

# New tools to assess the cumulative environmental, community and health impacts of resource development



Taylor, BC (Buse 2017)

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**RAIL Commons | Olds, AB**  
**September 30, 2017**



Berg Lake, BC (Buse 2016)

# Outline

- Introduction to the CIRC
- Background: Cumulative effects and impacts
- New tools and processes to address the cumulative impacts of resource development
- Discussion



**What is the CIRC?**

# Introducing the Cumulative Impacts Research Consortium

*The CIRC is a pan-UNBC initiative that provides a platform for research and community dialogue to understand the cumulative environmental, community and health impacts of resource development across northern BC*

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The Cumulative Impacts  
Research Consortium

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# Acknowledgements

## Steering Committee

**Present:** Greg Halseth (CDI); Marleen Morris (CDI); Margot Parkes (HRI); Henry Harder (HRI); Rachael Wells (HRI); Art Fredeen (NRESi); Al Wiensczyk (NRESi); Michelle Connolly (PICS); Madeline Wilson; Chris Buse; Marieka Sax

**Past:** Kyle Aben (PICS); Leanne Elliott (NRESi)

## Advisory Committee

**Present:** John Disney; Lana Lowe; Joan Chess; Nicole Cross; Andy Ackerman; Viva Wolf; Wayne Salewski; Sandra Harris; Charl Badenhorst; Alan Madrigga; Rob Spitzer

**Past:** Richard Kabzems; Jenn Pighin

## Student RAs

Ryan O'Toole; Bunu Gaudi-Sharma; Katie Cornish; Jenn Baddeley; Scott Brown; Nadine Meroniuk; Rebecca Delorey; Val Lai; Nadia Nowak; Theresa Fresco

## Funding Support



Pacific Institute  
for Climate Solutions  
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**NSERC  
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# **Cumulative Effects vs. Cumulative Impacts**

# What are cumulative effects?



# What are cumulative effects?

“Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions.” – CEAA 2014

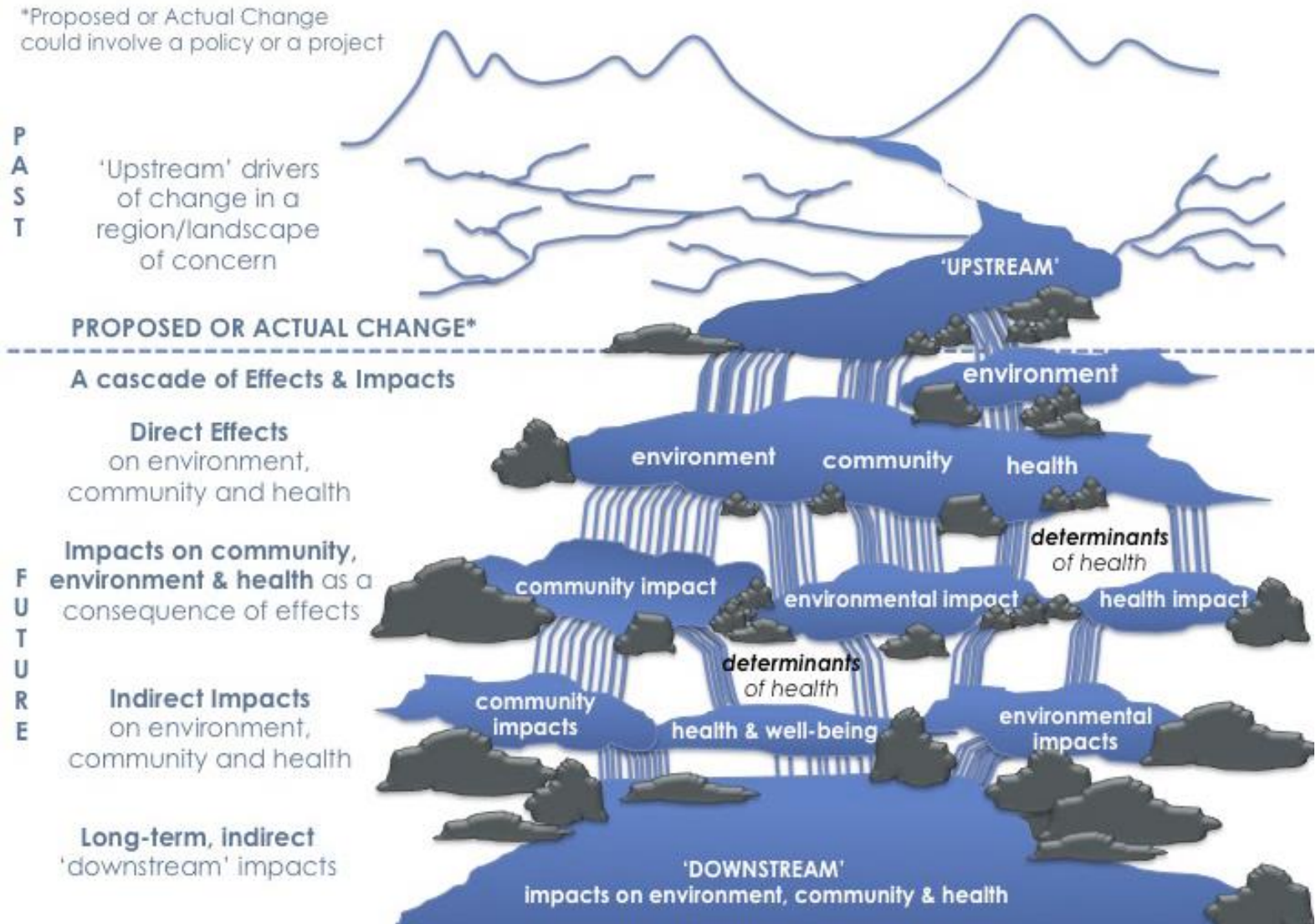


FISH BEARING  
STREAM  
DISTURBANCE  
FREE ZONE

“Cumulative effects are changes to social, economic and environment conditions caused by the combined impact of past, present and potential human activities or natural events.” – BCMFLNRO 2015



