

EVALUATING TOUCH-TABLE TECHNOLOGY IN NEIGHBOURHOOD DESIGN

by

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We accept this project as conforming  
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## EXECUTIVE SUMMARY

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The International Panel for Climate Change's Fourth Assessment Report (2007), drawing on the work of scientists and climate change experts worldwide, reports that not only can we observe altered climate scenarios across the globe, but that we can attribute these changes to greenhouse gas (GHG) emission levels that are generated by humans and that are higher than normal. The depth of GHG emission reduction needed to reverse climate change must be driven by national and international agreements and initiatives. However, research shows that individual citizens are more compelled to act on climate change initiatives when climate change communication is made tangible and local (Nicholson-Cole 2005; Moser 2010). One of the ways we can do this is to engage people using local government's most significant public policy tool to address climate change: land-use planning (Andrews 2008: 847).

Planning professionals and teams are increasingly using visual technology in planning processes to attract more participants, to convey information on complex issues, and to directly involve citizens in neighbourhood planning, with the intent of empowering citizens in the decision-making processes. Visual technology tools offer promise for helping to articulate more explicit links between urban form (neighbourhood design) and climate change by making information tangible to local users (Robinson in Campbell 2006; Senbel and Church 2011; Sheppard et al. 2011). Using a case-study in Revelstoke, BC, this paper examines how one of these tools can serve to go beyond engagement to mediate instances of empowerment. A team of University of British Columbia (UBC) researchers is in the research and development stage of creating a computer user-interface that enables users to collaboratively design and visualize future neighbourhoods, in both 2- and 3-D, by means of a touch-sensitive table-like computer screen. Over the course of 24 workshops (two separate weeks) in Revelstoke, 48 participants were engaged using this 'touch-table' to plan one of two future neighbourhood centres in their hometown. Examining the video and audio transcripts of these workshops with Senbel and Church's 6-I's of Design Empowerment, results showed that the touch-table augments participatory processes by supporting procedural and substantive learning, *information*, *ideation*, and *integration* in neighbourhood design. The tool showed potential but not direct evidence of *integration*, *inclusion* and *independence*. Recommendations for future use of the touch-table include considering:

- the environment in which the tool is being employed;
- whether and how participants priorities can be worked into the touch-table measurement-tools before the design process begins;
- which phase of the planning process the tool will be used in, and how participants will have been prepared for collaborative design before the use of the touch-table;
- how the rich discussion and collaborative-design process facilitated by the tool will be captured, communicated and used to contribute to planning processes after the fact;
- and how the tool can be embedded into decision-making process so that participants can engage over long periods of time, and on a project-by-project basis.

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## INTRODUCTION

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The International Panel for Climate Change's Fourth Assessment Report (2007), drawing on the work of scientists and climate change experts worldwide, reports that not only can we observe altered climate scenarios across the globe, but that we can attribute these changes to greenhouse gas (GHG) emission levels that are generated by humans and that are higher than normal. Substantial decreases to GHG levels in the atmosphere must be made in order to stabilize the global climate system and to manage climate impacts (IPCC 2007). The depth of GHG emission reduction needed to reverse this climate change must be driven by national and international agreements and initiatives but must also be supported and maintained by individual and localized action (IPCC 2007; Sheppard et al 2011).

Research shows that individual citizens feel ill informed, ambivalent, and disempowered when it comes to taking action on climate change (Lorenzoni et al 2007; Lorenzoni and Pidgeon 2006, Moser 2010, Sheppard et al. 2011). Communication and climate change engagement literature emphasizes that tools which make climate change tangible, are based on scientific data, and include feasible actions for individuals to take, can counter this ambivalence (Nicholson-Cole 2005; Moser 2010). Moser calls for empowerment through dialogic forms, to involve citizens "in shaping the new lifestyles and visions of a more sustainable society rather than simply [the] 'deliver[y]' [of these visions] from some external higher authority" (2010:38). Visualization tools employed through "public policy's most significant tool to address climate change", land-use planning, suit this criteria (Andrews 2008: 847).

Planning professionals and teams are increasingly using visual technology in planning processes to attract more participants, to convey information on complex issues, and to directly involve citizens in neighbourhood planning, with the intent of empowering citizens in the decision-making processes. This technology offers promise in helping to articulate more explicit links between urban form (neighbourhood design) and climate change by making information tangible to local users (Campbell 2006; Senbel and Church 2011; Sheppard et al. 2011). A team of University of British Columbia (UBC) researchers is in the research and development stage of creating a visualization tool that enables users to collaboratively design and visualize future neighbourhoods, in both 2- and 3-D, by means of a touch-sensitive table-like computer screen. Using Senbel and Church's Framework for

Design Empowerment for analysis, this paper examines a case-study in neighbourhood planning in Revelstoke to explore the question “In what ways does real-time “measured visualization” augment engagement in neighbourhood design related to climate change solutions?”

Section 1 outlines the research project origins and design. Section 2 contains a review of literature on engagement and empowerment in planning for climate change mitigation. Section 3 elaborates on the context of the case study in Revelstoke, British Columbia. Section 4 outlines the research methods in detail, including a description of the analytical tool used to examine the data (the Framework for Design Empowerment: the 6-I's of Design Empowerment). Section 5 presents the research findings and Section 6 presents recommendations based on these findings. The final Section 7 contains conclusions.

## SECTION 1: PROJECT DESIGN

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This project examines how a visualization tool, designed to make the link between land-use planning and climate change explicit, may mediate instances of design empowerment. It is a case-study on the use of this new collaborative-design and visualization multi-touch table tool (touch-table) by residents of Revelstoke, British Columbia. A case-study research approach was used in order to examine the detailed use of the tool in one particular instance. The City of Revelstoke was well suited to be the case-study for the use of this tool because it is the first municipality in British Columbia to be in the process of adopting a 'form based code' for land-use planning. This alternative form of land-use planning aims to preserve community character, but it also focuses on creating compact, mixed-use communities. Communities designed in this way have been shown to emit fewer greenhouse gas emissions than alternative urban forms, particularly suburban development (Andrews 2008, Bartholomew and Ewing 2008). The design exercises that the citizens of Revelstoke were asked to complete used design features that complied with the City's proposed form-based code: the Revelstoke Unified Development Bylaw.

This qualitative research project draws on:

- a review of the literature related to climate change communication and engagement, visualization tools used in planning, and engagement and empowerment in planning;
- on Revelstoke planning documents related to engagement, energy and emissions, and neighbourhood design;
- and on primary source data gathered through the Pacific Institute for Climate Solutions (PICS)-funded *Revelstoke Measured Visualization Project*.

The *Revelstoke Measured Visualization Project* is collaboration between faculty members and students from UBC's School of Community and Regional Planning, and UBC's School of Architecture and Landscape Architecture; the author was a research assistant with the *Measured Visualization Project* between May 2011 and December 2012. All primary data was collected during two intensive 'workshop weeks' held in Revelstoke, BC, in June and September of 2012. Data was derived from audio and video recordings of neighbourhood design exercises, audio recordings from a focus group, and two surveys, all of which occurred during these workshop weeks. The diversity in research

methods allowed for triangulation between data sets where participants were observed using the touch-table tool, and data where participants spoke directly about their experience using the tool. Data collection, workshop design, organization, recruitment, and analysis are discussed in detail in the methods section of this report. This data was transcribed, coded, and subsequently analyzed using Senbel and Church's Design Empowerment Framework, or "6-I's of Design Empowerment".

## **SECTION 2: THEORETICAL CONTEXT**

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### **CHALLENGES OF CLIMATE CHANGE ENGAGEMENT**

The unique characteristics of climate change make it a challenging topic to engage with, one that many citizens have a hard time accepting (Moser 2010; Nicholson-Cole 2005; Lorenzoni, Nicholson-Cole and Whitmarsh 2007, Sheppard et al. 2011). Climate change impacts and causes are complex. In Lorenzoni and Pidgeon's review of how climate change is conceptualized by publics, citizens express that they do not feel well informed on the topic (2006). The direct causes of climate change, namely greenhouse gas emissions, are invisible and therefore hard to link to their source; the impacts are often temporally, geographically, and socially distant from citizens (Moser 2010; Nicholson-Cole 2005). This distance makes it challenging to conceptualize how daily decisions can be connected to climate change, to the extent that individuals rarely see themselves as those who could be impacted by climate change (Lorenzoni and Pidgeon 2006).

These distances and the barriers to conceptualizing climate change as a personal risk mar individuals' inclination to act (Moser 2010; Sheppard et al. 2011). Despite a sentiment that individuals should be responsible for taking action to reduce the impacts of climate change, survey respondents in Lorenzoni and Pidgeon (2006) did not see themselves as direct actors in reducing GHG emissions and climate change. Considering isolated personal actions to combat climate change as having little or no impact, individuals saw government as the main, yet under-performing, actor on climate change. Overall, there are few signals that indicate the need for change, and in citizens' minds/ perceptions, the benefits of remaining inert with respect to climate change outweigh the risk of potential climate change impacts in a far-off time and place (Lorenzoni and Pidgeon 2006: 83). This disinclination to act and uncertainty towards climate change "may well reflect an expression of frustration fueled by disempowerment" (Ibid.).

### **PLANNING FOR CLIMATE CHANGE**

To address climate change in the pervasive, sustained manner that is needed to minimize the impacts, these sentiments of ambivalence and disempowerment need to be addressed. This requires "frameworks, tools and processes that help communities make sense of and organize emerging information on climate change" (Sheppard et al. 2011: 401), that draw explicit links between personal actions and climate change, and that present citizens with feasible steps that they

can take to contribute to GHG reduction (Nicholson-Cole 2005; Moser 2010). Moser emphasizes that effective engagement on climate change through dialogic forms must involve citizens “in shaping the new lifestyles and visions of a more sustainable society rather than simply ‘deliver[ing]’ [these visions] from some external higher authority” (2010:38). Municipal planning practice is uniquely equipped to shorten the perceived distances between individuals and climate action by drawing on the background of participatory planning in decision-making processes to “[forge] an explicit and effective link between urban form and emissions reduction” and actively engaging citizens in decision making that addresses this link in what Robinson claims “is the next frontier for Canadian municipal response to climate change” (in Campbell 2006: 221). Furthermore, municipal level planning controls local government's strongest public policy tool on climate change: land-use planning (Andrews 2008: 847). Land-use planning decisions have an impact on emissions that are directly related to individuals day-to-day lives (housing/building stock, energy use and transportation) making local planning processes an ideal venue to foster citizen engagement on climate change planning and decision-making (Sheppard 2011, Moser 2010, Nicholson-Cole 2005).

## **ENGAGEMENT AND VISUALIZATION**

Planning professionals and teams are increasingly using technology to identify planning issues, gather public opinion, model and evaluate proposed ideas, and mobilize citizens to act on these ideas and processes. In short planners are using technology to support public participation in planning. This technology is seen as a way to increase participation based on visual appeal, as a method for soliciting feedback on planning, as an effective way of sharing significant quantities of information on planning issues, and as a means to stimulate discussion and enhance the communicative elements of planning (Slotterback, 2011; Healey 1998; Moser 2010; Nicholson Cole 2005).

