



Resource Works
JOBS FOR BC. INNOVATION FOR THE WORLD.



LNG

A Citizen's Guide To LNG **Sea to Sky Country Edition (2015)**

British Columbians today are being asked to evaluate an opportunity to foster a natural-gas export industry.

This guide was produced by Resource Works – a B.C. non-profit society devoted to examining all sides of complex resource questions.

A Citizen's Guide To LNG

What all residents should know about the production and maritime export of natural gas in British Columbia

Sea to Sky Country Edition

Resource Works Society, March 2015

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About the *Citizen's Guide to LNG* project

The Resource Works Society

Resource Works is an independent, non-profit British Columbia Society open to participation by citizens from all walks of life who are concerned about their future economic opportunities.

Resource Works was begun as a response to the widespread observation that better information for all is needed on the path to meaningful public discourse on matters central to the quality of life of British Columbians.

The Resource Works Society Advisory Council brings together noteworthy British Columbians from a wide variety of backgrounds who see the value of this important work:

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We rely on our supporters and volunteers. Please see our website for ways to get involved: www.resourceworks.com and look for our events in your community during 2015.

This publication

The Citizen's Guide to LNG (Sea-to-Sky Country Edition) is published free of charge by the Resource Works Society as a public service. See it online <http://www.citizensguidetobclng.org/>

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Vancouver, British Columbia

Questions for us?

In the interests of ensuring subsequent editions are as up to date and accurate as possible, we welcome reader dialogue:

Please email us at info@resourceworks.com with "Citizen's Guide" in the subject line.

Follow us on Twitter: @Resource_Works

Find us on Facebook: <https://www.facebook.com/resourceworks>

Watch our weekly web television show, Higher Ground:

<http://www.theprovince.com/news/topic.html?t=keyword&q=higher+ground>

Executive Summary

The export of natural gas from British Columbia to overseas markets represents a major shift in the economic standing of the province. It will free up a resource commodity to be traded on the international market so that its full value can be realized.

Key points of this paper:

- Natural gas (NG) is a dependable, abundant, clean, and efficient source of energy. British Columbia has been exporting it for decades, and in today's global economy there is a strong case for converting NG into a liquefied form (LNG) allowing it to be sold into new markets. Safe and modern shipping practices exist to facilitate this.
- Today, specific projects are being considered that require approval processes, allowing citizens to find answers to the questions they may have.
- The *Citizen's Guide to LNG*, from the Resource Works Society, is designed to help answer these questions.
- What makes natural gas exports a local issue? We explore issues relating to "responsible" resource use and what it means to consider both the environmental and the economic sides of any question.
- In this, the Sea to Sky Edition of the *Citizen's Guide to LNG*, we look at a number of specific local issues.
- In Sea to Sky Country, the values of a diverse, balanced economy have been recognized by citizens and municipal leaders.
- Safety questions are examined in detail.
- The possible impacts on employment, local infrastructure and taxation, and funding of needed social services are also covered.
- We look at how First Nations are already engaging in natural gas business opportunities.
- A section covers consultation processes – what rights do citizens have? We explain the environmental approval process. A detailed section is devoted to the laws and regulations that apply to natural gas as it moves through the upstream, midstream, and, finally, downstream phases.
- A number of topics were selected for expanded discussion around the regulatory framework. In particular, we look more deeply into fracking and water integrity.
- We have provided current background information to guide further research.
- The final component is the submission presented to the District of Squamish council by Resource Works on March 3, 2015.

Introduction

Why responsible use of natural gas is a local issue for every B.C. resident

We must secure a prosperous existence for British Columbians and a bright future for our children and our children's children.

British Columbians today feel pulled in different directions when it comes to the use of natural resources. Thanks to the bounty that comes from our rich land, British Columbians enjoy freedom from want and illness at a level rarely seen in human history.

At the same time, we are conscious that failing to manage our ecological footprint to the best of our abilities equates to a moral failing that is unacceptable to the majority of us.

Municipal leaders must navigate complex public conversations at the same time as developing their economic plans and community development strategies.

Information that emanates from sources such as senior governments and industry can face a high threshold of skepticism. The public has told us that it needs additional sources of information to validate the competing claims they hear.

We listened. In just our first year, Resource Works has attracted citizen volunteers and thousands of supporters who were quick to realize the value and timing of this work.

Resource Works is supported by a broad coalition of British Columbia leaders from educational institutions, First Nations, trade unions and industry, environmental science, multicultural communities, and municipal government.

Resource industries pay royalties as well as taxes, setting them apart from other industries. BC's citizens strongly support resource activity, according to Resource Works opinion research.

Whether it is raises for teachers or new ferries, public sector costs ultimately go back to the individual taxpayer. What is here one day is not necessarily here the next. If we don't seize responsible resource opportunities when they are available, we are at risk of unwittingly choosing higher taxes and fewer services.