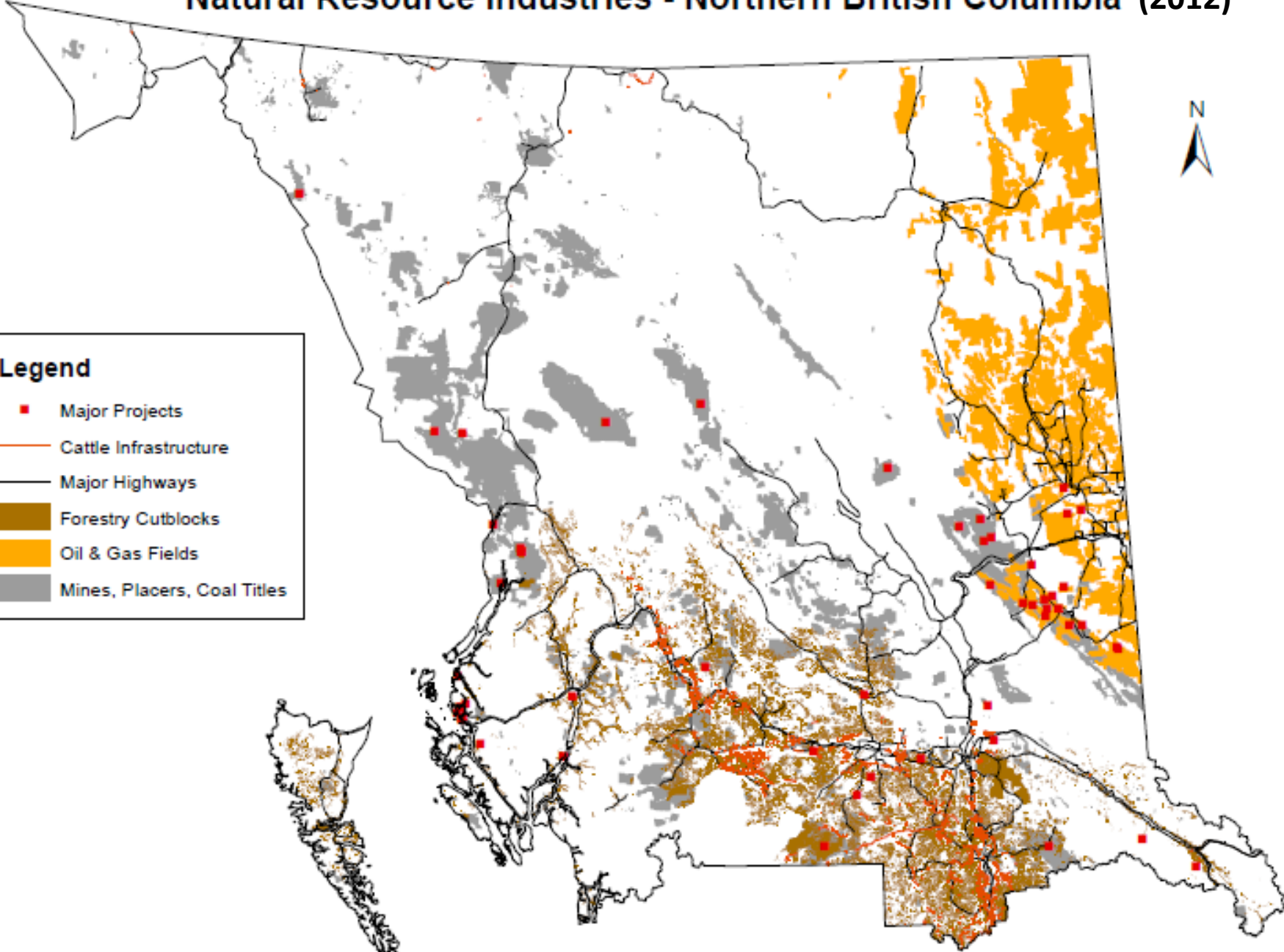
# What are cumulative impacts?



# Natural Resource Industries - Northern British Columbia (2012)

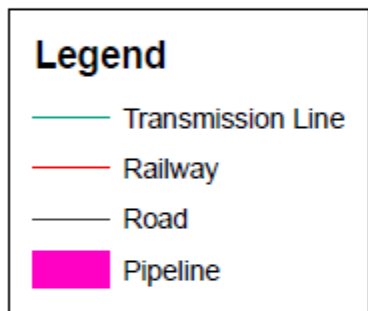
**Legend**

- Major Projects
- Cattle Infrastructure
- Major Highways
- Forestry Cutblocks
- Oil & Gas Fields
- Mines, Placers, Coal Titles