Specifically, planners are employing visualization technologies to support participation to improve engagement processes. Visualization technologies, as a tool for planning engagement, enable a range of people to interact with planning material and to participate in decision-making processes (Al-Kodmany, 1999; Slotterback, 2009). The tools are particularly useful for making information tangible to local users and for conceptualizing impacts and solutions to climate change (Sheppard et al. 2011). In Slotterback's assessment of technology use by planners, the planners' survey indicated

that they actually employed technology more for conveying information than for stimulating discussion. In contrast, others noted that visualization with real-time components augmented deliberation and negotiation (Arciniegas et al. 2011; Sheppard 2005). King presents visualization as the only language that can potentially transcend the expert-layperson divide, a language that is common regardless of technical background of those involved (1989, in Al-Kodmany 1999:38). Literature on climate change communication and engagement highlights the ability of dialogic and interactive communication to enable active engagement and learning over verbal or written communication. This position is based on the fact that it is “better for discussing differences in opinions and values, transcending social divides and visioning a common future” (Moser 2010: 41). Nicolson-Cole’s (2005) research into visual communication on climate change supports the idea of using visual means that are personally applicable, both spatially and temporally, and that the information used is scientifically certain and solution oriented. This confirms Levy’s early experience with visual tools in planning, where “computer modelling benefited the committee most when the planning issues discussed were closely tied to the immediate concerns” (1995: 355).

Planning teams use visualization tools with a range of technological sophistication, and at multiple scales of planning (Al-Kodmany 1999; Slotterback, 2011; Levy 1995; Arciniegas et al. 2011; Tress and Tress 2005). In Al-Kodmany’s neighbourhood planning process, the planning team employed a data-rich Geographic Information System, an artist using an electronic sketch-board, and a photo-manipulation exercise (1999, 2001). In a multi-criteria decision scenario on land-use planning, Arciniegas et al. used a touch-table surface, drawing on a Geographic Information System (GIS) on land-use type and quality to walk stakeholders through a land-use negotiation scenario (2011). Sheppard used 3-D visualization at municipal levels to create multiple neighbourhood visualizations based on potential climate change scenarios (2005). Salter et al. employed the use of a decision theatre to walk residents of Bowen Island through a land-use planning exercise, where residents had control of the decision-making parameters (2009). Visualization tools are best tailored to the audience, and not necessarily applied throughout planning processes, but to specific planning phases (for examples see Table 1) (Al-Kodmany 1999; Nicholson-Cole 2005; Levy 1995, Arciniegas and Janssen, 2012).

TABLE 1. EXAMPLES OF DIVERSE VISUALIZATION TOOLS APPLIED TO DIFFERENT PHASES OF PLANNING PROCESSES

TOOL	PHASE	USE	SOURCE
<b>GIS system</b>	Problem identification	<ul style="list-style-type: none"> <li>Context: visualizing current state.</li> <li>Problem identification</li> <li>Developing design alternatives</li> </ul>	Al-Kodmany, 1999
<b>Electronic sketch board and artist</b>	Exploratory phase	<ul style="list-style-type: none"> <li>Brainstorming and capturing ideas</li> <li>Record of progression of thinking</li> </ul>	Al-Kodmany, 1999
<b>Photo-manipulation</b>	Decision-making	<ul style="list-style-type: none"> <li>Exploring solutions</li> <li>enhancing group-decision making</li> </ul>	Al-Kodmany, 1999
<b>GIS and touch-table user-interface</b>	Negotiation	<ul style="list-style-type: none"> <li>Developing alternatives</li> <li>Comparing fine details of spatial solutions</li> </ul>	Arciniegas et al. 2011
<b>Interactive 3D landscape visualizations</b>	Scenario modeling	<ul style="list-style-type: none"> <li>Explore, discuss and assess residential density components in new plan</li> <li>Real-time data analysis</li> </ul>	Salter et al. 2009

While visualization tools in participatory planning processes are becoming increasingly popular for engaging communities, the early concerns and disadvantages of visualization technology in planning remain. The drawbacks of visualization technology lie both in the capacity of planning teams (at a local government or neighbourhood level) to employ these tools, and in the way in which different participants can use the tools and engage in the planning/visualization process.

Literature on technology application in planning processes enumerates some of the barriers to implementation and use of visualization technology in planning processes. The technical capacity of planning staff to put in place these tools/media, or the disconnect between technology staff and planning staff when tools are being developed and applied can limit or inhibit the use of these tools (Al-Kodmany, 1999; Slotterback, 2009; Elwood 2002; Elwood and Ghose, 2004). The cost of technology in planning processes can be prohibitive: not only the financial cost of appropriate systems, but also the time cost of systems when they involve compiling significant amounts of relevant data to support the systems (Al-Kodmany 1999 and 2002, Sheppard 2005).

The other set of concerns, associated with visualization technology in participatory planning processes, is related to power. These drawbacks can limit initial engagement by individuals, as well as sustained or meaningful engagement in the long-term. At the most fundamental level, user comfort-level with technology varies significantly. Particularly with emerging technologies, citizens who are less familiar with technologies may be intimidated, may be unable to use the technology, or may not have access to the required technology (i.e. Accessing computers or internet) (Al-Kodmany 1999; Slotterback 2009). Already marginalized communities are often the same people who don't have access to or comfort with technology (Elwood 2002). Therefore, technology-access issues can reinforce marginalization, and exacerbate exclusion for those who are already disempowered with respect to community decision-making (Ibid.).

The nature of visualization technology prioritizes and validates certain types of information. Visualization technology systems in planning processes are normally designed, implemented and controlled by planners, perpetuating the use and validation of 'expert knowledge', unless particular parameters are worked into tool planning that involve the input of non-expert knowledge into the system (Al-Kodmany et al. 1999, Elwood 2002, Elwood and Ghose, 2001, Weiner et al. 2001, Craig and Elwood, 1998). Despite best intentions, this may build a technocratic bias into visualization tools. Regardless of the sources of knowledge in a visualization tool, these tools, by function of how they operate, promote the use of discrete and often quantitative data (Esnard et al. 2001). "Fuzzy" data, such as cultural or qualitative information are harder to integrate into these systems and therefore decisions employing visual tools may neglect this entire body of knowledge (Arciniegas et al. 2011, Harris and Weiner, 1998).

## **ENGAGEMENT AND EMPOWERMENT THROUGH PLANNING PROCESSES**

The different types and depths of engagement in planning and public processes were first characterized by Arnstein (1969) in her ladder of citizen participation, which articulates a continuum of increasing levels of power in decision making processes, from manipulation to citizen control. Rocha continued the ladder metaphor to create a ladder of empowerment, which spans from individual to community empowerment (Rocha 1997). Particularly relevant to visualization is her notion of mediated empowerment which she defines as follows:

“Mediated empowerment is a highly professionalized model in which the *process* of empowerment is mediated by an expert or professional. The *locus* in this type can be either the individual or community, depending upon the specific circumstances. Its *goals* are to provide knowledge and information necessary for individual or community decision-making and action.” (Rocha 1997: 36)

For Rocha (1997), mediated empowerment focuses on the relationship between the expert and the individual/community, and the manner in which these relationships structure the operationalization of power. Senbel and Church (2011) developed this idea further and created a framework for design empowerment that is specifically tailored towards design and visualization tools, to examine the degree to which these tools can empower citizens to participate in design decisions and processes: the 6-I’s of Design Empowerment.

If visualization technology enables users to either express what they could not otherwise express or to participate in design decisions that they would otherwise be unable to participate in then experience becomes empowering. Empowerment has been described as distributive, generative, as building human capital, as social change, but in the most basic sense, it is the “acquisition of skills to enable individuals and communities to assert control over their circumstances” (Kyem 2002:8; Elwood 2002). For complex planning decisions involving many interrelated variables such as those related to climate change, engagement in the process requires acquiring basic knowledge as part of the weighting of different scenarios of development. Moser (2010) articulates a four-step process for addressing barriers to engagement on climate change: informing and educating; achieving a level of social engagement that is personal, local, and urgent; and bringing about change in social norms and cultural values. Visualization has the potential to contribute to each of these steps by informing individuals and “by fostering community understanding” (Senbel and Church 2011). However, as Senbel and Church (2011) warn, visualization can potentially be “misempowering” if it inadvertently leads community residents to believe that their capacity to articulate and produce their own visions for a design will actually lead to the adoption of their ideas. Visualization, like every other medium, has to be responsibly managed.

This research borrows the 6-I’s of design empowerment framework developed by Senbel and Church (2011) and applies it to the Revelstoke case study.

## **SECTION 3: CONTEXT**

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### **GREENHOUSE GAS EMISSIONS AND CLIMATE ACTION IN BRITISH COLUMBIA**

In 2007 the Government of British Columbia put in place the Greenhouse Gas Reduction Targets Act (GGRTA, Bill 44-2007), legislating province-wide greenhouse gas reduction targets below 2007 baselines for the medium- and long-term: 33% by 2030, and 80% by 2050. Core government and public sector organizations (School Districts, Universities and Colleges, Health Authorities and Crown Corporations) are legislated to reduce operational greenhouse gas emissions and to be carbon neutral by 2010 and 2012, respectively.

To make these provincial reductions relevant to local government the provincial government produced Community Energy and Emissions Inventories for all municipalities in the Province in 2007. In 2008, local governments were obligated to integrate targets for the reduction of greenhouse gas emissions and to integrate policies and actions, for achieving those targets, into their Official Community Plans (OCPs), as stated in Section 563 of the Local Government (Green Communities) Status Amendment Act (BC Government Bill 27-2008). Congruently, the Union of British Columbia Municipalities and the provincial government created the Climate Action Charter. Municipalities in British Columbia can choose to sign the Climate Action Charter. Signatories committed to being carbon neutral in municipal operations by 2012, to measure and report on their communities' greenhouse gas emissions, and to work to create complete, compact and efficient communities. Municipalities signing the Climate Action Charter were also eligible for the Carbon Tax and the Climate Action Revenue Incentives Program, to offset the carbon tax for local governments.

### **CLIMATE ACTION PLANNING IN REVELSTOKE**

The City of Revelstoke, a small (pop. 7,129) mountain town in Eastern British Columbia, signed the Climate Action Charter in 2008 and made amendments to their Official Community Plan (OCP) in 2009 to include a greenhouse gas reduction target of six percent below 2007 emission levels by 2020 (Statistics Canada, 2012; City of Revelstoke 2009). The City also proposed actions in their OCP to achieve those targets in order to meet the legislative requirements from Bill 27 (City of Revelstoke 2009). The actions reflecting citizen values and driving future municipal change include a new

Sustainability Framework and a suite of sustainability goals revolving around greenhouse gas emission reduction and land development and redevelopment, including:

- *developing mitigation and adaptability goals and policies within the OCP implementation plan by 2015, and*
- *developing smart growth regulations, policies and principles that specifically reduce GHG impacts through land use, zoning, transportation, parks and recreation, energy use, and other elements of the OCP. (City of Revelstoke 2009)*

In 2010, the City of Revelstoke initiated a complete review of the Official Community Plan land-use plans. Included in this process was the development of a Unified Development Bylaw (UDB) to guide future development in the City of Revelstoke using smart growth principles (Appendix 1-Smart Growth Principles). Drawing on the work of the Form Based Code Institute<sup>1</sup>, the Revelstoke Unified Development Bylaw uses an approach to zoning designed to maintain and build upon community character and to drive the development of compact, mixed-use communities. This particular characteristic of the UDB aligned with the commitment the City of Revelstoke made when representatives signed the provincial Climate Action Charter: to work on building complete, compact and efficient communities.

Revelstoke's Unified Development Bylaw is a type of Form-Based Code, designed to replace the existing Euclidean zoning code. Most cities in North America use Euclidean zoning codes for land-use planning. These codes divide communities into segregated land-use zones, with one land-use per zone, with specific standards on the dimensions of buildings, where they are placed on a lot, and how much of a lot they may cover. In contrast, Form-Based Codes “use physical form (rather than separation of uses) as the organizing principle for the code” (Form-Based Code Institute, 2011). These codes focus on form and scale of buildings, and where buildings are located in relation to public space. The Revelstoke Unified Development Bylaw focuses on maintaining city character, and on supporting the provincial commitment to build complete, compact and efficient communities.