Major international investment decisions will in part be based on the ability of British Columbia as a community to show that it is a place that is willing to do business. It is not like there is no incentive for B.C. residents. Without growth in the economy, rising public expenditures like health care – up \$516 million in the latest provincial budget – will inevitably mean higher taxes or a lower standard of care.

In municipal decision-making, the deciders are challenged to consider evidence that may at times seem contradictory. They are under pressure from citizens rightly concerned about climate change and environmental protection.

The natural gas to be exported is exactly the same type of natural gas used today in approximately 60 per cent of British Columbia homes to provide heat and hot water, and cook food. It has been used safely here since at least the 1930s. The province's track record in regulating safe hydraulic fracturing (fracking) dates back half a century.

Natural gas has many benefits:

- It is safe to extract, move, liquefy and ship;

- It burns cleanly, producing fewer pollutants and harmful particulate matter relative to other fuels;
- It has many uses – not just in energy but also in manufacturing.

Natural gas produced in British Columbia is a powerful economic driver. Although few residents will ever set foot on a gas field, since they are all located in the remote North East of the province, every citizen benefits.

Construction, the largest employer in Squamish, is also closely linked to natural gas and thus LNG. In 2014, capital investment in mining and natural gas in B.C. was worth \$7.3 billion.

In 2013, the gas industry spent \$8.3 billion in the province on everything from taxes and royalties to wages and equipment.

Natural gas may be relatively small in its direct employment needs (sometimes this is singled out as a negative). Yet those British Columbians who work out in the field produce *six times* the export earnings of their fellow residents.

Natural gas in liquefied form has many attractive features. It is efficient, safe, valuable, and exportable around the world to markets where it is needed and wanted. Local concerns need to be considered – and so do the benefits that directly impact all British Columbia residents.

LNG is a matter for public focus today for the simple reason that Canada's natural gas exports have until now gone entirely to one country, the United States. That customer has, however, now got gas supplies of its own which make it less reliant on Canada.

LNG is a way to monetize British Columbia gas, making it a commodity any nation can buy – while giving BC the trading power to import things like equipment, medicines and clothing.

The west coast of Canada has prime market advantages that have caused some 18 project proponents to invest in gas-export proposals.

Can we rise to the occasion and manage any risks through the use of world-leading resource technologies and regulations?

In Sea to Sky Country, the long track record of the forest industry may help to provide a model on which constructive discussions can be based to form understanding of an industry that is new to the region.

For those who find themselves nodding in agreement when they hear that natural gas is an evil to be stamped out, looking no further than their own stove or hot water tank should be enough to convince them there is more to the issue. Or they can look to the ferries they ride that must be refitted or replaced, to the highways that must be maintained, and to the schools that natural gas revenues help to pay for – \$17 billion in gas royalties alone in one recent 10-year period.

We hope you will find the answers here.

Third parties such as the Resource Works Society are stepping into an urgently needed role – gathering, sorting, analyzing and sharing neutral, fact-based information that helps us to understand responsible natural resource development in British Columbia. Without efforts like this, it is likely that middle-ground dialogue would not be emerging as quickly as it is in 2015.

The *Citizen's Guide to LNG* is the result. We hope the majority of citizens will find their values represented here.

Public opinion and LNG

In search of economic-environmental balance

A clear majority of British Columbia residents see, and value, the beneficial effects of a significant natural resource component in the provincial economy. However, they are also clearly not in line with harming the environment.

Residents see the positives of our resource-dependent economy

Resource Works Society conducted a public opinion poll in which we tested a number of statements of a general nature relating to the natural resource economy of BC.¹ We found agreement with the following:

- “Compared to other places, businesses operating in BC do a good job of balancing their economic interests with the need to protect the environment”: **76% agreement**
- “The wealth generated by the natural resource sector allows BC to create jobs in other unrelated industries like tourism and film”: **75%**
- “Resource industries in BC have a good track record in protecting the environment while delivering economic benefits like jobs and tax revenue”: **68%**
- “The wealth and taxes generated by the natural resource sector help to pay for education, healthcare and other social services”: **63%**
- “The province’s economic future would be a concern if the natural resource sector in BC went into decline:” **75%**

We see the economic/environment connections – yet there is a problem with trust

Protecting the environment and diversifying the economy are issues that frequently surface in public conversations. We tested six statements and found that there is strong support for responsible resource development – that the “either/or” choices that we often think we are facing are actually not seen that way by most residents:

- “British Columbians should be able to develop resources and create jobs in new sectors at the same time”: **88% agree/9% disagree**
- “British Columbia needs to work towards creating “green jobs” to reduce our dependence on resource sector jobs”: **84%/14%**
- “British Columbia has an important role in Canada as the gateway for resource exports to growing parts of the world”: **82%/16%**
- “Companies in the natural resource sector are usually only interested in profit and only do the minimum necessary to satisfy local concerns”: **70%/27%**
- “The natural resource sector in British Columbia is a world leader in responsibly developing resources”: **54%/37%**

¹ BC Job Initiative Project, 800 respondents, +/-3.5%. Conducted for the Resource Works Society by Maple Leaf Strategies.