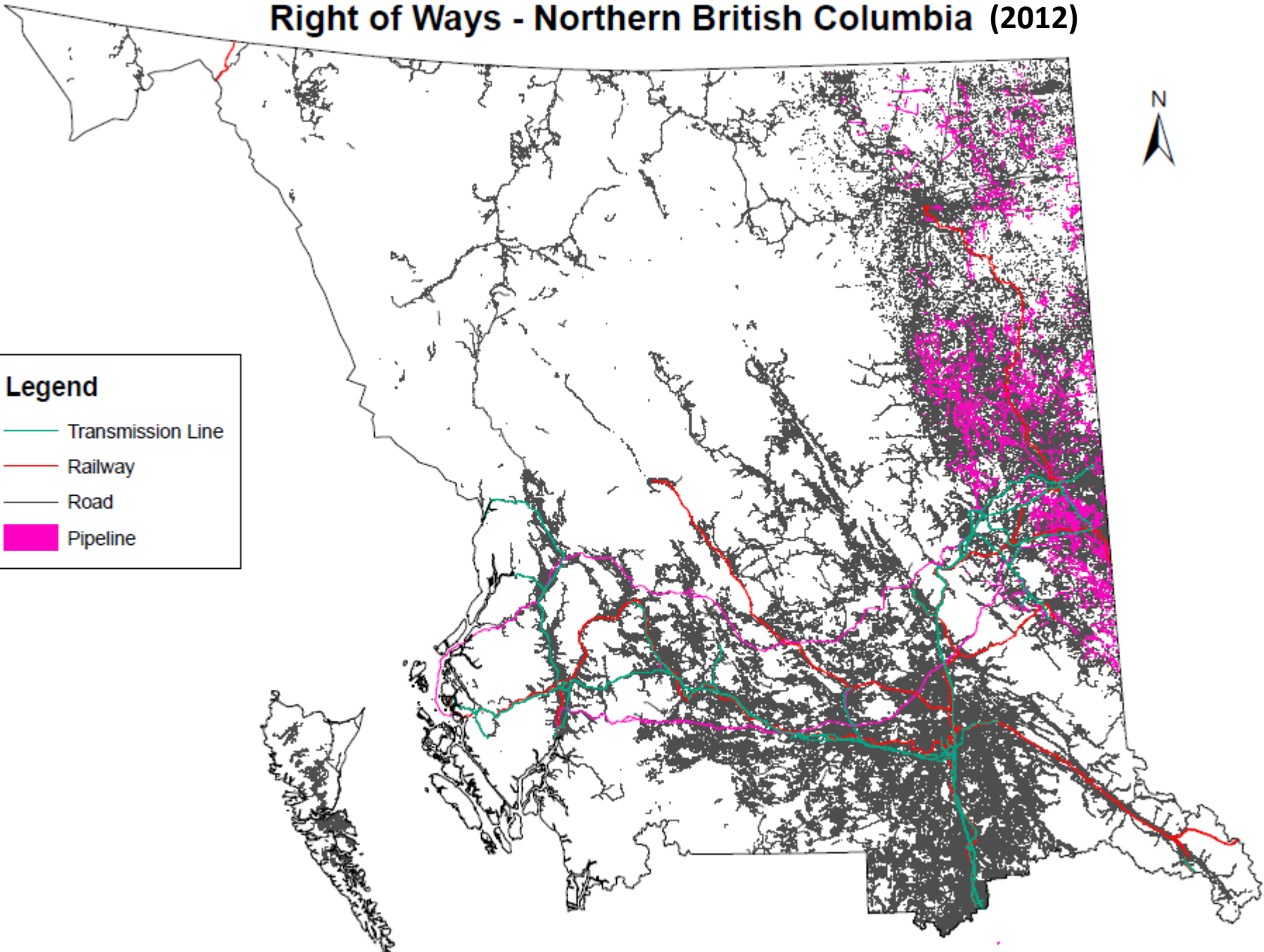
0 100 200 Kilometers

# Right of Ways - Northern British Columbia (2012)

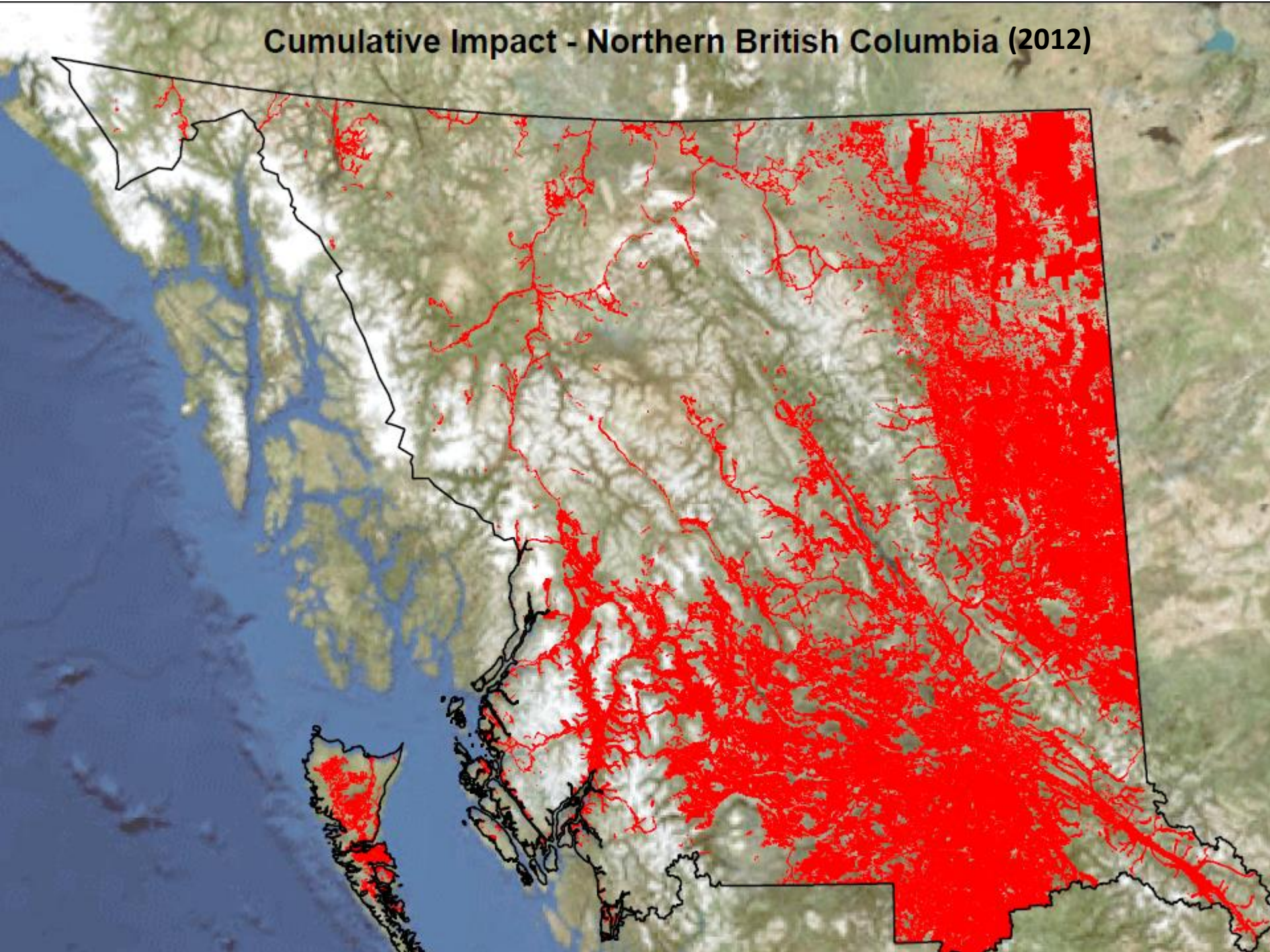


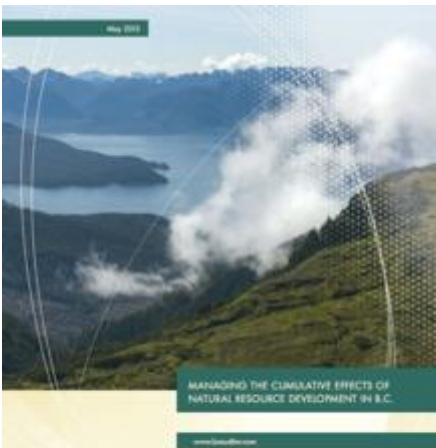
Coordinate System: NAD 1983 BC Environment Albers  
Projection: Albers - Created for Cumulative Impacts Research Consortium

0 100 200 Kilometers



# Cumulative Impact - Northern British Columbia (2012)

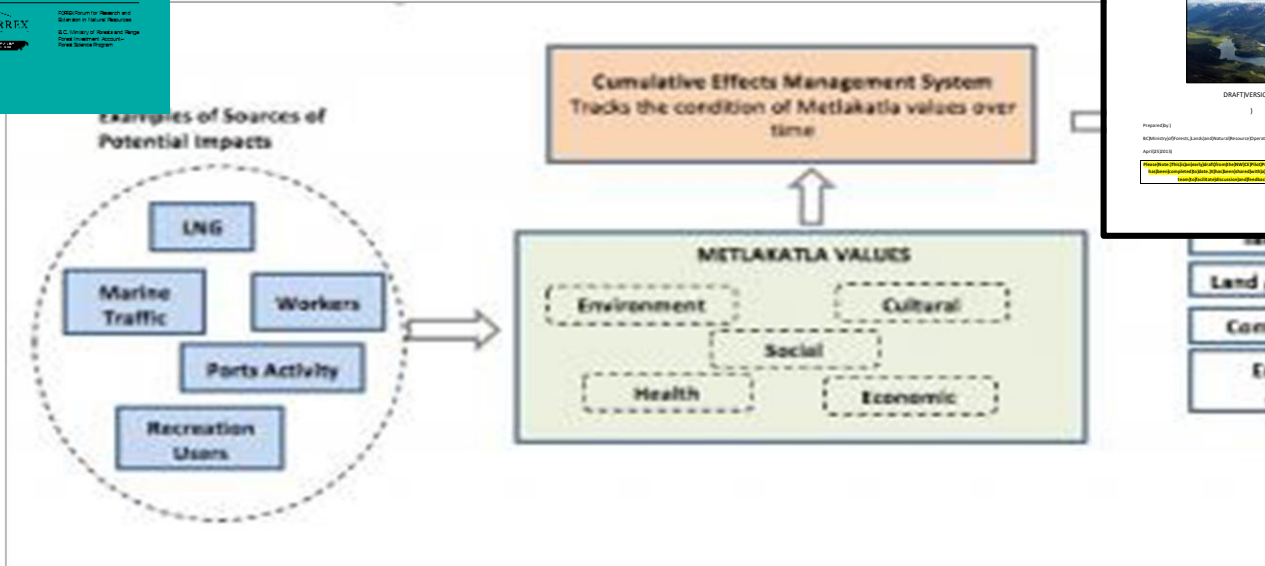
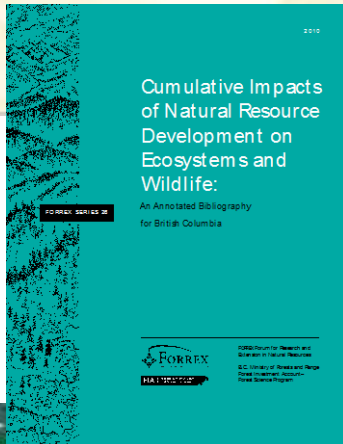
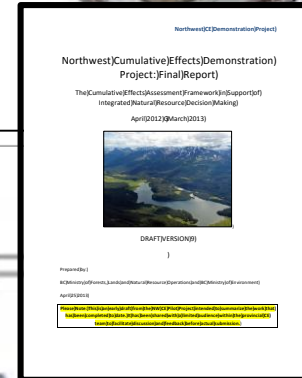
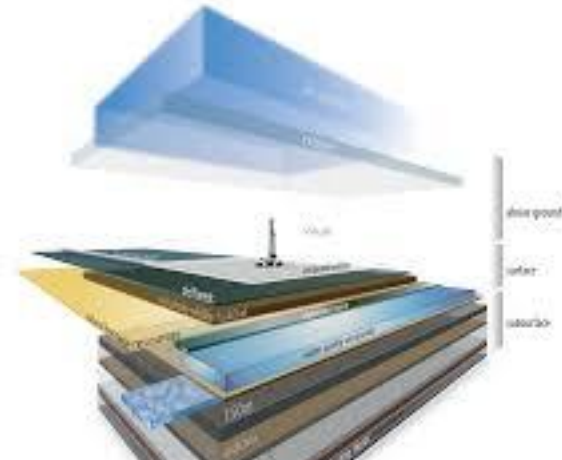




