network of transit-oriented urban centers and […] compact, complete communities that offer amenities close to home" (MV-Climate 2050-DP 2018, p. 45). PSRC's Vision 2040 plans to focus the forecasted population growth of 1.7 million people by 2040 in centers within existing cities in the urban area which is projected to reduce emissions by 6% (Vision 2040, p. 13). VRS aims to reduce VMT by defining primary transportation corridors (*Festlegung von Entwicklungsachsen*) and by concentrating retail and housing developments in centers (*Verortung von Wohnbau- und Gewerbeschwerpunkten*) in the regional plan (WIV 11617, p. 5).

[5] A common critique on growth boundaries is the housing affordability problem. In all three regions this issue is addressed within the regional growth strategy and through separate plans or policies.

[6] To create a compact urban area (Goal 1), the Metro Vancouver's RGS establishes an Urban Containment Boundary (Strategy 1.1), Urban Centers and Frequent Transit Development Areas (Strategy 1.2), and rural areas to be protected from urban development (Strategy 1.3) (MV-RGS 2011, pp. 13, 45). A core of PSRC's Vision 2040 is to develop mixed-use pedestrian-oriented centers along transit-lines (p. 14). By focusing growth in already built-up areas, farmland and resource lands are to be permanently protected (Vision 2040, p. 14). Infrastructure investments prioritize transit and nonmotorized transportation facilities for urban areas (Vision 2040, p. 14 and 82).

[7] The federal government in Germany has little influence over implementation as zoning authority is a right of local municipalities, however, the Spatial Planning Law provides a framework of coordinated land use decision making across sectors and levels of government.