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<sup>1</sup> <http://www.formbasedcodes.org/>



**FIGURE 1. REVELSTOKE RURAL TO URBAN TRANSECT AND UNIFIED DEVELOPMENT BYLAW ZONES**

One element of Revelstoke's Unified Development Bylaw is the creation, along a rural-to-urban transect, of neighbourhood centres (Figure 1). The neighbourhood centres are intended to enable walkable neighbourhood development that supports diverse housing choices, with mix of commercial and residential uses that are connected through pedestrian, bicycle and transit-friendly transportation networks. The Unified Development Bylaw supports the implementation of Revelstoke's newly-adopted land-use plans.<sup>2</sup>

<sup>2</sup>NOTE: In early 2013, the Revelstoke planning team decided to proceed with zoning changes for the City, but that the Unified Development Bylaw as originally presented to Revelstoke City Council would not be passed. Depending on City Council Approval sections of the UDB, including the zoning bylaw (which constitutes approximately 80% of the original by-law), and the form-based approach will still be pursued (Orlando 2013).

## SECTION 4: METHODS

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The following section elaborates on the research methods used to answer this project's research question, including the design of the workshop weeks, participant recruitment, workshop organization and execution, and data processing. Since this qualitative research project draws on primary source data gathered through the larger Pacific Institute for Climate Solutions (PICS)-funded *Revelstoke Measured Visualization Project (Measured Visualization Project)*, the Engagement Scoping section expands on how the engagement process was planned for the entire *Measured Visualization Project*, rather than just the work done for this research paper. The *Revelstoke Measured Visualization Project* used City of Revelstoke as a case-study to consider “*What is the most effective method of engagement for mobilizing attitudes on climate change and urban form?*” The entire research process was designed to meet a series of outcomes:

- test out a previously developed touch-table urban design user-interface,
- examine the ability of Form-Based Codes (in this case Revelstoke's Unified Development Bylaw) to impact neighbourhood energy use and greenhouse gas emission generation, and
- provide additional information on whether visualization, augmented by real-time measurement of certain attributes, would contribute to shifts in public attitudes on compact, mixed-use developments.

Given the research time frame and access to participants, long-term behaviour monitoring was not possible. As a result, the engagement focus was re-oriented to test attitudes towards compact, mixed-used urban form before and after a presentation that explicitly linked climate change, and energy use to neighbourhood design and a comparison of designs produced without and then with energy consumption calculations.

### ENGAGEMENT SCOPING

The research team and the City of Revelstoke worked as partners in the *Measured Visualization Project*. In order to embed the *Measured Visualization Project* research in the existing context, the initial scoping for the engagement process began with a review of Revelstoke planning documents related to engagement, energy and emissions, and neighbourhood design.

Documents that were reviewed included the:

- Revelstoke Official Community Plan,
- Draft Public Participation Master Plan,
- Proposed Unified Development Bylaw (UDB), UDB process documents and UDB website,
- Revelstoke Community Energy and Emissions Plan
- Revelstoke District Energy Feasibility Study and report, and
- Community City of Revelstoke Corporate GHG Inventory and Reduction Strategy.

Review of these documents highlighted which audiences were a key focus for the City of Revelstoke, what planning approaches and tools had been used to engage the community, what commitments and planning the City of Revelstoke had made to energy and greenhouse gas emission reductions, and which sites had been considered for development as neighbourhood centres. This information contributed to the selection of participants and study sites, to the selection of the tools, and to the broad context provided to Revelstoke residents who participated in the research.

Two study-sites, Southside and Arrow Heights were selected for the research. Each of these sites had previously been identified in the UDB development process as sites of potential neighbourhood centres.

Youth and seniors were initially identified as desired participants for the research. Both of these groups were identified in the City of Revelstoke's Draft Public Participation Master Plan as target groups with whom the city would like to improve engagement. The selection of these groups was reinforced with:

- The research team's desire to test cutting-edge technology (the touch-table) with participants who, based on age, were likely to be the most and the least familiar with touch-screen technology.
- The community's desire to engage with citizens from a broad spectrum of ages, with younger and older populations being the hardest to reach and engage on community issues.

- The fact that youth are more likely to be present when the growth and neighbourhood design that was explored in the research would materialize in Revelstoke.
- The observations of principal investigators on the research team that older segments of the population are often the most vocal and resistant to changes in neighbourhood design at relevant public meetings. Consequently, this group had the potential to change their 'attitudes' and preferences for neighbourhood design.

Planning professionals (in a broad sense) were also targeted for participation. The research team wanted to receive feed-back on the touch-table as an engagement tool for participatory planning processes.

Ideally, from a research perspective, the greatest number of media tools, with the greatest variation of problems and the greatest number of participant groups would have been employed. Time, money and a limited pool of potential participants were notable barriers. Consequently, strategic decisions were made regarding what combination of these characteristics would most efficiently lead to an examination of the capacity for visualization tools to mobilize individual preferences. The result was that two types of engagement media were selected for the research: the touch-table visualization tool and an individual paper design exercise.

## **PARTICIPANT RECRUITMENT AND ORGANIZATION**

In July 2011, with the selection of youth, seniors and professionals as desired potential participants, the research team held a planning meeting in Revelstoke. The meeting was convened by the Revelstoke planning director, John Guenther and included a spectrum of professionals from education and family services, social, community and regional planning, environmental conservation and land development, and community leaders. At the meeting participants were given an introductory presentation to the research team's preliminary planning process. Participants were surveyed about their views on who may be interested in participating, how long a session people would be willing to attend, and what time of day would be most convenient for potential participants.

Using the survey results and the notes from the presentation discussion, the research team decided that the initially targeted groups: youth, seniors and professionals, would continue to be the target

participants. Each participant would be invited to two separate workshops scheduled three months apart and workshops would be no longer than three hours. In addition to defining the overall research approach, this initial engagement meeting fostered contacts in the community who became essential to participant recruitment.

## **RECRUITMENT**

Recruitment began in February 2012. Participants from the first planning meeting were invited to the research workshops. Youth were recruited through the local high school, Revelstoke Secondary, and seniors were recruited through the Revelstoke Community Centre.

The research team consulted with Jessica Stuart, a former Revelstoke planner and 2012 SCARP student, regarding participant engagement and recruitment strategies for Revelstoke. Initial recruitment was through existing e-mail networks in the Neighbourhood Committees and the Senior Centre e-mail list. John Guenther initiated connections between the research team and Revelstoke Secondary School principal, Mike Hooker, and encouraged potential participants to sign up during community meetings or presentations during the March-May period (2012). A February meeting with John Guenther and Councillor Linda Nixon highlighted community members who may be of particular interest to the research team for their involvement in recent planning processes.

On-site work by Jessica Stuart broadened the recruitment through fliers on community message boards, a booth at the Revelstoke Farmer's Market, a brief announcement on a local radio station and presentations in select classrooms in Revelstoke Secondary School.

Community members were invited to indicate their interest and availability on the UBC based blog (<http://blogs.ubc.ca/magedsenbel/author/magedsenbel/>).

## **WORKSHOP ORGANIZATION**

Following the four-month recruitment period, potential community participants were contacted if they indicated that they were available and interested in attending *both* a June and a September three-hour workshop.

There were not enough participants to create exclusive groups of youth, seniors and planning professionals. Therefore, diverse groups of four were configured based on:

- availability: date and time
- community residency: a minimum of one participant per group was a resident of the community in which the study site was located
- age diversity: where possible, all age cohorts were represented in each group age (25-39, 40-54, 55-64, 65 and over; there were no potential participants between 19 and 25)
- planning knowledge: one participant per group was familiar with planning processes (based on the list of invitees from the July 2011 meeting)

A separate pair of workshops was organized for five, grade 9 and 10 students from Revelstoke Secondary School. Lori Milmine, the Gifted Program coordinator at the school, coordinated all scheduling and communication for these students.

With the exception of the Revelstoke Secondary School students, interested and available participants were sent invitations to attend a specific three-hour workshop. Invitations were sent through the participant preferred form of communication. For the most part, this communication occurred through email.

If an invited participant could not attend at the scheduled time, where possible, they were moved into an alternate time slot where group diversity could be maintained. As well, to maintain group diversity, participants who declined the invitation were replaced with another participant of similar characteristics. In accommodating these individual needs, the research team found that it would be working with groups of between two and five people.

## **WORKSHOP DESIGN**

Designing the workshops involved selecting and combining several research methods that would contribute data to answer the main and sub-research questions. While the data collected in each workshop can stand alone in contributing to some of the research sub-questions, the two workshops offered in June and September were designed as a pair, testing whether the addition of new information in the second workshop would change the neighbourhood design preferences that participants articulated in the first workshop. The pair of workshops was also designed to expose participants to and provide familiarity on Revelstoke's Unified Development Bylaw.

During the June workshops, 48 community members, in groups of two to five individuals, were engaged in 13 workshops. During the September workshop week participants from the June workshops were invited to return. Twenty-eight of the original 48 participants returned to work in identical, or nearly-identical, groups in 11 workshops. Again, between two and four individuals were in each workshop with the exception of two workshops, where last minute cancellations meant that only one individual attended.

Twenty-four workshops were held in total during June and September. For two days there were three concurrent morning workshops and three concurrent evening workshops. Workshop start times were staggered in order to accommodate each group access to the single touch-table.

**TABLE 2. JUNE WORKSHOP AGENDA**

<b>1</b>	<b>Baseline Information and Values Survey</b> (15 minutes) Participants will be asked to fill a questionnaire on an iPad about their knowledge of the Unified Development Bylaw, urban design, planning, climate change and their attitudes about growth, economic development, preferred developments and transportation options.
<b>2</b>	<b>Individual Paper Design Exercise</b> (15 minutes) Using colour-coded building cards and a paper base-map of a neighbourhood in Revelstoke, participants will individually prepare a neighbourhoods design of the preselected study area.
<b>3</b>	<b>Multi-Touch Table Exercise</b> (45 minutes) The basic exercise is to choose one of 3 to 5 options for each half block in the study-area. The options will be colour coded to match each half block's transect-zone. The exercise will begin with participants taking turns presenting individual choices for 5 minutes each, followed by a group exercise where all participants are asked to agree on a single selection of options.
<b>4</b>	<b>Debrief</b> (15 minutes) In an open and informal discussion, participants will be asked to reflect on the degree to which the touch-table exercise enabled them to represent their values and aspirations in a neighbourhood design. They will additionally be asked about the quality of the experience and their interests and curiosities related to the UDB and urban design.

## JUNE WORKSHOPS

Workshops were conducted for 48 people between June 6 and 8, 2012. The June workshop elicited the participant's personal preferences about neighbourhood design in four ways: a survey, an individual design exercise, a group design exercise, and a focus group discussion. A final short focus group discussion was held to obtain information on the participants' experience with the touch-table, and to have participants think about how and what they may have learned during the entire workshop.

The survey posed questions to participants on planning experience, preferences in neighbourhood density, style and composition, and on opinions on climate change (Appendix 2-June Workshop Survey). The survey also set the scene for the upcoming workshop. Participants moved from the questions to a 20 minute exercise. The individual design exercise was intended to elicit participants' preferences of neighbourhood design within the context of the incoming Unified Development Bylaw. In the exercise participants were asked to individually design one of two study-sites suggested in the 2012 Revelstoke land-use plan as 'neighbourhood centres'. Participants used printed paper maps and printed building card pieces to design neighbourhood centres. Each card piece was printed on two sides; one side showed the plan view of the building-block, and the other side included a perspective view of the buildings arranged on the piece. These pieces also included information on number of dwelling units, jobs and etc. Land-use zoning were colour coded on the paper map of the study-site and the building-block pieces.