LNG and the new, green economy

Survey respondents welcomed an increasingly green economy, with 71 per cent (whether they live in the city or in rural areas) believing it is possible to expand green jobs and the green economy *within* the natural resource sector.

Industries that are not so easy to spot, because they are located mainly out of sight in remote resource-producing regions of the province, tend to be rated as less important than industries that are easier to see.

Tourism's positive image

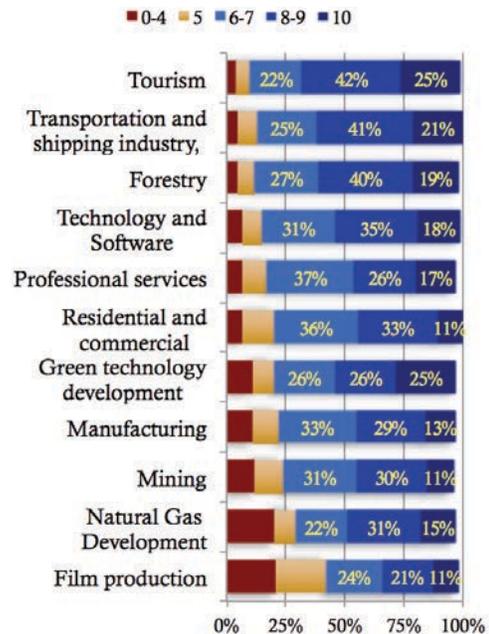
British Columbians see tourism as the province's most important economic driver. Tourism is easy to spot if you live in Metro Vancouver. It carries positive cultural associations and is seen as "green". In a survey conducted for Resource Works, residents believed that tourism was number one while natural gas was the second *least* important sector (20% not important/48% important), behind only film production (21%/35%).²

Tourism's growth in real numbers and in positive support is a good step toward B.C.'s economic diversification. However, the perception that it is the greatest contributor is deeply flawed.

In fact, natural gas has been one of the most productive generators of royalties, direct jobs, and a complex supply chain that stimulates growth throughout the British Columbia economy. It really should be near the top of this list. For example, for every \$1 of capital investment in the tourism industry in 2014, mining and natural gas planned to spend \$8.20.³ The impact of high resource-industry spending can be hard to see, especially for those who reside in Metro Vancouver and surrounding areas, yet it is crucially important.

What the data showed us most of all is that diversification is desirable. We don't need to make either/or choices. As this *Citizen's Guide* shows, the actual facts of the economic relationships are often quite different from the perceptions. Starting with a well-informed and commonly agreed fact set is a positive starting point for any public discussion.

*QUESTION: "How important is each industry to the overall provincial economy in BC?"
0 is least, 10 is most.*



² Maple Leaf Strategies - November 2013

³ Table A1.6, "Capital Investment by Industry". Comparing "Mining and Natural Gas Extraction" with spending in these two categories: "Arts, entertainment and recreation" and "Accommodation and food services". B.C. Financial and Economic Review 2014, p. 74.

LNG: Key facts

Background

Natural gas is the world's fastest-growing primary energy source. Economic growth, the abundance of natural gas, its clean-burning nature and its wide applicability as a fuel source have been driving this demand.

LNG is simply natural gas in its liquid state. When natural gas is chilled to a temperature of about minus 160° C at atmospheric pressure, it becomes a clear, colorless and odorless liquid. This process takes place at a liquefaction facility.

British Columbia has abundant conventional natural gas resources spread throughout northeast BC. These resources have been the focus of development over the past 50 years.

The LNG shipping industry continues to grow rapidly with global demand for LNG expected to increase by more than 50 percent by 2030. LNG allows countries with limited natural gas reserves or limited access to long-distance transmission pipelines to meet their demand for natural gas.

LNG's appealing qualities include:

- High energy-density for transport storage
- It occupies 1/600th the space of natural gas⁴

The path to Liquefied Natural Gas

Taking natural gas to market includes the following key stages:

- Identifying the location of natural gas reserves
- Drilling wells
- Extracting gas
- Moving gas to liquefaction facility
- Liquefaction
- Shipping
- Regasification

⁴ <http://www.acec-bc.ca/media/8659/B1-Journey-from-Natural-Gas-Field-to-Domestic-LNG-Markets-Rev-56-final.pdf>

What LNG do we export today?

Canada has no operational LNG export facilities. In early 2015, it is commonly stated that nearly 20 proposed LNG export facilities in Canada have entered the regulatory review process. At least 16 of them are in British Columbia and one is in Nova Scotia.

Canada's only operational LNG terminal is Canaport LNG's regassification terminal located in Saint John, New Brunswick. North America has the second oldest LNG export facility – Kenai LNG in Alaska. This facility has been serving customers in Asia since it started up in 1969. A second LNG export terminal in North America (Sabine Pass) is scheduled to come online in 2016.