## Addressing Cumulative Effects in Natural Resource Decision-Making

A Framework for Success

# What do we know about cumulative impacts?



# However, significant gaps still exist in scientific knowledge...

- Thresholds for change, tipping points, and management triggers
- Robust science on environmental effects, longer term impacts less well understood
- Studies typically communicate potential rather than actual risk to environments

# ... and in practice

- Limited consistency in assessment across sectors
- Incorporation of socio-economic, cultural and health values into assessments
- Few (but growing!) number of regional, landscape-level assessments
- Public discussions of balance between avoidance of development vs. minimization of risks vs. restoration

A circular graphic composed of several overlapping, curved segments in shades of red and blue. The segments are arranged in a roughly circular pattern, creating a sense of movement or a cycle. The background is a light, textured surface, possibly wood or stone, with some faint lines and shadows.

**Moving forward with integrative tools  
for thoughtful action**



# New tools for integrated cumulative impact assessment and land-use planning

**Project Goal:** to provide new, integrative and holistic supports for communities that reflect environment, community and health values to better understand the cumulative impacts of resource development

## LEARN

about and participate in the practice of cumulative impacts assessment

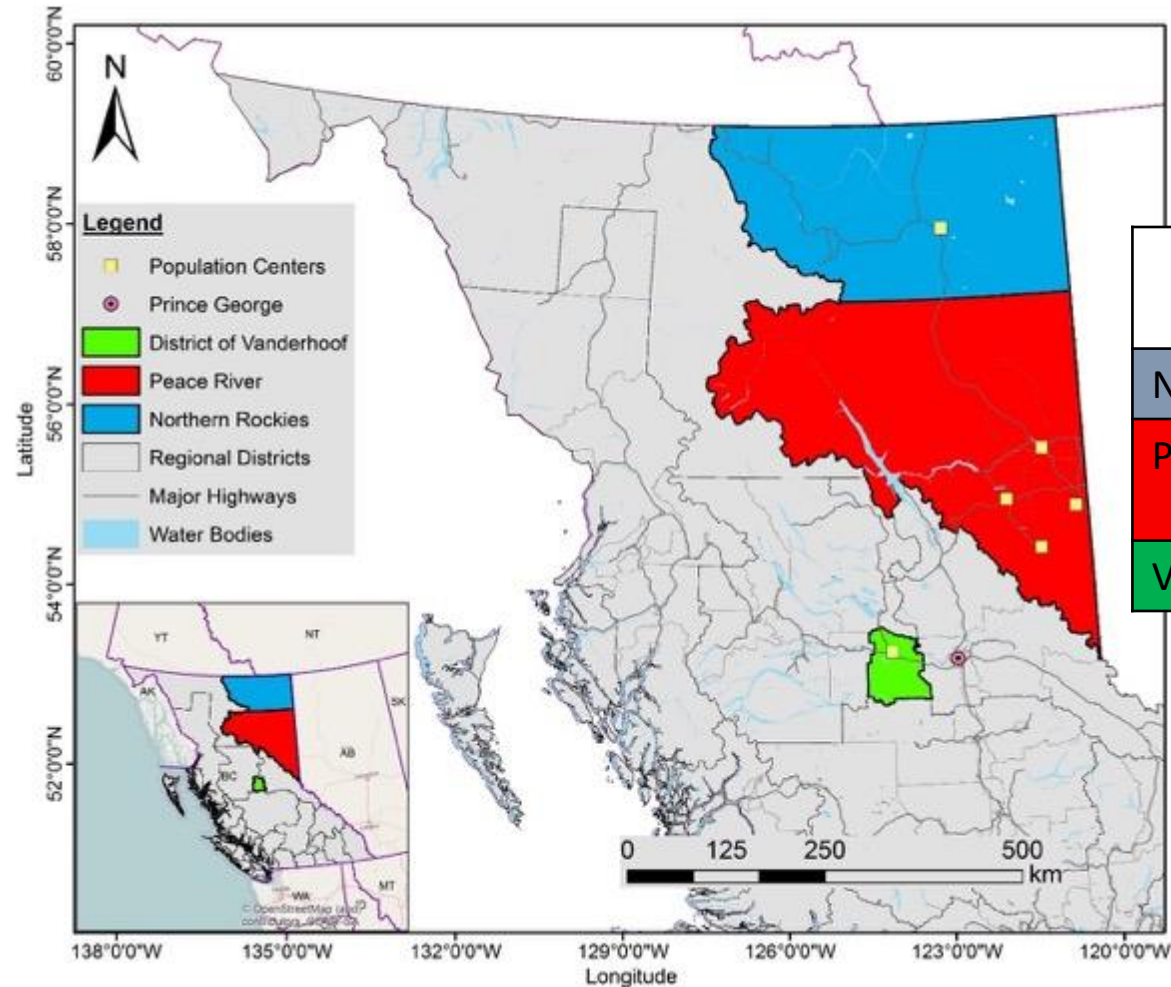
## SHARE

best practices, local knowledge, experiences and ideas

## ENVISION

the next generation of integrated assessment tools

# “New Tools”: Case Study Communities



Communities	Area (km <sup>2</sup> )	Population (2011)
Northern Rockies	85,111	5,578
Peace River	117,391	60,082
Vanderhoof	13,870	4,480

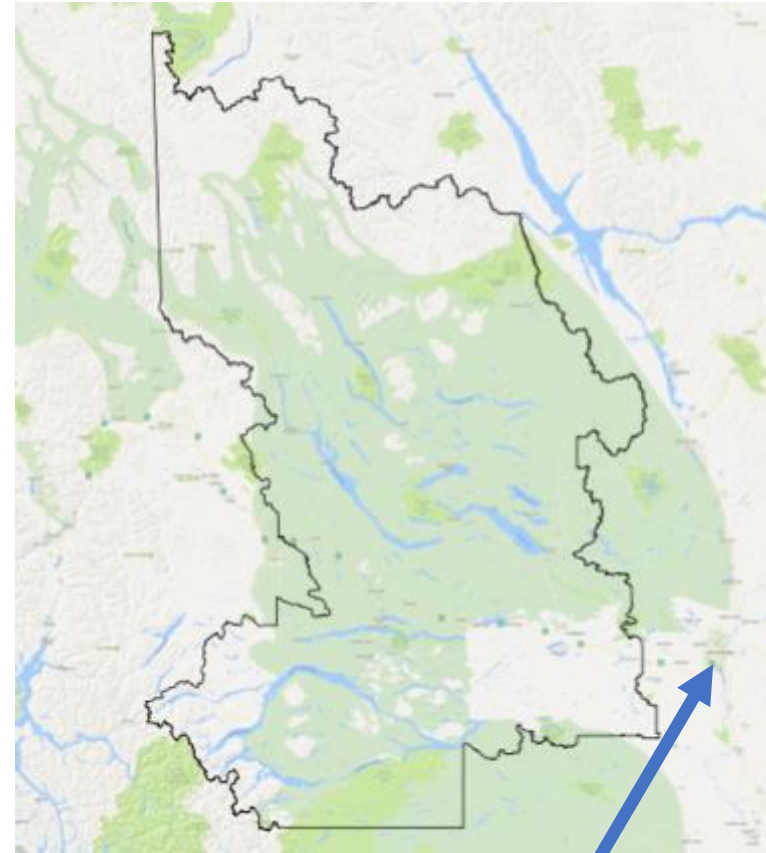


# **Tool and Process #1 – Integrated Values Mapping**

# Tool/Process #2: Youth values workshop with SD91

**Goal: To explore youth perspectives on environmental, community and health values in and around the Nechako/Vanderhoof region through an interactive values-mapping activity**