FIGURE 2. TOUCH-TABLE SURFACE SEEN FROM ABOVE



Once the questions and the design exercises were complete, participants moved from individual to group work and from paper to electronic input. The group neighbourhood design demonstrated how personal preferences may contribute to group design processes. Both of these design processes were intended to create an environment where there could be hands-on learning about neighbourhood design. The small groups moved to the touch-table to complete the same neighbourhood design exercise using the electronic touch-table interface. Individual paper-map exercises were posted on a wall adjacent to the touch-table area as a reference. Groups had 45 minutes to complete this design exercise.

The touch-table (like a giant iPad), provided an underlay map with the same colour-coded zoning locations, like with the paper exercise. On each edge of the touch-table participants were able to find scroll-bars where building-block pieces, the same as the card pieces, were available. This configuration enabled four individuals to have individual access to the 'menu' of buildings at the same time. Information on dwelling units, jobs, impervious surface area, etc. could be viewed for each building-block on the touch-table surface.

**FIGURE 3. PROJECTED 3-D VIEW AND MEASUREMENT TOOLS**



By dragging and rotating building-block pieces with their fingers, participants could place the blocks on the map underlay and locate and orient the pieces in the desired location. In addition to the touch-table surface this part of the workshop included a real-time projection of a 3-D view of the

neighbourhood design as it evolved and real-time measurement of dwelling units, jobs, percentage of the design dedicated to commercial or residential land-use, average vehicle miles travelled by household, and average transportation mode-split. Participants determined the viewpoint at a fixed 45 degree angle from the ground plane. This means participants could not view their design as if they were on the street.

Once the touch-table exercise was completed, June workshop participants finished with a 15-25 minute focus group. The focus-group discussion addressed the participants' experience with the touch-table, and acted as a means to have participants think about how and what they may have learned during the entire workshop.

### **SEPTEMBER WORKSHOPS**

The September workshops re-convened 28 volunteer participants from June. These workshops began with a 20 minute presentation sharing the previous workshop results and introducing new information on energy-use, climate change, and district energy systems. The presentation then outlined the links between the initial planning results and energy use, greenhouse gas emissions and urban form/neighbourhood design.

Following the initial presentation, participants were given their original individual designs and had the opportunity to make changes to this design. In the group participants discussed these changes and the reasoning for their changes. Groups moved from the briefing and reflection exercises to a wall displaying the individual results from the June workshops. For the South-side neighbourhood, this meant seven group-results, and for the Arrow Heights neighbourhood this included six group-results.

Groups then moved to the touch-table where the June group design was displayed. The groups spent up to 30 minutes making any desired changes to this original design. This portion of the workshop also included the introduction of two new building-block cases based on design comments made during the June workshops. A new real-time measurement tool, which included a density measure with a district-energy threshold, as well as calculating the household energy-costs, was also introduced.

The final part of the September workshop was a survey, including similar questions to the original survey from June (Appendix 3-September Workshop Survey).

**TABLE 3. SEPTEMBER WORKSHOP AGENDA**

<b>1</b>	<b>Presentation</b> (30 minutes) Participants will be presented with a summary of the designs from June. Presentation will flesh out the link between urban design/ the UDB and the CEEI and community emission reductions goals in Revelstoke. The comments/issues about different building heights will also be addressed.
<b>2</b>	<b>Individual Reflection Exercise</b> (15 minutes) Participants will be given a print-out of their June individual paper design and asked to reflect on whether, now that they have more information from the presentation, they would do anything differently in that design? Participant will record their reflections on the print-out and extra paper.
<b>3</b>	<b>Wall Display</b> (15 minutes) All 13 June group designs and associated metrics will be displayed on the wall for participants to see and discuss.
<b>4</b>	<b>Group Touch-table Exercise</b> (30 minutes) Groups will re-convene and undertake a group (re)design of their June session neighbourhood.
<b>5</b>	<b>Survey</b> (30 minutes) Participants will be asked to complete a 15-20 minute survey on an iPad. This survey will have similar questions to the June survey, as well as some new open-ended questions.

## **DATA PROCESSING**

The June and September workshops in Revelstoke produced five different types of data: survey answers, audio files, video recordings, paper and electronic neighbourhood designs. The surveys at the beginning of the June workshop and at the end of the September workshop captured close-ended answers to some 40 questions and open-ended answers to three questions. The focus group at the end of the June and the reflection exercise at the beginning of the September exercise-workshop produced over five hours of audio files. The individual and group exercises, using the paper and the touch-table design surface produced over 15 hours of video footage. The workshops were designed so that the five different types of data complemented each other and could contribute to answering the key questions in more than one way.

In addition to the surveys and audio and video footage, each participant created an individual paper design of their study site. Groups of participants produced electronic designs of their study site on

the touch-table. Throughout the design processes, participants made changes and notes that were also recorded.

The survey questions were compiled into a spreadsheet by Fluid Survey, the survey software used.

The audio files/footage of the focus groups, for all of the groups, were listened to and transcribed into 120 pages of transcriptions. The audio files/footage from the individual-reflection exercise were listened too, Rather than being transcribed word-for- word, notes were taken on the general themes of the discussion. The audio footage from the individual reflection exercise was complemented by individual participants notes made on their individual design exercise.

The video footage captured one angle for the paper exercise, two different angles of the touch-table working surface in June, and three different angles of the touch-table working surface in September. Individual paper-exercise video footage was not processed beyond securing and making copies of the footage. Video-footage of the June touch-table exercise was recorded to capture the 3-D screen projection of the touch-table design and to capture the participants interacting and executing the touch-table based design process.

Video footage from of six of the 13 groups involved in the June touch-table exercise was selected to be transcribed. These six groups were the most dynamic groups, based on interaction and engagement with the table, and between the participants in each group. These groups were selected based on day-of observations at the workshops by members of the research team who had been present as the touch-table exercise was occurring. This video footage (the direct table-angle) was transcribed word-for-word, and notes were taken within the transcripts on the physical interactions in the footage. These notes included how the tool was used physically; who was dominating the table; who was using which feature, and physical interactions of participants. Video-footage from the September workshop was recorded to capture the same two camera angles featured in the June footage, with the addition of a third camera suspended directly above the touch-table by a boom, which recorded the hand movements and touches on the touch-table screen. The video footage from the September workshop, for the same six groups as the June workshops, was viewed but not transcribed in the same detail as that of the June workshops.

Building selection and orientations of the individual paper design exercises were manually recorded and saved in the touch-table software. This enabled researchers to record the measurement data generated by the touch-table software on mode-split, average distances (km/year) travelled per household, the residential dwelling types and neighbourhood density and floor area ratio for each individual neighbourhood design, as they had done for the electronic group touch-table designs.

#### TRANSCRIPTS

The transcripts for both the focus groups and the videos were coded using Atlas-ti. The first round of coding used grounded theory to draw out common themes and patterns iteratively. This resulted in 47 different codes for at least 350 pages of transcripts (total audio and video). The coded data was re-examined based on a selected code. The second round of coding was more focused. The transcripts were coded for evidence that the tool supported instances examples of the 6 -Is of design empowerment: *Information, Inspiration, Ideation, Integration, Inclusion, and Independence*.

#### ANALYTICAL FRAMEWORK

As mentioned in section 2, Senbel and Church (2011) created an analytical framework for design empowerment (the 6 I's of empowerment), that aligns instances of empowerment with the design process of information gathering, visioning, plan development, and decision making. This framework operates along a continuum of empowerment, from passive information acquisition to independent plan formation, but the steps along this continuum are categorized into the 6-I's of Design Empowerment. This framework (Table 4) serves as the analytical framework for this research project; the analytical questions in the far right hand column of Table 4 guided the coding of data in this project.

**TABLE 4. DEFINITIONS OF SENBEL AND CHURCH'S 6-I'S OF EMPOWERMENT (SOURCE: SENBEL AND CHURCH 2011: 426)**

INSTANCES OF DESIGN EMPOWERMENT	FORMS OF EMPOWERMENT	ANALYTICAL QUESTIONS APPLIED TO THE VISUALIZATION MEDIA
<b>Information</b>	Participants gain a new understanding of planning issues and possibilities through substantive and procedural knowledge.	What information is presented by the medium? It is divers and is it sufficiently transparent to be understood by community residents?

<b>Inspiration</b>	Participants are compelled to act in response to the visualization material.	Does the medium trigger a response stimulating action toward a neighbourhood vision or design?
<b>Ideation</b>	Participants are able to generate and express ideas and thoughts about the future of their home neighbourhoods.	Does the medium provide a mechanism for community residents to express their ideas about their home neighbourhood?
<b>Inclusion</b>	The ideas and thoughts of participants are included among other priorities in neighbourhood design decisions.	Does the medium facilitate the inclusion of community residents' ideas into the planning and neighbourhood design process?
<b>Integration</b>	Participants collaborate in the coproduction of plans and proposals.	Does the medium facilitate the integration of community residents in the neighbourhood planning and design process?
<b>Independence</b>	Participants are able to create their own independent plans and visions.	Does the medium enable community residents to develop their own plans?

## SECTION 5: FINDINGS

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Findings for this case-study draw from the workshop-weeks in June and in September, including content from the two completed surveys, transcripts of the touch-table design exercises, transcripts of the focus group, and content of the design exercises.

These findings are presented following the analytical framework order of the “6-Is of design empowerment”. For the first three I’s of design empowerment, *Information, Inspiration, and Ideation*, there were numerous examples. The summaries of these examples are presented below. Evidence of the other three I’s of design empowerment—*Inclusion, Integration and Independence*—is constrained by the fact that the design exercises were not leading to actual changes in the City of Revelstoke. As a result, the findings for these three I’s of design empowerment go over the *potential* for the tool to facilitate mediate empowerment, rather than examples of the empowerment.

### INFORMATION

During the two workshop-weeks in Revelstoke, there was evidence of substantive and procedural learning for participants. The learning was facilitated in two ways: direct discovery through the use of the touch-table tool; and exchanges between participants mediated through the use of the tool.

While peer-to-peer learning could have been possible with the use of other tools, one group expressed the capacity of the touch-table tool to facilitate learning: “*when you’re focused on [the table], and not on [the people] and you’re just throwing ideas around and it’s pretty quick I don’t know of another forum where you can do that effectively...*”.

The tool enabled instances of procedural and substantive learning on two particular topics. Participants demonstrated substantive learning on the newly-adopted land-use plan and Unified Development Bylaw, and procedural learning on the range of considerations planners must take into account when conducting neighbourhood planning processes.

Learning between participants occurred when group members corrected each other on details related to the Unified Development Bylaw and planning minutiae. Instances where this occurred included such things as: questioning the size of the setbacks in the T4O zoning; clarifying different housing types (i.e. townhouses versus row houses); examining how the slope of roofs along

commercial streets could exacerbate liability in the wintertime, based on whether snow could slide off onto pedestrians below; how different types of parking took up different amounts of space, and how planning decisions might affect services such as snow-ploughing.

Learning between participants on substantive planning topics and Unified Development Bylaw issues was facilitated by group composition. Mixing planning professionals and citizens in most of the groups, enabled distinct learning to occur around the physical design process. One particularly engaged group, which consisted of an active community member, a planner and a developer, showed clear evidence through multiple learning moments related to planning: *“the other thing I learned is how important [it is to]..have some transportation made before you start doing major re-developments because we were relying somewhat on the community suggestion that traffic be re-routed to the mountain through Edwards, and then that changes the main traffic route, and changed the position you put things in, and where we put the village centre, and how you want to stay away from the main intersection and all that.”*. This same participant elaborated that they *“... learned the difference in thinking about space that is developer owned and is currently community property, provincial property but it's a community asset that you're redeveloping and it's a different context that you start from...I hadn't thought about that before even though I'm from the...neighbourhood and we've talked a lot about that piece of property.”*.