Why should a person care that BC does not yet export LNG?

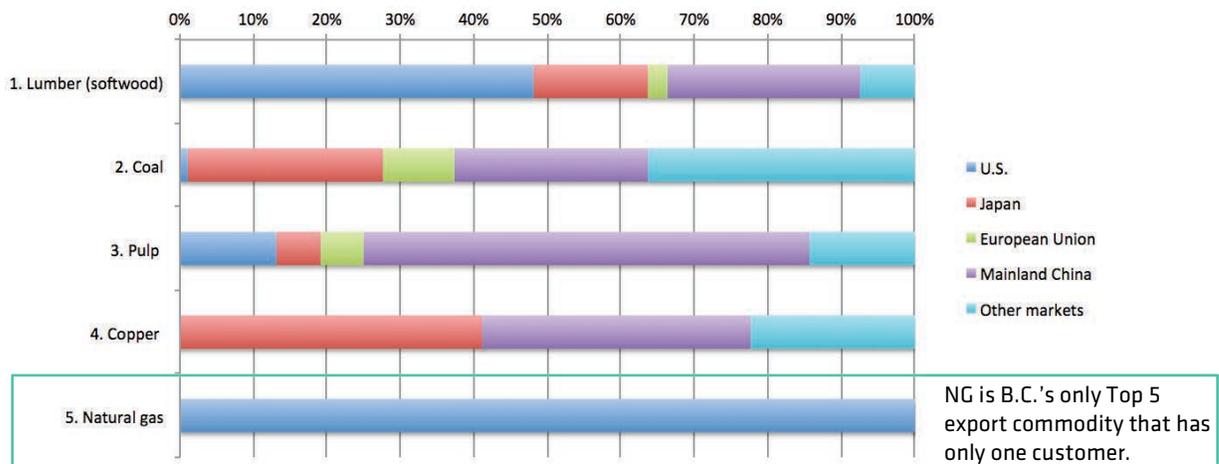
The real question is this: What role does market diversification play in our exports of natural gas, and other resource commodities?

Natural gas (NG) was BC's fifth largest resource export in 2013, by value.⁵ Yet, out of 32 resource commodities exported from BC, it was the only one where all exports went to only a single country (the United States).

When you have only one customer for any product, it is the buyer – not the seller – who dictates the price. So today, BC's NG has to be sold at a price chosen by the United States. To get the best value for ourselves and our heirs from this resource, it only makes sense to seek to bring it to other markets, just like we do today with the other Top 5 commodities.

Liquefying our NG to make LNG will create an internationally tradable product, sheltering our economy in future from the ups and downs of reliance on a single customer.⁶

Market diversification of the Top 5 BC commodity exports by 2013 value



⁵ This fluctuates: in 2008, natural gas was the third most valuable commodity export.

⁶ <http://www.fin.gov.bc.ca/tbs/F&Ereview14.pdf> p 75

How is LNG shipped overseas?

Specially built tanks on double-hulled carrier ships move LNG between liquefaction facilities and import terminals or floating storage regasification units (FSRU). These ships have a sophisticated containment system that holds and insulates the LNG so it maintains its liquid form. LNG that evaporates during the voyage and converts to natural gas (called *boil-off*) is not released into the atmosphere: it is used as fuel to help propel the carrier.

Can LNG be shipped safely?

LNG has been shipped safely around the world for 50 years. There has never been a recorded incident involving a loss of containment of an LNG carrier at sea. LNG carriers are among the most modern ships in operation. These ships have complex containment systems, double-hull protection and are heavily regulated by international and federal standards.

According to the definitive study of LNG storage and public safety, a 2012 report from Sandia National Laboratories: "The potential breaching of an LNG cargo tank due to an accident, such as a collision or grounding appears to be minimal."

The study further stated: "The most significant impacts to public safety and property from an accidental spill exist within approximately 250 m of a spill, with lower impacts at distances beyond approximately 750 m from a spill."

What public safety issues are associated with LNG?

In the event there is a spill from an LNG carrier – which could only occur after a twin hull is breached – LNG would never mix with water. Instead, it would quickly return to a gas state. Methane is lighter than air, so the gas would simply rise and dissipate into the air.

For safety, ship operators typically enact the following operational mechanisms:

- Managing ship traffic
- Coordinating ship speeds
- Active ship control in inner and outer harbours where the consequences of a potential LNG spill might be most severe

Safe harbours: Examples of LNG terminals near human habitation

Resource Works considered the locations of major LNG terminals. It turns out there are numerous global examples of LNG terminals near population centres. Local authorities in all cases have enabled these industrial facilities to be set up so they could serve population needs without introducing unmanageable safety concerns.