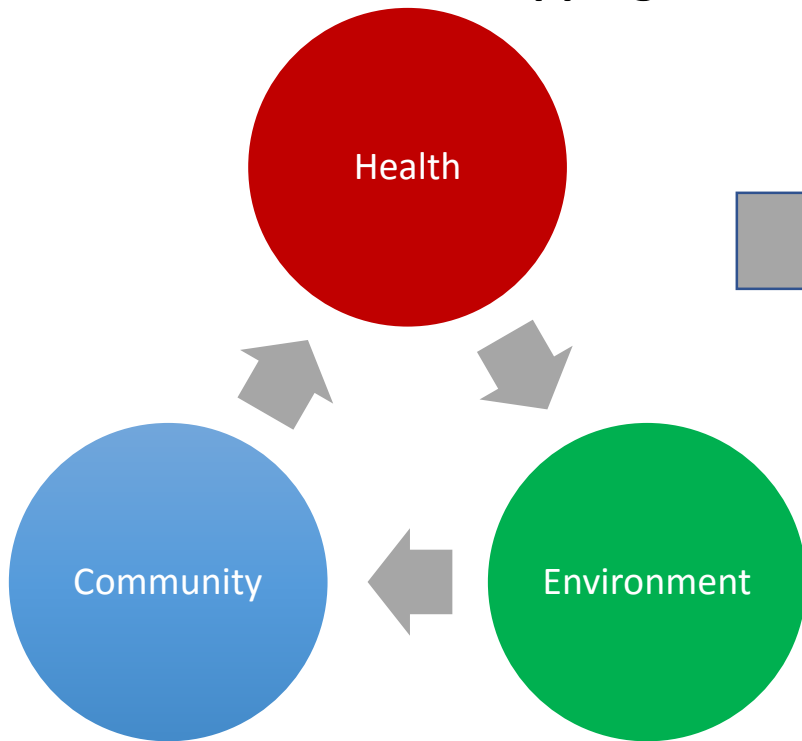
- While public consultation is typically a central and often mandated part of the assessment process, youth voices are often underrepresented in current practices at best, or missing entirely at worst



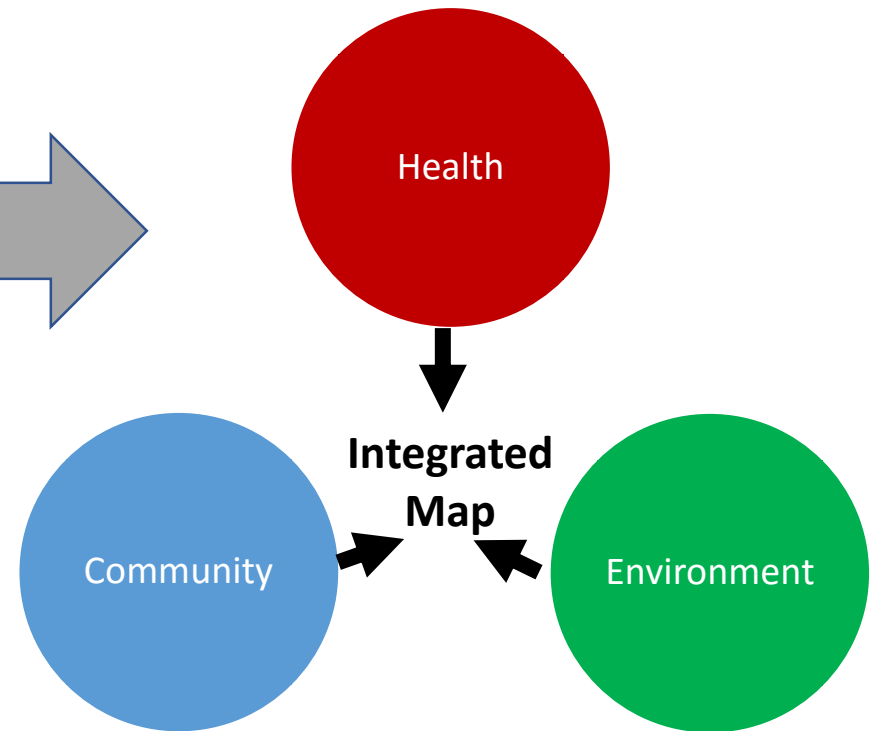
Prince George, BC

# Phase 1 (Process): Values Elicitation

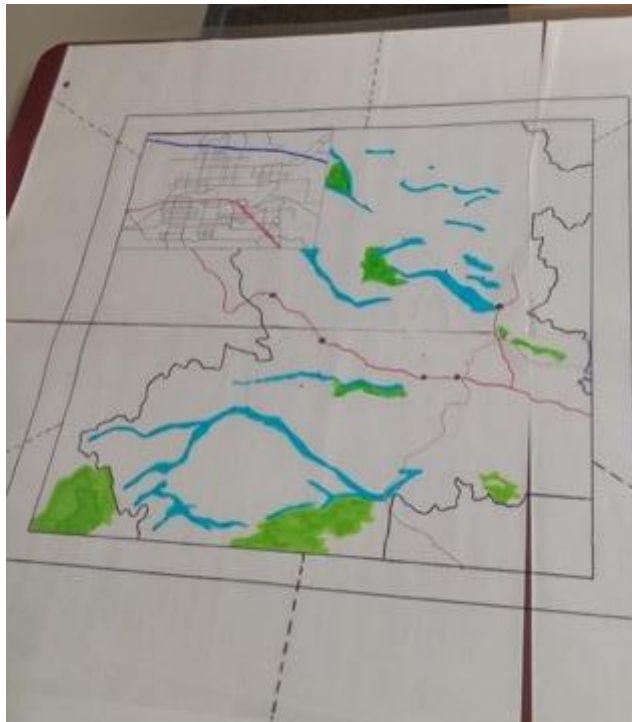
**Small Group Roundtable  
Discussions  
and Values Mapping**



**Integrative Debrief  
and Large Group  
Discussion**



# Example Map (Start) → Example Map (Round 1)



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# Phase 2 (Tool): Example Map (Completed)