During and following the planning exercises, participants remarked on their new understanding of the complexity of issues considered for neighbourhood planning. *“It's a very complex matter all that stuff,”* commented one participant, *“mind boggling when you try to work in...about pedestrian use and whether there's a place for transit and how many miles people drive, and how many jobs are going to be involved...”*. Another participant described their learning about the process of making neighbourhood planning decisions, remarking *“...I found out its not very simplistic. You can't just stick the building there. I wanted to know...how much of that green space was going to be committed to parking lot, and how much was going to be green, and how that'd obscure the view for other people, and for drivers, and would there be kids on the sidewalks and that sort of thing, so...yeah. It's sort of complex.”*

Of the comments made about the touch-table, the touch-table augmented people's ability to understand the spatial elements and to select implications of planning decisions. In addition, the tool expanded participant's thought processes regarding the complexity of neighbourhood planning. One participant in particular, noted, that the "...[the] *different measuring tools, to illustrate different things...that was neat, and maybe in terms of people's learning and wrapping their heads around how different designs can have impacts on various different...transportation patterns, or jobs created, or that sort of thing*" .

## **INSPIRATION**

The planning exercise executed on the touch-table stimulated emotions of frustration, skepticism, and anxiety with respect to the incoming Unified Development Bylaw and the design exercise the participants were being asked to do. There was only one instance where a participant clearly expressed not only a negative emotional reaction, but also an urge to become involved. There were, however, instances where the visualization associated with the touch-table facilitated softening of staunch opinions on neighbourhood form.

Several of the emotional reactions were the result of the way the design activity was planned and executed on the touch-table. More than one group of participants was frustrated with the choice of study sites, as development was being encouraged *on top of* existing houses belonging to neighbours or acquaintances of the participants. Participants felt it would have been "*more appropriate to choose...an area that is going to be developed, as opposed to an area that is already developed*" (emphasis added). These participants explained that "*a lot of us have lived here for an awful lot of years and we're going 'oh we're taking Joe's house, and we're taking down this guy's house'*". Participants saw other new development sites, such as the airport or the block across from Revelstoke's hospital, as more beneficial sites to explore.

Participants were also skeptical at the growth in population that the design exercise implied. While some participants articulated that they could imagine the types of neighbourhoods they were designing, they could not imagine Revelstoke growing enough in the next 20 years to require or accommodate density or infill to the extent that they were designing. In fact, when they learned what the UDB would allow, many participants were anxious about the density and size of buildings. In some cases, participants called three- and four-storey buildings 'monstrosities'. This, in particular,

was where one participant seemed compelled to act, based on seeing the touch-table *“having sat through all of the community meetings [on the Unified Development Bylaw] and looking at the maps and the dots and all the different stuff we did, you're right, this is, this could happen, so for me, seeing it on that map was really scary. Really scary. So, I think we need more community meetings to make sure that even though that's [the 3 and 4 storey mixed-use development] possible, that it's never the intent of the re-zoning”*.

In contrast, the visualization of the types of buildings and mixture of uses that would be allowed through the new land-use plan and through the adoption of the UDB in Revelstoke altered some reactions to the proposed increase in neighbourhood density. One participant noted, *“I actually surprised myself because ...I would like to keep my neighbourhood as a single-family dwelling neighbourhood but yet I do see where there could be some change, if it's done correctly. And if you can, when you're presenting this to the residents of the community, when they can see, see a project like that, like I'm not necessarily so opposed. Like I've opened up my line of thinking, you know...”*

More specifically, another participant noted the role of visualization in their change in thinking, *“I think that's (visualization on the touch-table) a better way to look at it. And actually when you look at them here (looking at 3-D image, gesturing towards it)...It does show how they can fit in with the other buildings”*.

## **IDEATION**

The touch-table provided ample opportunities for residents to express their ideas about their home communities. In the data, these comments were the most frequent and clearest examples of the touch-table facilitating Ideation. This was visible in what the participants mentioned in the focus groups after their first planning workshop, and in how they interacted with one another and made decisions at the touch-table.

The touch-table facilitated Ideation by providing participants with the ability to physically demonstrate, in 2-D and in 3-D, what they meant. This ability was augmented by the real-time component of the table and the measurement tools displayed adjacent to the touch-table surface. Participants used these components to make and show changes to community design as they were considering them and to delete these changes, or further manipulate the design if their ideas were not part of the final designs. In spite of this, the concept of Ideation also highlighted frustrations that

participants had with respect to the range and detail of neighbourhood block 'pieces' that were available in the touch-table software. These frustrations were linked to an absence of certain building pieces, variables in the software that either did not demonstrate their vision or could not be manipulated to do so.

The 3-dimensional paper representation of the neighbourhood designs was a tool that was used by almost all groups to demonstrate their design ideas and configurations. Participants contrasted the paper design exercise with the design exercise on the touch-table, reflecting *"It's challenging to visualize this on paper-I appreciate the touch screen much more!"* Participants named the visualization tool most often when asked, in the focus groups and open-ended survey, to identify the most useful tool in the design process. At the touch-table, the touch surface and the 3-D design projection were actively used by participants to explain their design intentions, to move buildings to different places and to different orientations, and to see how buildings might interact: *"I think that's a better way to look at it. And actually when you look at them here, where it's showing (looking at 3-D image, gesturing towards it)...It does show how they can fit in with the other buildings from the rooftop. It looked less dramatic than it did on these I think (pointing at individual design workstation and map wall)." This sentiment was most often accompanied by hand gestures referring to the surface or the projection directly, or demonstrating the design concepts they were trying to articulate.*

Participants familiar with developer-City relations also commented on how the tool would be a useful means for land developers to communicate design changes and ideas in a more real-time format, when they were responding to City demands: *"being able to do that quickly is, as I said, if you were doing that with a planning process you'd have to send it back to the planners, and come back, and then three weeks later, and \$4000 later, you come back with one building changed."* This real-time reaction was also employed by workshop participants, who made design decisions on-the-fly, using both the physical arrangement of the building pieces as well as the measurement tools on jobs to finalize decisions, *"but when you put it up on the screen like that, ..then it's like "oh right, you have to consider this" and "oh yeah, no that doesn't look so good" and then, your opinion evolves, ...which I think is very, very useful when you're doing planning like that and trying to involve the...the*

*community as opposed to just the people who are doing the planning and talking at you. I really like that process”.*

Many participants found the design components on the touch-table limiting, undesirable, or unrepresentative of their preferences when they manipulated the building pieces. In particular, participants repeatedly remarked on three features whose absence or inflexibility made things difficult: the absence of pieces for “green-space”, the inflexibility of parking spaces/ absence of underground or covered parking pieces, and the predominance of three- and four-storey buildings. Two of these items, the building block design and the absence of significant green space were designed to conform to the design specifications of the Unified Development Bylaw.

Participants had differing opinions on the amount of detail present on the individual building blocks; they felt there was either too much or too little detail. One participant commented “I... *learned...that when you don’t give people enough options it stifles creativity because I think we could agree with some of the principles that were going forward but we were so resisting the three- and four-storey options that...if we had had more options in the exercise I think we could have actually developed something ...”*

## **INCLUSION**

The touch-table design exercises were configured to have community residents involved in planning and neighbourhood design processes. During the two workshops there were instances where the design exercises clearly facilitated the articulation of community residents' priorities. While the transcripts and survey data revealed that the tool enabled participants to articulate their priorities, integrating these priorities into the tool and model was not possible. There were very few, if any, instances within the data where the touch-table was facilitating community ideas being included in planner or designer priorities. There were, however, a series of suggestions that arose from the two workshops that could be integrated into the touch-table tool and software, and a series of examples of how the touch-table could be used to facilitate access to public process, and planners’ ability to access resident's views and ideas. Participants’ critique of the table reveal potential for the tool to better include participant’s priorities and ideas.

Participants repeatedly mentioned three elements that they would have liked to have seen included in the touch-table. People felt they would have made better neighbourhood design decisions if there had been: “green space” building blocks, parking which was malleable/manipulatable (i.e. above or below ground, covered), and the ability to select the criteria for the measurement tools displaying real-time.

In more than one instance the participants articulated that their priorities were not reflected in the touch-table design surface/scenario. *“The other thing was that the criteria across the bottom....it would be interesting to select those criteria...”* stated one participant. Another felt constrained by the limits to the tool *“like you were saying it shows what is possible, but I felt it was in a real certain parameters so you want the feedback, so it's only within certain choices. It's not really what might be the vision of everybody or what people might want.”* Another was blunt about what was being measured in the measurement tools: *“that assumes that these measures matter, and I'm not sure they matter to me, there's no measure of green space, and those other things that might matter (pointing at tools on the screen).”*

The group composition dictated when planners were engaged with participant’s ideas. Some groups consisted of planners employed by the City of Revelstoke, and other citizens, which would have served as a direct opportunity where planners could take a look at community residents’ ideas and design process.

Two participants expanded their observations beyond what was actually displayed and questioned the order of operations for creating their neighbourhood designs, one commenting on their need to *“[think] about the bigger picture stuff, and all those bigger sorts of principles that we're working towards, and put those on a map and then put the buildings on after and work those buildings in on top of those concepts, as opposed to then having the concepts have to work around the buildings.”*

## **INTEGRATION**

Given the nature of the workshop, it was not possible to establish the ability of the tool to assist community residents in being integrated into the general planning process. The intention of the research workshops was to explicitly engage citizens and community members in Revelstoke. Under these circumstances, there are several examples of this occurring. There is no direct evidence that

the tool facilitates truly collaborative decision making processes. There is evidence of the potential for the touch-table small-group neighbourhood design process to foster useful collaborative space. There were instances, as a result of the participant group mixtures, where planners and stakeholders collaboratively produced neighbourhood plans during the hypothetical design scenarios. In reality how the touch-table is applied in an official planning process will have an impact on its ability to integrate community collaboration.

## **INDEPENDENCE**

As a product of the workshop design, the touch-table enabled community residents to create their own plan independent of planning processes. However, the (design) constraints of the new UDB that were built into the tool limited the possible outcomes of the independent designs. As a result, participants had varied perspectives on the tool's ability to reflect their preferences for neighbourhood design. The workshop structure did, however, make expensive hardware, and previously un-released design-software accessible to community residents, thus creating potential design opportunities. The potential of this tool to provide design independence, and the constraints around using and having access to such a tool will be explored in the discussion section.

## **PLANNING ENVIRONMENT**

Examining the transcripts and surveys using the 6-I's of design empowerment highlighted another cross-cutting theme worth mentioning: the environment in which the planning process was taking place. Instances of mediated empowerment were facilitated in part through the features of the tool, but also in part because of the learning environment. The tool was used in an environment where people felt *comfortable* having complex discussions on neighbourhood design issues. This augmented the tool's ability to provide more compelling visual information. The physical orientation of the tool, including the four tool bars and sides of the table requires that small groups (maximum of five) are personally engaged rather than being part of larger stakeholder groups. This smaller, diverse group fostered an environment where participants were "*excited to hear other opinions*" and ready to share their own. One participant specifically commented on the group size, "*I like this smaller group work, you don't feel as intimidated*".