- **FortisBC Tilbury LNG Plant:** Numerous homes, churches, government facilities, recreational attractions, and workplaces are located a short distance away from this longstanding facility in Metro Vancouver.
- **Barcelona LNG, Spain:** Within a 7 km radius of the terminal are a vast number of tourist facilities, residences, schools, hospitals, the 20th busiest airport in the world, and essential services for a city of 1.6 million. The terminal is located in a busy port that is visited by 7,727 vessels a year.
- **LNG Plant, Stavanger Norway:** A residential neighbourhood is located less than 1 km away.

- **Everett LNG Terminal, Boston, MA:** The Everett terminal is located less than 4 km from Harvard University and the downtown Boston location of some of America's most treasured tourism destinations and architectural landmarks. Logan International Airport is within a 7 km radius; it is the 18th busiest airport in the USA.
- **Higashi-Ohgishima LNG, Tokyo:** A familiar story – hospitals, schools, homes and recreational facilities are located well within a 7 km radius.
- **Futtsu LNG Terminal, Tokyo Bay, Japan**
- **Snøhvit LNG Plant, Norway:** 1 km to residential Hammerfest.
- **Zeebrugge LNG Terminal, Belgium**

It is clear that authorities around the world have, time after time, applied the decision-making processes in effect in their jurisdictions and satisfied themselves that LNG terminals represent a safe and acceptable urban activity.

LNG in Sea to Sky Country

What is planned for Woodfibre LNG?

Woodfibre LNG will be a small-scale LNG processing and export facility in District of Squamish that produces approximately 2.1 million tonnes of liquefied natural gas per year.

The Woodfibre property is zoned for industrial use and has a deep-sea port. FortisBC plans to construct a natural gas pipeline to supply the gas.

What things will take place at Woodfibre

1. Receive natural gas from FortisBC pipeline
2. Remove components that would freeze during the liquefaction process
3. Remaining essentially pure gas (mostly methane) cooled until it changes from a gas state to a liquid state (-162 C)
4. LNG stored in a floating storage and offloading (FSO) unit
5. LNG loaded onto carriers (three to four per month) for shipment overseas

Howe Sound shipping safety

What safety precautions are taken by LNG ships?

An examination of Woodfibre LNG's proposal shows that it proposes having three to four carriers arrive at the site each month.

The LNG carriers are proposed to travel along existing commercial shipping lanes, would be escorted by at least three tug boats and piloted by two BC Coast Pilots. Professional mariners have safely navigated Howe Sound for over century. The narrowest point on the passage is 12 football fields wide. The mouth of Horseshoe Bay that numerous ferries navigate every day is 3.5 football fields across.

Is Howe Sound too narrow for LNG ships?

We have not seen evidence that Howe Sound is considered a narrow waterway by maritime professionals. An examination of maritime charts shows that the narrowest Howe Sound passage is between Anvil Island and Brunswick point, which are 1,600 metres apart. The passage between Bowen Island and Bowyer Island is more than 2,000 metres wide.

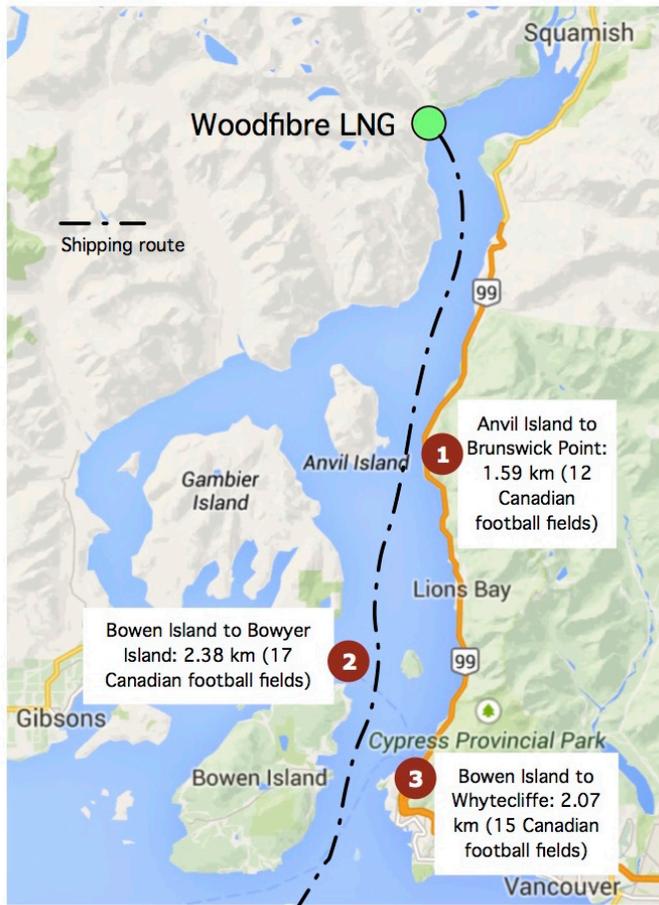
The location of the Woodfibre LNG site is not within a narrow waterway as defined by SITTGO (Society of International Gas Tanker & Terminal Operators) and TERMPOL (Technical Review Process of Marine Terminal Systems and Transshipment Sites). By way of contrast, a proposed LNG facility in Port Charles, Louisiana will require ships to pass through a river inlet that is as little as 230 metres wide in places.