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<b>Legend</b>		
<b>Class One: Environment</b>		
1.	Gravel trail	
2.	Horseshoe riding	
3.	Challin Lake	
4.	Swimming at a friend's home	
5.	Hiking trail	
6.	Gravel bike track	
7.	Roadside park	
8.	Want a new bike park in this location	
9.	Mount Pope	
10.	Camping location	
11.	Sharing	
12.	Changes in the environment - Fire	
13.	Changes in the environment - Fire	
14.	Changes in the environment - Fire	
15.	A. Thom & Thom	
16.	Arm	
17.	Natchik River	
18.	Walking in the lake	
19.	Hunting location	
20.	Saltation and Stubbart horses	
21.	Beaufort Campsite	
22.	House habitat	
23.	Hogback Lake	
24.	Quail alongside the road	
25.	Ice fishing	
26.	Horseshoe riding	
27.	Cutbacks	
28.	Bike park	
29.	A. Farm & Hunting location	
30.	Arm	
31.	Walking location when there is	
32.	Feeder	
33.	7 Elton	
34.	Muskrat lettuce harvesting	
35.	Cow farm	
36.	School	
37.	Swimming in lake	
38.	Wanderhoof	
39.	Tim Irons	
40.	WNS	
41.	School	
42.	Roadside Park	
43.	Shedding in the winter and the	
44.	A. Cheneville Park & Seawing	
45.	Mount Pope	
46.	Hunting location	
47.	Pease's Beach	
48.	Murphy Ridge	
49.	Hogback Lake	
50.	Camping location	
51.	A. Farming on the ranch & in	
52.	ABW	
53.	A. Swimming at home & in	
54.	ABW	
55.	7 Elton	
56.	Tim Irons	
57.	A. South Road & Nature Trail	
58.	A. Colton by Fraser Lake & in	
59.	Community health centre	
60.	Chop grocery store	

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<b>Class One: Health</b>		
1.	Wanderhoof	
2.	Biking trails	
3.	Habitats	
4.	Wanderhoof	
5.	Wanderhoof	
6.	Swimming	
7.	Stuart Lake	
8.	Wanderhoof	
9.	Hogback Lake	
10.	Horseshoe riding	
11.	Halls Green	
12.	7 Elton	
13.	Muskrat lettuce harvesting	
14.	Cow farm	
15.	School	
16.	Swimming in lake	
17.	Murphy Ridge	
18.	Wanderhoof	
19.	Tim Irons	
20.	WNS	
21.	School	
22.	Roadside Park	
23.	Shedding in the winter and the	
24.	A. Cheneville Park & Seawing	
25.	Mount Pope	
26.	Hunting location	
27.	Pease's Beach	
28.	Murphy Ridge	
29.	Hogback Lake	
30.	Camping location	
31.	A. Farming on the ranch & in	
32.	ABW	
33.	A. Swimming at home & in	
34.	ABW	
35.	7 Elton	
36.	Tim Irons	
37.	A. South Road & Nature Trail	
38.	A. Colton by Fraser Lake & in	
39.	Community health centre	
40.	Chop grocery store	

CIRC The Cumulative Impacts Research Consortium		UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA
<b>Class One: Community</b>		
1.	Tim Irons	
2.	Subsides	
3.	Bike park	
4.	Bike park	
5.	7 Elton	
6.	Hospital	
7.	Churnies	
8.	Clinc	
9.	Soccer field	
10.	Elementary school	
11.	Pease's home	
12.	ABW	
13.	Community band	
14.	Arava	
15.	Tim Irons	
16.	A. South & Bike park	
17.	A. Sturgeon Release Facility & Hogback Lake	
18.	Community band	
19.	Swimming pool	
20.	Ones Lake	
21.	Murphy Ridge	
22.	Roadside Park	
23.	Exhibition grounds	
24.	Araven	
25.	Beaufort Campground	
26.	Nith Lake	
27.	Camping on Stuart Lake	
28.	Scot Trade	
29.	Soccer fields	
30.	Campsite	
31.	Pease's Beach	
32.	Chop country 68 trails	
33.	Library	
34.	Community garden	
35.	Mount Pope	
36.	A. WNS & WNS	





**Tool and Process #2 – Integrated  
Cumulative Impact Assessment and  
‘Data-driven story-telling’**



# Stage 1 (Process): Elicitation of Community Values

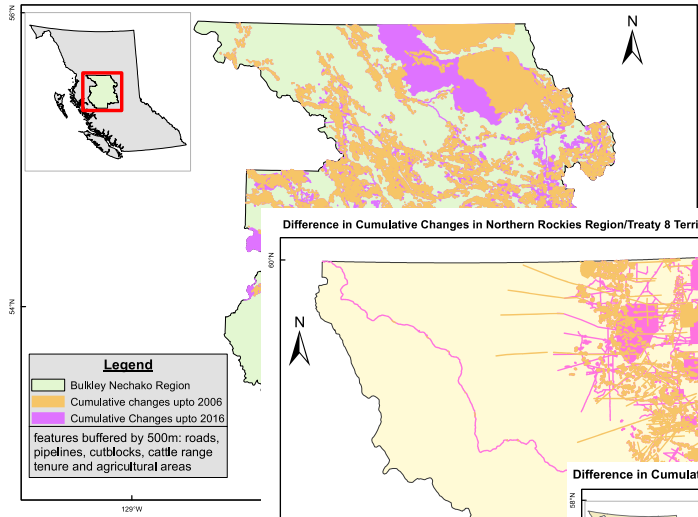
## Fort Nelson

Meta-Value	% of all votes
Balance between development and conservation	15.4%
Health/promotion/prevention	12.5%
Connecting communities through reconciliation	7.7%

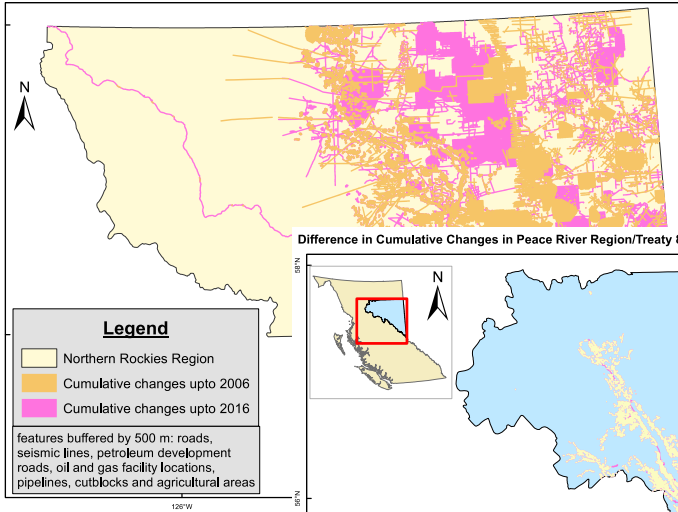


# Phase 2 (tool): Building integrated cumulative impact assessment pilots

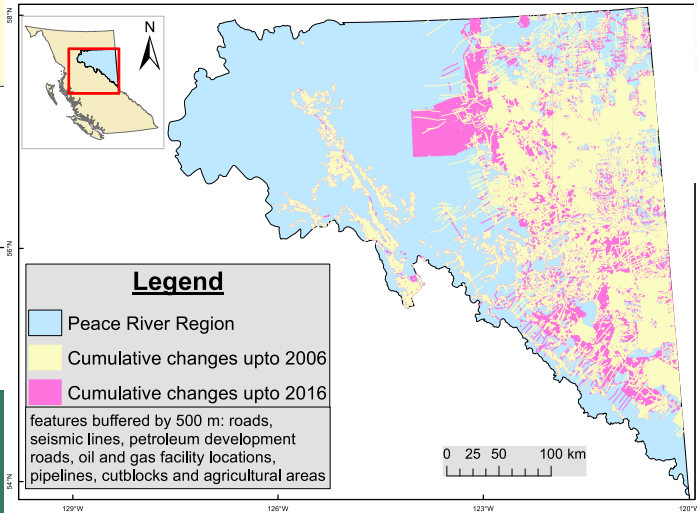
Difference in Cumulative Changes in Bulkley Nechako Region between 2006 & 2016 (buffered by 500m)