While the design exercise in this case-study in Revelstoke had participants explore two neighbourhoods that could realistically be candidates to become 'neighbourhood centres' through

the application of Revelstoke's Unified Development Bylaw, the situation was still hypothetical and experimental. This element may have also amplified the opportunities for learning. Workshop participants appreciated the opportunity and the beginning of the touch-table design exercise to articulate the reasoning behind their design. This contrasted to some participants' experiences in previous planning processes: *"I think open houses by their nature are, well,...to deflect criticism, and people sense that, you know...I think maybe that [open house] was sort of the start of some people's discontent,... they felt that they weren't being heard because they didn't have a venue to do that."*

The touch-table surface was frequently used as a temporary 'place holder' for the interactive design and decision-making process that participants were undertaking. During the neighbourhood design exercises, participants were never given the impression that their design exercise was the one and only place to express their opinions on the neighbourhood. This provided participants with room to experiment, and to look in-depth at the design they were creating. Individuals elaborated and changed opinions as the exercise progressed. This setting contrasted with previous planning experiences participants had been a part of: *"right now the way our planning processes are, well they're pretty cursory in a way. You know people end up feeling alienated"*.

The language of visualization may *"be the key to effective public participation because it is the only common language to which all participants - technical and non-technical - can relate"* but individuals still need to be comfortable expressing that language (S.King in Al-Kodmany et al. 1999:38). This unique scenario provided a safe learning environment: participants were in smaller groups; participants had a design task to complete as a team; individual and group opinions were recorded but could be changed as the design task progressed.

A review of the data reveals that in this case-study, there was no strong evidence of the touch-table enabling mediated empowerment across all of the 6 I's of Design Empowerment. There is, however, clear evidence of the tool facilitating instances of design empowerment through *Information*, *Inspiration* and *Ideation*. There may be potential for the tool to facilitate *Inclusion*, *Integration* and *Independence* in the future.

## SECTION 6: RECOMMENDATIONS

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Reviewing the case-study and the analysis of the results, there are seven key conclusions. These conclusions may serve as recommendations for future development and application of the collaborative measured-visualization touch-table employed through the *PICS Revelstoke Measured Visualization Project*. These conclusions are as follows:

The touch-table tool mediated instances of learning, and facilitated communication between participants on neighborhood design issues. It was a space around which to convene people interested in community planning, and features of the touch-table tool stimulated questions. The majority of these instances of learning were, however, the result of people with different types of knowledge interacting and sharing this knowledge or answering questions posed by peers. **This finding emphasizes the importance of context in instances of empowerment, in that those invited to the table can dictate whether learning and discourse is stimulated or stifled. For climate change planning this means that not only the tools used but also the people involved planning processes need to be able to communicate on climate change.**

This research also revealed that the touch-table enabled instances of *Ideation*. Participants were both compelled to express their opinions, and were able to do so through manipulation of buildings on the touch-table surface, and using the 3-D projection. In a few instances, participants made use of the measurement tools. Through use of the touch-table participants communicated that they were hesitant to accept the type of compact, mixed-use development needed to reduce greenhouse gas emissions at a local level if this urban form threatened neighbourhood character, green-space, and Revelstoke's sense of community. Many preferred this type of development to be focused in the city center, downtown, rather than in various neighbourhood centers throughout the city. **This finding exposes the *potential* of this touch-table to contribute to planning processes that engage citizens in dialogue about the future of their neighbourhoods. Using the tool in this capacity, however, is no guarantee that participants' visions about the future of their neighbourhoods will be aligned with the type of development that is urgently needed to reduce greenhouse gas emissions.**

The touch-table facilitated community-member collaboration, and in instances where the groups were more diverse, collaboration between planners and community members. What was of real value during the use of the tool, however, is not captured in the tool outputs. One participant noted, *“[the] visualization process facilitate the conversation which I would agree for me was the most helpful. In terms of measuring the result of that conversation ...what we handed in as our visualization, it probably doesn’t represent the conversation we had. If you were to see that... out of context of our conversation it probably doesn’t represent the process that we were able to go through.”* This is consistent with findings on the ability of visualization with real-time components to stimulate and augment deliberation and negotiation (Arciniegas et al. 2011; Sheppard 2005). Using the touch-table in neighbourhood design processes produces either a final neighbourhood design, or multiple designs that document an iterative design process, depending on how frequently the work on the table is saved. This doesn’t capture all of the detail about participant preferences and the negotiations that go on at the table. **For the table to serve as a communication tool between citizens/participants and planners that captures and conveys the aspirations of community members either a planner should be present and listening during the duration of the use of the touch-table, or the discussion and collaboration should be captured in some other way.**

While the touch-table enabled learning, and facilitated participants being able to generate and articulate their ideas about their neighbourhoods, it also contributed to a work environment in which these same participants felt comfortable *sharing* these ideas and feeling as if these ideas were acknowledged. The touch-table helped to contribute to this feeling by limiting the number of people involved in the design scenario to a small group, and by having an interface that was easily changeable, and operated in real-time (i.e. participants could immediately see how a change they made would look and would affect the measurement tools). Participants made comparisons between the touch-table design exercises, and other planning processes they had been involved. These comparisons highlighted the need for people to have places where they could explore neighbourhood design without having to produce a final design, and where they could express their opinions and be listened to. **This emphasizes the importance of creating comfortable design or planning environments to stimulate learning, engagement, and ultimately, empowerment.**

The setting of this project was a community where cutting-edge planning bylaws were proposed that would promote neighbourhood design that could contribute to a long term reduction in community GHG emissions. The intent of the *Revelstoke Measured Visualization Project*, under which this research paper is nested, was to see if the visualization-tool could make citizens more inclined to adopt this type of planning by making the connection between GHG emissions and land-use planning more explicit. Therefore, the touch-table tool was designed with measurement tools directly tied to how urban form has an impact on greenhouse gas emissions. The use of the real-time measurement tools in the neighbourhood design process varied between groups. Overall, the measurement tools were under-utilized. Several participants expressed that they did not measure things that they cared about. Instead, the participants were interested in how the neighbourhood designs would impact day-to-day life: how the designs might alter the sense of community, what the implications of the potential types of development would be on parking and snow removal, and on the green space that participants highlighted as an important part of their neighbourhoods. While the entire design of the exercises and workshop revolved around low-GHG urban form, climate issues were a low priority for participants.

**The findings indicate that engaging participants or community members earlier in the touch-table design process could create the potential for the touch-table to enable instances of *Integration and Inclusion*.** This would directly integrate resident priorities into planning priorities, if the decision support tools (measurement tools) reflect values that a community considers worth measuring (Al-Kodmany et al, Elwood 2002, Craig and Elwood 1998). An early engagement might lengthen the design process and could also weaken the touch-table's emphasis on climate change and urban form. The inclusion of relevant bench marks/ indicators in comparison to climate-related indicators may, however give participants a better sense of the 'cost' of climate change and other behaviours in relation to one another.

**The comments from participants showed that workshop design mattered.** The workshop design progressed from having people articulating their preferences on individual building (survey), to individual design work, to the collaborative design work. Several participants commented on how they needed this preparation, the progression of thinking in order to be prepared to work collaboratively on a neighbourhood design. *"Reflecting back on the workshop it's a really good flow*

*as far as getting you thinking, and giving you some information and getting you to contribute on paper, [it was a]...good progression.”*

Finally, the ability of the tool to enable mediated empowerment on some but not all of the 6-I's is consistent with the findings in other research on visual tools employed in planning (Senbel and Church 2011; Al-Kodmany 1999; Arciniegas 2011; Levy 1995). Most directly, it is consistent with Senbel and Church's exploration of six different visualization mediums employed in neighbourhood design in Vancouver, and evaluated based on the 6-I's of Design Empowerment (2010). No single media in that research enabled strong levels of all of the 6-I's of Design Empowerment. Rather each media, ranging from community and policy films, physical, digital and energy consumption models and a digital summary, had distinct strengths or potential for mediating empowerment. Al-Kodmany employed several different visualization tools in a planning process in Chicago and determined that different tools were appropriate for different parts of the planning process (1999). Arciniegas et al. (2011) also found that the efficacy of use of a touch-table tool differed for different parts of a participatory land-use planning process — the design, the analysis or the negotiation. Given the strengths and weaknesses highlighted through the analysis of the touch-table tool using the 6-I's of Design Empowerment, distinguishing which phases of planning process the tool would best support should be a next step in the tool development.

## SECTION 7: CONCLUSION

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Addressing climate change in the urgent and in-depth ways needed in order to minimize climate change impacts requires action at international, national, and local scales. Getting citizens to engage with greenhouse gas emission reduction and climate change planning is limited by a series of barriers, including a sense of geographic, social and temporal disconnect from the causes and impacts of climate change. Visual technology tools offer promise for helping to articulate more explicit links between climate change and powerful local decision making processes, such as land-use planning. Using a case-study in Revelstoke, BC, this paper examined how a computer user-interface that enables users to collaboratively design and visualize future neighbourhoods in both 2- and 3-D, by means of a touch-sensitive table-like computer screen, may reverse citizens' sense of distance and disempowerment with respect to climate change.

Over the course of 24 workshops (two separate weeks) in Revelstoke, BC, 48 participants were engaged using this 'touch-table' to plan one of two future neighbourhood centres in their hometown. Analyzing the video and audio transcripts of these workshops with Senbel and Church's 6-I's of Design Empowerment showed that the touch-table augments participatory processes by supporting procedural and substantive learning, by compelling participants to act, and by enabling participants to generate and express their ideas and thoughts. The tool showed potential but not direct evidence of including participants' ideas into the planning *process*, enabling the co-creation of neighbourhood design or supporting instances where participants independently created their own designs. Despite the design of the tool, climate change and greenhouse gas emissions were not at the forefront of discussions and negotiations in the neighbourhood design processes.

This analysis also highlighted the potential for the touch-table tool to be applied in other scenarios as a means to foster learning and to stimulate dialogue. Based on the findings of this project, future use of the touch-table tool should be mindful of:

- the environment in which the planning process is occurring;
- group composition;
- whether and how participants priorities can be worked into the touch-table measurement-tools before the design process begins;

- which phase of the planning process the tool will be used in, and how participants will have been prepared for collaborative design before the use of the touch-table;
- how the rich discussion and collaborative-design process facilitated by the tool will be captured, communicated and used to contribute to planning processes after the fact;
- and how the tool can be embedded into decision making processes so that participants can engage over long periods of time; and on a project-by-project basis.

## **APPENDICES**

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### **APPENDIX 1. SMART GROWTH PRINCIPLES IN THE REVELSTOKE OFFICIAL COMMUNITY PLAN**

1. Create a range of housing opportunities and choices
2. Create walkable communities
3. Encourage community and stakeholder collaboration
4. Foster distinctive, attractive communities with a strong sense of place
5. Provide a variety of transportation choices
6. Strengthen and direct development towards existing communities
7. Take advantage of compact building design

## APPENDIX 2. JUNE WORKSHOP SURVEY

### How did you learn about this Workshop?

- ☐ Stoke FM
- ☐ Email from the City of Revelstoke
- ☐ Email from a friend or Colleague
- ☐ Flyer (where?)
- ☐ Facebook
- ☐ Word of Mouth
- ☐ Announcement in class or at a meeting
- ☐ Twitter
- ☐ Farmer's Market
- ☐ Stoke List
- ☐ Revelstoke Current
- ☐ Revelstoke Times Review
- ☐ Other, please specify

### Please provide us with your name:

### What is the nearest intersection to your home?

### What is the name of your home neighbourhood?

	Less than 2 years	2-5 years	6-10 years	11-20 years	More than 20 years
How long have you lived there?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How long do you plan on living there?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### What is your age?