How fast will ships move and what kind of wake will they produce?

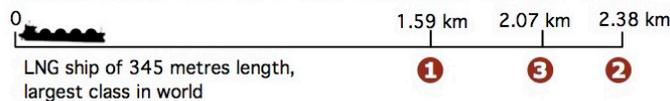
Woodfibre LNG has stated that LNG carriers would be manoeuvring at about 8 to 10 knots in Howe Sound. One estimate said that the wake generated by the carriers in normal conditions would be less than 10 centimetres at a distance of 50 metres away from the carrier. This is less than the wind-generated waves typically encountered in Howe Sound.

The map below shows the established path of ships journeying from Howe Sound into the Strait of Georgia.

Narrowest passages for LNG ships transiting Howe Sound



Length of large LNG ship vs narrowest points of Howe Sound



Drawn from public information sources

Climate, air, water

What risks are created for air quality in Sea to Sky Country?

The majority of Woodfibre LNG air emissions would come from elements removed from the natural gas prior to liquefaction. After removal, this material is incinerated.

What impact will Woodfibre have on climate?

The maximum greenhouse gas output for LNG, under the *Greenhouse Gas Industrial Reporting and Control Act* is 0.16 t CO₂e per tonne. At peak output, according to the Woodfibre LNG application, the project would have a greenhouse gas intensity of 0.059 t CO₂e per tonne of LNG.

What are the facts about using seawater as a coolant?

A seawater cooling system will be used for Woodfibre LNG's plant. Chlorine may be applied because it prevents equipment fouling. The seawater will be returned to Howe Sound with one per cent of the maximum chlorine concentration allowed in Canadian drinking water. On Nov. 27, 2014 a scientist from Vancouver Aquarium told Squamish District's Woodfibre LNG committee this would have "very little effect" on starfish. Returned water will be cool, just one degree above the nearby ambient temperature. The matter was discussed at the Squamish LNG committee.⁷

According to the EAO application, Woodfibre LNG's water-cooling system, required to remove heat from equipment, would meet all provincial and federal rules. Key facts:

- Water cooling is more energy efficient and quieter than alternatives.
- The intake would be located in deep water, below where herring larvae and juvenile salmonids are found in the greatest numbers. A screen would keep out seals.
- A bio-fouling agent such as sodium hypochlorite may be needed on the way in. On the way out, the water would pass through a de-aeration tank and – if needed – have a de-chlorination agent added to it.
Residual chlorine would meet or exceed the Canadian water quality guideline.
- Passing back out, the water temperature would be one degree Celsius above the nearby ambient temperature.

Will Woodfibre LNG be noisy?

Woodfibre LNG says in its EAO application that it expects a "perceptible" increase in noise during construction at Watts Point (2.7 km away from the plant). However, this increase would not be noticed at Britannia Beach (5.8 km) or Darrell Bay (6.1 km). Once operational, Woodfibre says increased noise will not likely be perceptible in any of those locations.

⁷ <http://squamish.ca/assets/WLNG/Woodfibre-LNG-Minutes-Nov-27-2014-final.pdf>

Will Woodfibre's operations be visible from across Howe Sound?

Light from the proposed project light may be visible from parts of Squamish and Darrell Bay where there are unobstructed views of the project site. The overall visual effect is described by Woodfibre LNG as being "minor" because it is a small-scale project in a spot where there has long been human-caused site disturbance.

Will a flare be onsite at Woodfibre LNG?

The Woodfibre proponents say their design includes a flare as a safety feature. It would be used in three circumstances, less than 3% of operational time:

- During start-up
- During maintenance
- Following an unscheduled event like a power loss or emergency

What kind of smell does an LNG plant give off?

Natural gas smells because of an additive called mercaptan, which is a safety measure to warn people when there is a leak in a home or business. LNG facilities do not smell because the mercaptan is removed from the gas before liquefaction.

Risks for people and wildlife

Is LNG explosive?

As a liquid, LNG is not explosive. LNG vapor is only explosive if within the flammable range of 5%-15% when mixed with air. In 2014, British Columbia brought in the LNG Facilities Regulation (LNGFR) covering engineering, hazard analysis, safety, risk assessment, emergency planning and response, flaring limits and noise and light control. *See page 22 for a detailed discussion of this point.*

People

"Negligible" and "not significant residual effects to human health" – that's what Woodfibre states in its application. Powering the LNG plant using electricity instead of gas turbines was a factor in this. Woodfibre also said there are no "unacceptable risks" created for the public.