Difference in Cumulative Changes in Northern Rockies Region/Treaty 8 Territories between 2006 & 2016 (buffered by 500m)



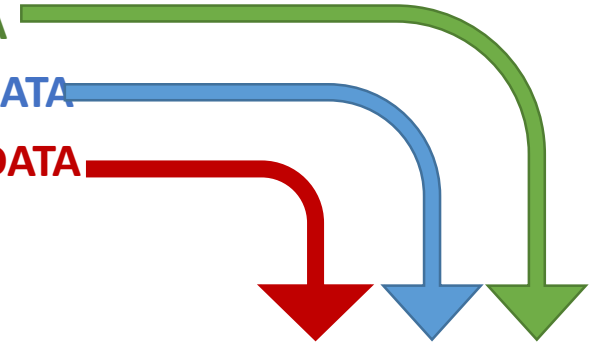
Difference in Cumulative Changes in Peace River Region/Treaty 8 Territories between 2006 & 2016 (buffered by 500m)



ENVIRONMENT DATA

COMMUNITY DATA

HEALTH DATA



**Regional Statistics by Treaty 8, 2008**

**Regional Demographics**

**Social Services and Growth**

**Regional Demographics**

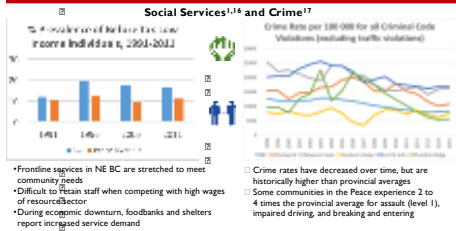
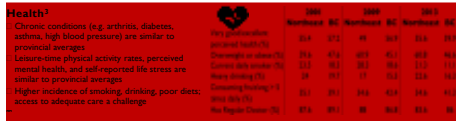
**About this project**

**Context**

**About the CIRC**

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# Integrated Regional Profiles



### Contact

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 W: [www.unbc.ca/cumulative-impacts](http://www.unbc.ca/cumulative-impacts)  
 P: +1 250.960.5778

### About this project

CIRC—with funding from the Real Estate Foundation of BC—is focused on broad and inclusive public engagement. This project seeks to build new tools to support regional cumulative impacts assessment and enhance natural resource decision-making.

### Add a project to our living library of resources:

[cumulativeimpacts@unbc.ca](mailto:cumulativeimpacts@unbc.ca)

### About the CIRC

The CIRC is a pan-UNBC initiative and a platform for original research and community dialogue on the cumulative environmental, community and health impacts of resource development. We are located in Prince George.

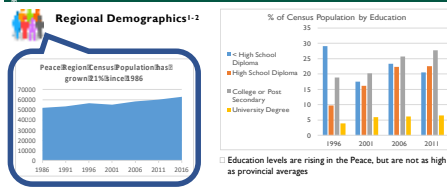


## Exploring the Cumulative Impacts of Resource Development: A Regional Profile of the Peace River Region, British Columbia

### About this document

Resource development is a primary driver of local economies and social development in northern communities across British Columbia. However, there is an increasing need to understand the long-term positive and negative impacts of development activities for environments, communities and human health. This regional profile integrates a variety of data sources to provide a 'snapshot' of change in the Peace River Region over time. While this is one tool to understand cumulative impacts of development activities, the perspectives and lived experiences of communities are an equally important source of information. UNBC's Cumulative Impacts Research Consortium (CIRC) hopes this document, and the stories it elicits, will inform a collective conversation on the following question:

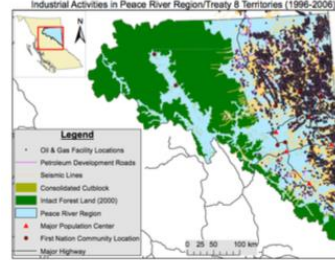
**"How do we make better land-use decisions that account for long-term impacts to environmental, community and health values?"**



The region typically grows 2-5% per year  
 Between 1996-2001 there was a 2.5% decrease in regional population

The region typically grows 2-5% per year  
 Between 1996-2001 there was a 2.5% decrease in regional population

Residents of the Peace have a strong sense of connection and belonging to their communities.<sup>2</sup>



### Climate Change (2030)

- Warmer winters, hotter summers
- More consecutive days of rain in the fall
- Increase in extreme rainfall and other severe weather events (drought, fire risk)

### Air Quality

- Between 1986-2011, 15 monitoring stations in the region found few exceedances of provincial air quality standards for SO<sub>2</sub>, NO<sub>2</sub>, H<sub>2</sub>S and PM<sub>2.5</sub>
- PM<sub>2.5</sub> exposure continues to be a health concern from increased traffic patterns and fire activity

### Water Quality

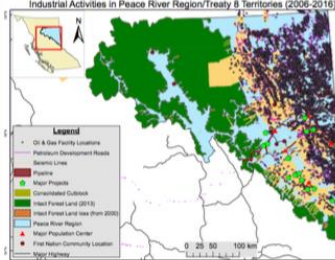
- General worsening of water quality over time, but no present health risks
- Limited data on ground water quality as a result of increased hydraulic fracturing

### Wildlife

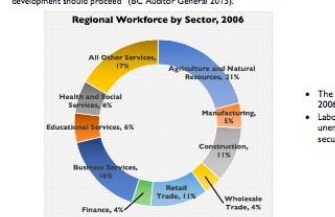
- Not cumulative impacts on grizzly bear, lynx, fisher, wolf, wolverine and caribou is significant
- Absolute reductions in regional landscape effectiveness among species range from 7-47% at present to a projected loss of 1-55% in 25 years

### Agriculture Land Reserve (ALR)

- 11% of the Peace is within the ALR; the Peace comprises 27% of the provincial ALR
- Farm size and operating expenses have increased over the past 25 years, and the area experienced a 7% decline in productivity between 2008-2011



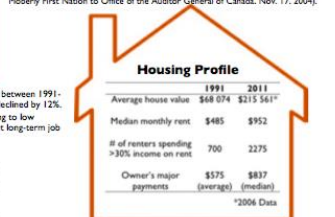
"Sustainable management of this area is critical also for the protection of our rights guaranteed by Treaty 8, namely the right to hunt, fish and gather. The exercise of Treaty rights are closely tied to the health of ecosystems and therefore, negative impacts to the ecosystem constitute infringement of those rights" (Chief Roland Wilson, West Moberly First Nation to Office of the Auditor General of Canada, Nov. 17, 2004).



- The region's workforce remained consistent across most sectors between 1991-2006. Business Services increased by 14%, and all other services declined by 12%.
- Labour demands have outpaced local workforce availability, leading to low unemployment rates. However, there are growing concerns about long-term job security and the economic future of the region more broadly.