- ☐ Under 19
- ☐ 19-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65-74
- ☐ 75 and over

### What is your gender?

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

### How would you characterize neighbourhood planning in Revelstoke today?

- ☐ Serves all Revelstoke Residents
- ☐ Serves most Revelstoke Residents most of the time
- ☐ Serves Revelstoke Residents some of the time
- ☐ Serves some neighbourhoods more than others
- ☐ Is not relevant to most Revelstoke residents
- ☐ Is not relevant to me

**If you participated in any neighbourhood or community planning in Revelstoke how would you characterize your experience.**

- ☐ Meaningful
- ☐ Satisfactory
- ☐ Neutral
- ☐ Unsatisfactory
- ☐ Useless
- ☐ I have not participated

**How many, if any, public planning meetings have you attended in Revelstoke?**

- ☐ None
- ☐ 1 to 3
- ☐ 3 to 10
- ☐ More than 10

**How many, if any, development permit or rezoning application meetings have you attended in Revelstoke?**

- ☐ None
- ☐ 1 to 3
- ☐ 3 to 10
- ☐ More than 10

**Which of the following characterizes your involvement with Revelstoke's Unified Development Bylaw?**

- ☐ I attended a design charette/workshop
- ☐ I attended one or more community meetings
- ☐ I made online comments
- ☐ I read online comments
- ☐ I watched YouTube videos
- ☐ I followed related stories in the news
- ☐ Other, please specify...
- ☐ I had no involvement
- ☐ I don't know anything about the Unified Development Bylaw

**Are you familiar with any of the following planning documents?**

- ☐ Official Community Plan
- ☐ Community Energy and Emissions Inventory
- ☐ Corporate Energy and Greenhouse Gas Emission Inventory and Reduction Strategy
- ☐ Smart Growth Development Checklist
- ☐ Unified Development Bylaw
- ☐ Transportation Master Plan
- ☐ City of Revelstoke District Energy Expansion Pre-feasibility Study
- ☐ Revelstoke Community Energy and Emissions Plan
- ☐ City of Revelstoke Integrated Community Sustainability Plan
- ☐ I am not familiar with any of these

**From the list below, select the features of a street or neighbourhood that might encourage walking**

- ☐ Frequent driveways
- ☐ Wide sidewalks
- ☐ Street vendors
- ☐ Street trees

- ☐ Outdoor seats and benches
- ☐ Modern conveniences like drive-through services
- ☐ Shop windows and doors
- ☐ Strip malls
- ☐ Good lighting
- ☐ Lots of hedges

**How often do you use the following?**

- ☐ LinkedIn
- ☐ Facebook
- ☐ YouTube
- ☐ Twitter
- ☐ Blogging Sites (wordpress etc.)
- ☐ Tumblr
- ☐ Flickr

**How do you access the internet**

- ☐ Home computers
- ☐ Work computers
- ☐ Mobile Laptops
- ☐ Smart Phone
- ☐ iPad or similar

**Please rate the following buildings in terms of your preferences for Revelstoke.**



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



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- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building

Please rate the following buildings in terms of your preferences for Revelstoke:



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building
- ☐ I don't know



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building
- ☐ I don't know



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building
- ☐ I don't know



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building
- ☐ I don't know

**Which of the following building uses most appeals to you for your neighbourhood?**

- ☐ Only residential
- ☐ Residential with some retail and/or offices in central areas in the neighbourhood
- ☐ Mixed-use with commercial and residential throughout the neighbourhood

**Which of the following housing types most appeals to you throughout your neighbourhood?**

- ☐ Single family homes with lots of green space
- ☐ Townhouses and multi-unit heritage houses with lots of character
- ☐ Apartment buildings with lots of shops and activities around open spaces

**Which of the following housing types most appeals to you for central areas in your neighbourhood?**

- ☐ Single family homes with lots of green space
- ☐ Townhouses and multi-unit heritage houses with lots of character
- ☐ Apartment buildings with lots of shops and activities around open spaces

	Yes	No	Maybe	Don't Know
Would you support adding more housing to central areas in your home neighbourhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you support adding shops and services in central areas in your home neighbourhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you support adding more housing, shops and services all together in central areas in your home neighbourhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you support adding shops, services and amenities within walking distance to your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you live in a neighbourhood central area with a concentration of housing, shops, services and amenities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Do you believe that planning for the future of energy use and energy supply in your community is an important topic for people to work on?**

- ☐ Yes
- ☐ No
- ☐ Maybe
- ☐ Don't know

**Please select the statement that best matches your opinion**

- ☐ Neighbourhood design has no impact on Revelstoke's overall energy use
- ☐ Neighbourhood design impacts Revelstoke's overall energy use
- ☐ I don't know

**Please select the statement that best matches your opinion**

- ☐ Neighbourhood design has no impact on Revelstoke's greenhouse gas emissions
- ☐ Neighbourhood design impacts Revelstoke's greenhouse gas emissions
- ☐ I don't know

**How informed do you consider yourself to be about climate change?**

- ☐ I regularly read articles and news reports about climate change
- ☐ I understand the various issues related to climate change
- ☐ I have a general sense of climate change
- ☐ I have heard of climate change but don't know the details
- ☐ I don't know anything about climate change

**Do you think energy emissions lead to climate change?**

- ☐ Yes
- ☐ No
- ☐ I don't know anything about this
- ☐ undecided

**Does Revelstoke have a greenhouse gas emissions reduction target?**

- ☐ Yes
- ☐ No
- ☐ I don't know anything about this

	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	I don't know
I believe my actions matter in the overall energy consumption in Revelstoke.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My personal actions to reduce energy emissions in my community will encourage others to do the same.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Revelstoke should do everything within its power to reduce its energy emissions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Human actions have an impact on global energy emissions and climate change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change is a global problem and nothing that happens in Revelstoke will make a difference.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Please choose the statement that best represents your views on climate change**

- ☐ I do not care about climate change
- ☐ I care about climate change but I am confident that the government and technology will solve any problems that emerge
- ☐ I care about climate change but don't believe that we can reduce our emissions
- ☐ I care about climate change but don't think our emissions are the cause
- ☐ I care about climate change and believe that our individual actions matter
- ☐ I care about climate change and believe that we can reduce our emissions as a community
- ☐ I care about climate change and believe that we can reduce our emissions as a society

**Please choose the statement that best represents your actions related to climate change**

- ☐ I don't know anything about climate change
- ☐ I know about climate change but don't spend time thinking about it
- ☐ I think about climate change but it doesn't make me change my day-to-day actions
- ☐ I would like to reduce my energy consumption sometime in the future
- ☐ I have concrete plans for reducing my energy consumption soon
- ☐ I do some things to reduce my energy consumption but would like to do more
- ☐ I have structured my life so that I consume as little energy as possible

**In your opinion what is the most successful approach to addressing future energy issues**

- ☐ Improvements in Technology
- ☐ Changes in people's behaviour
- ☐ Changes in government policies and regulations
- ☐ Government incentives and/or subsidies
- ☐ Changes in how we plan communities

**Who do you think should be responsible for responding to energy issues, such as finding new sources of energy, or reducing our overall use of energy?**

- ☐ Businesses
- ☐ The provincial government
- ☐ Municipal (city) governments
- ☐ Groups of citizens and/or neighbourhoods
- ☐ Individual citizens
- ☐ Federal government

## APPENDIX 3. SEPTEMBER WORKSHOP SURVEY

### Thank you for participating in the MyRevelstoke 2030 Workshop today.

This survey is part of a study entitled: Measured visualization of urban form scenarios as a means to community engagement in planning.

### Research Team

Maged Senbel, Assistant Professor, UBC School of Community and Regional Planning; Ron Kellett, Professor, UBC School of Architecture and Landscape Architecture; Cynthia Girling, Professor, UBC School of Architecture and Landscape Architecture.

### Purpose and Objectives

This research tests how different participatory design methods contribute to participants' understanding of the link between the physical layout of a city and environmental issues.

### Voluntary Participation

Participation in this workshop is completely voluntary. You may withdraw at any time without any consequences or any explanation. If you do withdraw you can request that all materials related to you including audio, video and text files will be destroyed securely.

### Confidentiality

All the information we gather will remain strictly confidential and will be kept on a secured computer and/or hard drive.

### Contacts

If you have any questions regarding this study you may contact Dr. Maged Senbel ([maged.senbel@ubc.ca](mailto:maged.senbel@ubc.ca) or by phone at 604-822-9158). In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the University of British Columbia's Office of Research Services (604-822-8595 or [ors@ors.ubc.ca](mailto:ors@ors.ubc.ca)).

### Consent

By completing this survey you are providing consent for your full participation in this study. You may be photographed or videotaped for research purposes and the photos and videos will be stored securely and will not be shared publicly, with the City of Revelstoke officials or with anyone outside the research team.

### Please provide us with your name.

This will be kept strictly confidential and will only be used to connect to the September workshops. After the September workshops we will permanently delete all records of your name and any association between your name and the answers to any of these questions.

### Please rank the top four components of today's workshop from 1-4, with 1 being the most helpful component.

	1	2	3	4
Presentation on Energy and Neighbourhood Design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reflection exercise on personal preferences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wall Display of Neighbourhood Scenarios	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Touch-table Map with Menu of Building Choices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Real-time 3-D view of Neighbourhood Scenarios	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Real-time Measurement Tools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**What stood out for you in the workshop today and why? Please briefly explain.**

This could be something that surprised you, or something that you enjoyed, or didn't enjoy, or something new that you learned, etc.

**Which of the following building uses most appeals to you for your neighbourhood?**

- ☐ Only residential
- ☐ Residential with some retail and/or offices in central areas in the neighbourhood
- ☐ Mixed-use with commercial and residential throughout the neighbourhood

**Which of the following housing types most appeals to you throughout your neighbourhood?**

- ☐ Single family homes with lots of green space
- ☐ Townhouses and multi-unit heritage houses with lots of character
- ☐ Apartment buildings with lots of shops and activities around open spaces

**Which of the following housing types most appeals to you for central areas in your neighbourhood?**

- ☐ Single family homes with lots of green space
- ☐ Townhouses and multi-unit heritage houses with lots of character
- ☐ Apartment buildings with lots of shops and activities around open spaces

	Yes	No	Maybe	Don't Know
Would you support adding more housing to central areas in your home neighbourhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you support adding shops and services in central areas in your home neighbourhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you support adding more housing, shops and services all together in central areas in your home neighbourhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you support adding shops, services and amenities within walking distance to your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Would you live in a neighbourhood central area with a concentration of housing, shops, services and amenities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**From the list below, which features of a street or neighbourhood might encourage walking?  
Please select any that apply.**

- ☐ Frequent driveways
- ☐ Wide sidewalks
- ☐ Street vendors
- ☐ Street trees
- ☐ Outdoor seats and benches
- ☐ Modern conveniences like drive-through services
- ☐ Shop windows and doors
- ☐ Strip malls
- ☐ Good lighting
- ☐ Lots of hedges

Please rate the following buildings in terms of your preferences for Revelstoke.