Salmon

While the application says the "residual effects" to fish are likely to be "negligible", mitigation measures to avoid or reduce effects include preparing and implementing a Marine Works Management Plan, preparing and implementing a Concrete Works Management Plan, preparing and implementing a Waste Management Plan, and minimizing marine shading.

Killer whales and dolphins

According to Woodfibre LNG, mitigation measures to avoid or reduce effects to marine mammals include preparing and implementing a Marine Mammal Management Plan, and preparing and implementing an Underwater Noise Management Plan. There have been presentations to the District of Squamish about cetacean issues.⁸

Should recreational boaters in Howe Sound be concerned?

A marine control zone 450 metres and 550 metres from the Woodfibre LNG site shoreline would be established, and only project-related traffic will be permitted to enter this area. As far as moving LNG ships, the project plan calls for three tug boats that create a “dynamic safety awareness zone” for small boaters as the ship goes through Howe Sound. This would also let the ship stop on very short notice.

Could an LNG plant approved for one size be expanded later?

A major change to the project – such as increasing the physical size of a facility – would require an EA certificate holder to enter an amendment process.

Our research located more than 20 individual accountability processes pertaining to liquefied natural gas that apply to Howe Sound operations (see page 45). It is expected that all of these would have to be revisited in the event of a proposal to increase the scale of the project.

⁸ <http://squamish.ca/assets/WLNG/Van-Aquarium-PR-Presentaton-WLNG-Committee-Nov-27-2014-.pdf>

<http://squamish.ca/assets/WLNG/Van-Aquarium-LBL-Presentation-WLNG-Nov-27-2014-web.pdf>

Safety first: Health, stewardship and the future of natural gas

Factoring in climate change and human health

Global society's success in attaining independence from fossil fuels is widely seen as the challenge of our times – a moral one to many, but also an engineering challenge and an economic one.

Nearly four fifths of worldwide energy today comes from fossil fuels. The question is not *whether* to develop clean energy – but, rather, *how* do we speed up adoption of cleaner forms.

The need for clean energy is increasing globally, particularly in the emerging Asian economies. Natural gas – the world's cleanest burning fossil fuel – is able to accommodate the demand. World-wide demand for LNG is projected to increase two-and-a-half times over the next two decades.

Success in reducing pollution in Asia has real consequences for the west coast of Canada. Up to one fifth of sulfate pollution – a product of burning coal and other fossil fuels – on Canada's west coast could come from China's export-gearred industries, reported scientists studying the subject.⁹

Scientist Richard Muller of the University of California has predicted a “bridge period” for natural gas as the world adopts new clean-energy technology. He stated that natural gas can reduce greenhouse gas growth from coal by one-half to two-thirds, while also providing rapid backup for intermittent clean sources such as solar and wind.¹⁰

The moral imperative to save lives points to LNG's role in reducing air-pollution mortality:

- In China, 1.2 million deaths a year are linked to air-pollution caused by coal.¹¹
- India's polluted air “is cutting 660 million lives short by about three years,” says new research into the hidden costs of India's heavy reliance on coal to power economic growth.
- Thirteen Indian cities are now on the World Health Organization list of the globe's 20 most polluted.

Notwithstanding this heavy toll, India's current coal expansion plans through 2030 will “at least double sulphur dioxide levels, along with those of nitrogen oxide and lung-clogging particulate

⁹ “West Coast air being fouled by Asia's industrial emissions, study shows,” by Iain Marlow, The Globe and Mail, Jan. 23 2014, <http://www.theglobeandmail.com/news/british-columbia/westcoast-air-being-fouled-by-asias-industrial-emissions-study-shows/article16474167/> Accessed Feb. 24, 2015.

¹⁰ Understanding the role that natural gas plays (and could play) in climate change, by Richard Muller, University of California Berkeley.

¹¹ Understanding the role that natural gas plays (and could play) in climate change, by Richard Muller, University of California Berkeley.

matter,” according to a study by Urban Emissions and the Conservation Action Trust of Mumbai.¹²

Natural gas – bridge fuel to clean-energy future

Replacing the use of coal in China with BC LNG will lead to significant avoidance of greenhouse gas emissions and air pollution.

Natural gas does not produce large particulates like coal and it is significantly cleaner-burning than diesel. This comparison shows the natural gas emission reduction compared to diesel:

GHG: -29.9%

NOx: -30.9%

SOx: -73.7%

Particulate Matter: -50.2%¹³

Environmental groups and health campaigners have been highly supportive of the role natural gas can play in a world with strong climate change policies. According to the Pembina Institute, which advocates for clean energy policies, British Columbia has climate policies in place that are creating environmental and economic benefits.¹⁴

Because it uses electricity rather than natural gas, the proposed Woodfibre LNG facility would have the lowest GHG emissions per tonne of LNG produced of any current or proposed export facility in the world, according to the BC Ministry of Natural Gas. This approach has been commended by Clean Energy Canada. Despite its broadly supportive position on cleaner energy, Pembina has said it wants to see more regulation of British Columbia's LNG before the province's natural gas exports can be described as the cleanest in the world.