### Employment Profile

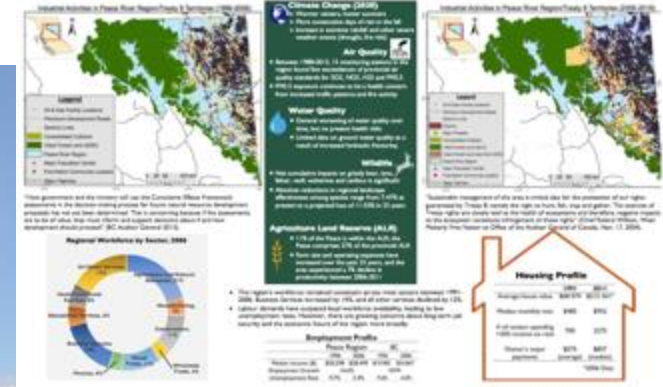
	1996	2006	1996	2006
Median Income (\$)	\$23,298	\$28,499	\$19,982	\$24,887
Employment Growth	16.6%		18.2%	
Unemployment Rate	9.7%	5.4%	9.6%	6.0%



# Phase 3 (Process): Data-driven storytelling

***“I guess for me it was the flooding of the Williston Reservoir...And that’s had a huge impact on the whole area. The forest base has been destroyed, the impact on residents, on First Nations, the residents who have waited 40-45 years to claim settlements. The change, I mean it’s a piece of land that’s basically inaccessible by most people now. It has had an enormous impact on the area, both social and environmental. I made money off that, I worked at the dam, I was employed in construction. It has changed our world”***

***-Participant, Fort St. John***



## Other Examples of “New Tools” (1)



### WELCOME

The Cumulative Impacts Living Library is a searchable database of projects and organizations broadly related to the cumulative impacts of resource development in Canada.

Feel free to browse through the various projects and organizations by visiting the *Library* page. You can narrow your search by selecting one of the regions listed, or by entering various keywords into the search tool.

[www.Cumulativeimpactslivinglibrary.ca](http://www.Cumulativeimpactslivinglibrary.ca)

# Other Examples of “New Tools” (2)

## Indicator Development for Improved Socioeconomic and Health Impact Monitoring in Environmental Assessment Processes (funded by HRI w/ Northern Health and PHSA)

	Indicator	Description	Available Data Sources	Original Documents
Safe Housing	Access to safe housing	The right to accessible, secure, affordable, culturally appropriate, and habitable housing	Statistics Canada - Shelters for abused women, 2014. Transitional homes in Canada	Opportunities to Meet the Health Needs of the Stuart Lake/Nak'at' Bun Area
	Homes are safe and secure	Whether an individual would consider where they live to be a safe and secure place of residence	Statistics Canada - Shelters for abused women, 2014. Transitional homes in Canada. Housing and shelter costs	Ellison et al., 2015. Ellison, C., Wyman, O., Reynolds, C., & Alessi, C. (2015). Measuring wellness: An Indicator Development Guide for First Nations. Ktunaxa Nation Council.
	Number of smoke free homes	The number of homes that are non-smoking. Residents of the home do not smoke indoors.	Statistics Canada - Second hand smoke	Ellison et al., 2015.
	Percentage of homes with smoke alarms	The percentage of homes that are equipped with an adequate number of functioning smoke detectors	BC Stats - BC Annual Statistical Fire Report, 2012. Statistics Canada - Survey of emergency preparedness and resilience	Ellison et al., 2015.
Housing maintenance	Houses without running water/kitchen facilities	The number of homes within a given area that are without necessary services such as running potable water and access to kitchen and cooking facilities	Source not given	Ellison et al., 2015.
	Percent of homes served by centralized water treatment plants and sewage disposal systems	The number of homes in a community that are receiving essential services of water treatment and adequate sewage disposal	Environment and Climate Change Canada - residential water use 1991-2011. BC Stats - environmental reporting BC	Ellison et al., 2015.
	Number of homes needing repairs (minor, major, regular maintenance)	The number of homes in a given community that require any degree of maintenance	National household survey, 2011. Census 2006, 2011, Statistics Canada - housing conditions	Ellison et al., 2015.
	Percent of homes served by centralized minor or regular maintenance	A percentage of the number of homes being responsibly and adequately maintained within a community	National household survey, 2011. Census 2006, 2011, Statistics Canada - housing conditions	Ellison et al., 2015.
	Number of properties under construction	The number of properties that are currently under construction within a given period of time	Canada Mortgage and Housing Corporation, local contractors and sub-contractors	LNG Canada CLISMP
	Number and value of building permits issued		BC Stats (Municipal permit records)	Grassy Point LNG
				Grassy Point LNG, Standard Working Group Comments and Recommendations for Provincial Environmental Assessments in Northern British Columbia: Suggested Candidate Valued Components for Assessing Health Impacts
Social housing and homelessness	Social Housing usage rates	The vacancy rates for social housing units within a community	BC Stats	Grassy Point LNG, Standard Working Group Comments and Recommendations for Provincial Environmental Assessments in Northern British Columbia: Suggested Candidate Valued Components for Assessing Health Impacts
	Number of social housing properties	The number of social housing homes within a community	Canada Mortgage and Housing Corporation	LNG Canada CLISMP, Interim Support for Developing Health Baselines for Projects in the Prince Rupert Area
	Waitlists for affordable/assisted housing	Whether or not there is a waitlist in order to be placed in an assisted housing unit	Canada Mortgage and Housing Corporation	LNG Canada CLISMP
	Number of members on housing waitlist	At least 30 members have been on the housing waiting list since 1990	Assembly of First Nations, 2013. Indigenous and	Talka Lake First Nation Socioeconomic Study 2014
	Homelessness rate	the condition of people without a permanent dwelling, such as a house or apartment, often with the inability to maintain safe and secure housing	Statistics Canada (PROXY MEASURES)	Standard Working Group Comments and Recommendations for Provincial Environmental Assessments in Northern British Columbia: Suggested Candidate Valued Components for Assessing Health Impacts
	Homeless count	The number of individuals residing within a community that are without a home (including couch surfing, and those living on the street)	Statistics Canada - number of people living in shelter during the census, residential facilities (shelters) for female victims of domestic violence. (PROXY MEASURES)	LNG Canada CLISMP, First Nations Health Authority Northern Caucus Overview of Sub-regional Engagement Sessions: Health and Resource Development Fall 2015
	Overcrowding	the situation in which more people are living within a single dwelling than there is space for, so that movement is restricted, privacy secluded, hygiene impossible, rest and sleep difficult	Statistics Canada - Persons per room of private household	Standard Working Group Comments and Recommendations for Provincial Environmental Assessments in Northern British Columbia: Suggested Candidate Valued Components for Assessing Health Impacts, BC. Murray River Coal, Ellison et al., 2015

# Additional projects Incubated through the CIRC Initiative

- A case study review of innovative and cost effective brownfield remediation strategies in rural and remote communities (BC OGC)
- Examining the ‘state of the art’ of CEA in BC through interjurisdictional comparative case studies (UNBC / NSERC)
- Examining the community impacts of unconventional natural gas development in BC along the supply chain (SSHRC)
- Analyzing the health equity impacts of unconventional natural gas development (Michael Smith Foundation for Health Research)
- Whose brownfields count? Effective brownfield remediation strategies for rural and remote communities

# Discussion

- Resource development across Canada has left lasting environmental, community and health impacts
- There is increasing appetite to revisit landscape-level planning in BC, but to do so we must consider...
  - Problems with past landuse planning process (in BC, e.g. LRMP)
  - The integration of community and health values into planning processes beyond \$ contributions to provincial coffers
  - Strategic consideration of meaningful units of analysis that map onto existing data availability at the regional level
  - Incorporation of lived experience of marginalized stakeholders into the planning process



# Thank you!

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For more information about related projects incubated through the CIRC:

[www.unbc.ca/cumulative-impacts](http://www.unbc.ca/cumulative-impacts)



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Research Consortium

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# Discussion

- What has been the experience of managing for cumulative effects/impacts of development activities in Alberta?
- What tools and processes are you aware of that could help balance diverse land-use values in an integrated way?