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



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- ☐ It would depend on the location of the proposed building

**Please rate the following buildings in terms of your preferences for Revelstoke**



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building



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Please rate the following buildings in terms of your preferences for Revelstoke:



- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building
- ☐ I don't know



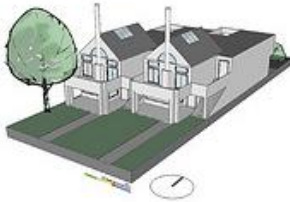
- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building
- ☐ I don't know



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- ☐ I would support this type of building if it was proposed in Revelstoke in the future
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- ☐ I would support this type of building if it was proposed in Revelstoke in the future
- ☐ I would not support this type of building if it was proposed in Revelstoke in the future
- ☐ It would depend on the location of the proposed building
- ☐ I don't know

**Do you believe that planning for the future of energy use and energy supply in your community is an important topic for people to work on?**

- ☐ Yes
- ☐ No
- ☐ Maybe
- ☐ Don't know

**How do you think Revelstoke should balance the competing priorities of preserving neighbourhood character and the environmental values of reducing energy consumption and emissions?**

**Please select the statement that best matches your opinion**

- ☐ Neighbourhood design has no impact on Revelstoke's overall energy use
- ☐ Neighbourhood design impacts Revelstoke's overall energy use
- ☐ I don't know

**Please select the statement that best matches your opinion**

- ☐ Neighbourhood design has no impact on Revelstoke's greenhouse gas emissions
- ☐ Neighbourhood design impacts Revelstoke's greenhouse gas emissions
- ☐ I don't know

Please select the response that best describes your opinion on the following statements:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	I don't know
Human actions have an impact on global energy emissions and climate change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change is a global problem and nothing that happens in Revelstoke will make a difference.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Revelstoke should do everything within its power to mitigate climate change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My actions matter in the overall energy consumption of Revelstoke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My personal actions to reduce energy emissions in my community will encourage others to do the same	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please choose the statement that best represents your views on climate change

- ☐ I do not care about climate change
- ☐ I care about climate change but I am confident that the government and technology will solve any
- ☐ I care about climate change but don't believe that we can reduce our emissions
- ☐ I care about climate change but don't think our emissions are the cause
- ☐ I care about climate change and believe that our individual actions matter
- ☐ I care about climate change and believe that we can reduce our emissions as a community
- ☐ I care about climate change and believe that we can reduce our emissions as a society

Please choose the statement that best represents your actions related to climate change

- ☐ I don't know anything about climate change
- ☐ I know about climate change but don't spend time thinking about it
- ☐ I think about climate change but it doesn't make me change my day-to-day actions
- ☐ I would like to reduce my energy consumption sometime in the future
- ☐ I have concrete plans for reducing my energy consumption soon
- ☐ I do some things to reduce my energy consumption but would like to do more
- ☐ I have structured my life so that I consume as little energy as possible

Briefly describe your vision for the future of neighbourhood development in Revelstoke?

If you had access to a web page that shows the 3-D visualization of buildings you can select, with associated measurements, how do you think you would use it?

- ☐ I would use it to make selections and also to look at and comment on other people's selections.
- ☐ I would look at and select buildings myself.
- ☐ I would look at others' selections but not make my own selections.
- ☐ I would not use this tool myself.
- ☐ Other (please specify) \_\_\_\_\_

**How would you describe your use of comments sections on websites?**

**Please click all that apply**

- ☐ I never read comments
- ☐ I read comments when they are not anonymous
- ☐ I read comments when the issue is important to me
- ☐ I read all types of comments
- ☐ I sometimes add my own comments
- ☐ I regularly add comments
- ☐ I think comments allow more people to participate in discussions in their own time

**Thank you for taking the time to complete this survey.**

## SOURCES

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- Al-Kodmany, K. (1999). Using visualization techniques for enhancing public participation in planning and design: process, implementation and evaluation. *Landscape and Urban Planning*, 45(1), 37-46.
- Girling, C., Kellet, R., & Johnstone, S. (2006). Informing Design Charrettes: Tools for participation in neighbourhood-scale planning. *Integrated Assessment Journal*, 6(4), 109-130.
- Al-Kodmany, K. (2000). Public participation: technology and democracy. *Landscape and Urban Planning Journal of Architectural Education*, 53, 220-228.
- Andrews, C.J. (2008) Greenhouse gas emissions along the rural-urban gradient. *Journal of Environmental Planning and Management*. 51(6), 847-870.
- Arciniegas, G., Janssen, R., (2011). Spatial decision support for collaborative land use planning workshops. *Landscape and urban Planning*, 107(3), 332-342.
- Arciniegas, G., Janssen, R., (2011). Map-based multicriteria analysis to support interactive land use allocation. *International Journal of Geographical information Science*, 25(12), 1931-1947.35, 216-224.
- Arnstein, S., (1969). A ladder of citizen participation. *Journal of the American Planning Association*, 35, 216-224.
- Bartholomew, K. & Ewing, R. (2008). Land Use-Transportation Scenarios and Future Vehicle Travel and Land Consumption: A Meta-Analysis. *Journal of American Planning Association*, 75(1), 13-37.
- Ben-Joseph, E., Ishii, H., Underkoffler, J., Piper, B. Yeung, L., (2001). Urban simulation and the luminous planning table: bridging the gap between the digital and the tangible *Journal of Planning Education and Research*, 21(2), 196-203.
- Campbell, H. (2006). Is the Issue of Climate Change too Big of Spatial Planning?, *Planning Theory & Practice*, 7(2), 201-230.
- City of Revelstoke, (2009). Revelstoke Official Community Plan Bylaw No. 1950. Amendment No. 2020, 2009.
- Compass Resource Management Ltd. (2011). City of Revelstoke District Energy Expansion Pre-feasibility Study Final Report. Retrieved at <http://www.cityofrevelstoke.com/DocumentCenter/Home/View/180> .
- Craig, W.J., T. Harris, D. Weiner. eds. (2002). *Community Participation and Geographic Information Systems*. London: Taylor and Francis.
- Craig, W. J., and S. Elwood. (1998). How and why community groups use maps and geographic information. *Cartography and Geographic Information Systems*, 25(2) 95-104.

- Compass Resource Management Ltd. (2011). City of Revelstoke District Energy Expansion Pre-feasibility Study Final Report. Retrieved at <http://www.cityofrevelstoke.com/DocumentCenter/Home/View/180> .
- Elwood, S. (2002). GIS use in community planning: a multidimensional analysis of empowerment. *Environment & Planning A* 34 (5) 905- 922.
- Elwood, S. (2006). Negotiating Knowledge Production: The Everyday Inclusions, Exclusions and Contradictions of Participatory GIS Research. *The Professional Geographer* 58(2): 197-208.
- Elwood, S. and R.Ghose (2004). PPGIS in Community Development Planning: Framing the Organizational Context. *Cartographica*, 38 (3-4), 19-31.
- Esnard, A-M., M. Gelobter, and X. Morales. (2001). Environmental Justice, GIS and Pedagogy. *Geographica*. 38(3-4), 53-6.
- Form Based Code Institute. (2011). *What are Form-Based Codes?* Retrieved from <http://www.formbasedcodes.org/what-are-form-based-codes>
- Harris, T. and D.Weiner. (1998). Empowerment, marginalization and “community-integrated” GIS. *Cartography and Geography Information Science*, 25(2). 67-76.
- IPCC (2007). Summary for Policymakers. In: *Climate Change 2007: The physical Sciences Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. [Solomon, S.D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press: Cambridge, UK and New York, USA.
- Kyem, P.A.K. (2002). Power, Participation and Inflexible Institutions: An Examination of the Challenges to Community Empowerment in Participatory GIS Applications. *Cartographica* 38(3-4), 5-15.
- Levy, R. M. (1995). Visualization of Urban Alternatives. *Environment and Planning B: Planning and Design*, 22, 343-358.
- Local Government (Green Communities) Statutes Amendment Act, Bill 27. (2008). Retrieved from [http://www.leg.bc.ca/38th4th/1st\\_read/gov27-1.htm](http://www.leg.bc.ca/38th4th/1st_read/gov27-1.htm)
- Lohmann, M., Wilson, M. (2011). City of Revelstoke Community Energy and Emissions Plan 2011. Retrieved at <http://www.cityofrevelstoke.com/DocumentCenter/Home/View/361> .
- Lorenzoni, I. & Pigeon, N. (2006). Public Views on Climate Change: European and USA Perspectives. *Climatic Change*. 77(1-2), 73-95.
- Lorenzoni I., Nicholson-Cole, S. and Whitmarsh, L.. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*, 17(3-4), 445-45.

- Mallet, B. (2011). City of Revelstoke Corporate Energy and Greenhouse Gas Emission Inventory and Reduction Strategy. Retrieved at [http://www.fcm.ca/Documents/reports/PCP/City\\_of\\_Revelstoke\\_Corporate\\_Energy\\_and\\_Greenhouse\\_Gas\\_Emission\\_Inventory\\_and\\_Reduction\\_Strategy\\_EN.pdf](http://www.fcm.ca/Documents/reports/PCP/City_of_Revelstoke_Corporate_Energy_and_Greenhouse_Gas_Emission_Inventory_and_Reduction_Strategy_EN.pdf)
- Moser, N. (2010). Communicating climate change: history, challenges, process and future directions. *Climate Change*. 1(1), 31-53.
- Nicholson-Cole, S.A. (2005). *Representing climate change futures: a critique on the use of images for visual communication*. *Computers, Environment and Urban Systems* 29: 3, May 2005, Pages 255-273
- Nyerges, Timothy, and Robert W. Aguirre. (2011). Public participation in analytic-deliberative decision-making: Evaluating a large-group online field experiment. *Annals of the Association of American Geographers*, 101(3) 561-86.
- Orlando, A. (2013, March 13). Revelstoke Unified Development Bylaw quietly ditched. *Revelstoke Times Review*. Retrieved from <http://www.revelstoketimesreview.com/news/197845191.html> .
- PlaceMakers, (2010). City of Revelstoke unified Development Bylaw. Retrieved at <http://revelstokeudb.com/>
- Rocha, E.M. (1997). A Ladder of Empowerment. *Journal of Planning Education and Research*. 17, 31-44.
- Salter, J.D., Campbell, C., Journeay, M. & Sheppard, S.R.J. (2009). The digital workshop: Exploring the use of interactive and immersive visualization tools in participatory planning. *Journal of Environmental Management*, 90(6), 2090-2101.
- Sanoff, Henry. (2000). *Community Participation Methods in Design and Planning*. John Wiley & Sons: New York.
- Senbel, M. & Church, S. (2011). Design Empowerment the limits of Accessible Visualization Media in Neighbourhood Densification. *Journal of Planning Education and Research*.
- Sheppard, S. (2005). Landscape visualization and climate change: the potential for influencing perceptions and behaviour. *Environmental Science & Policy*. 8(6), 637-654.
- Sheppard, S., Shaw, A., Flanders, D., Burch, S., Wiek, A., Carmichael, J., Robinson, J., Cohen, S., (2011). Future visioning of local climate change: A framework for community engagement and planning with scenarios and visualization. *Futures*. 43 (4), 400-412.
- Shipley, R. & Utz, S. (2012). Making it Count: A Review of the Value and Techniques for Public Consultation. *Journal of Planning Literature*. 27(22)
- Slotterback, C.S. (2011). Planners' perspectives on using technology in participatory processes. *Environment and Planning B: Planning & Design*, 38(3), 468-85.

- Statistics Canada (2012). *Revelstoke, British Columbia (Code 5939019) and Columbia-Shuswap, British Columbia (Code 5939) (table)*. Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012. <http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E>
- Tress, B. & Tress, G. (2011). Scenario visualization for participatory landscape planning –a study from Denmark. *Landscape and Urban Planning*, 64(3), 161-178.
- VanHerzele, A. & C.M.J van Woerkum. (2008). Local knowledge in visually mediated practice. *Journal of Planning*. 27(4), 444-455.
- Weiner, D., Harris, T.M., & W.J. Craig. (2002). Community Participation and Geographic Information Systems. Position paper, Spoleto Workshops. Available at: <http://www.spatial.maine.edu/~onsrud/Spoleto/WeinerEtAl.pdf>.
- Wissen Hayek U., (2011). "Which is the appropriate 3D visualization type for participatory landscape planning workshops? A portfolio of their effectiveness" *Environment and Planning B: Planning and Design* 38(5) 921–939.