Pembina has noted that BC got a good start in the previous decade by cancelling two planned coal-fired power plants and following that with a requirement that new electricity supply be met almost entirely through improved energy efficiency and renewable energy.

Using electrification in the natural gas liquefaction process, as Woodfibre LNG plans, reduces GHGs 93 per cent.¹⁵

Specific BC actions that have earned support from Pembina include:

¹² New study shows India's filthy air is literally killing millions, by Katy Daigle, Associated Press environment writer, Feb. 21, 2015.

<http://www.usnews.com/news/world/articles/2015/02/21/filthy-india-air-cutting-660-million-lives-short-by-3-years>

¹³ <http://www.acec-bc.ca/media/8659/B1-Journey-from-Natural-Gas-Field-to-Domestic-LNG-Markets-Rev-56-final.pdf> p 15

¹⁴ How B.C. does climate change right, iPolitics, Dec. 11, 2014.

<http://www.ipolitics.ca/2014/12/11/how-b-c-does-climate-policy-right/>

¹⁵ Uncertain Futures: LNG, GHGs and Clean Energy in BC, presentation by Dave Sawyer of Navius Research at Generate 2013, Clean Energy BC, p 10.

- BC attained its first climate target and in its 2014 Climate Progress acknowledged the need for more action to continue moving toward longer-term goals
- Acknowledgment by BC Environment Minister Mary Polak to have a “Climate Action Plan 2.0”.
- Commitments the province has made with California, Oregon and Washington under the Pacific Coast Climate Action Plan that include more electric vehicles and significant improvements in the energy efficiency of homes and buildings.

According to Pembina, where the province could do more is as follows:

- Strengthen its successful carbon tax.
- Implement policy to reduce the methane released during natural gas production.
- Don't miss out on opportunities to keep growing its clean energy and clean technology companies – businesses which will thrive in a world that is transitioning away from coal, oil and natural gas.

Global perspective

Expert viewpoint on maritime safety

The liquefaction, storage, handling and maritime shipping of natural gas are conducted safely on a widespread basis around the world. Often, such activities are located directly adjacent to urban populations.

In all the time that liquefied natural gas has been shipped, anywhere in the world, there has never been a major safety incident. The analysis drawn from shipping and safety experts firmly indicates that there is no credible data to suggest otherwise.

For the *Citizen's Guide to LNG* and a video series it publishes, Resource Works interviewed the world's leading expert on maritime LNG safety, Michael Hightower of the US Department of Energy's Sandia National Laboratories. He was one of the lead authors of a report considered to be the 'bible' of LNG tanker safety: “Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water,” compiled in 2003-2004.

“What we found out,” said Hightower “is the LNG shipping industry is a very, very safe industry. They have some of the best crews, they've had very few accidents, and have never had an accident that caused a spill.”

Key points:¹⁶

- Spills associated with accidental events from LNG tankers would be relatively small.
- High hazard distances would be a couple of hundred meters from a spill with no danger roughly 600-800 meters from the ship.
- For larger spill events, high hazard zones were 200-300 meters in diameter.

¹⁶ Higher Ground: Floating Disaster? LNG tankers and reality of risk?, posted Jan 26, 2015
<http://www.theprovince.com/news/Higher+Ground+Floating+Disaster+tankers+reality+risk/10761973/story.html>

- Fires rather than explosions are the most likely scenario associated with accidents and spills.
- There is the possibility of a cold vapor LNG spill, according to the study. Findings were that the vapor could reach as far as 2 miles from a ship. Should the cool dispersion be ignited, it would burn back to the ship.
- Hightower said the studies showed if a fire occurred in this scenario, it would pass by in about half a second to two and would have no chance to cause major damage.
- The ignition would burn back to the ship and cause a “pool” fire. The report’s author called it a “relatively benign event” because the timing has no chance for major damage to human flesh or structures.

How we are already making use of LNG here at home

For many citizens, the benefits of natural gas should be felt at home first, before they are shared with other countries.

Selling our natural gas to overseas countries creates jobs at home. Any natural gas, no matter its end use, creates this benefit. Gas exports help to pay for costly public services such as schools and hospitals. Domestic use of natural gas has many benefits, although it does not directly create export revenues. If we choose to eliminate or reduce gas exports, we also need to ensure there is a healthy debate on how we will replace those revenues through new exports or higher taxes, or make do with fewer services.

Here are some current and anticipated uses of LNG in the domestic economy:

- **FortisBC LNG at Tilbury** in Delta is an example of how liquefied natural gas can be used domestically. The facility was
 - Tilbury originally established in 1971 to supplement gas supply during times of peak demand.
 - Supplies fuel for remote communities.
 - In 2009, it began to supply LNG as a transportation fuel.¹⁷
- **Mt Hayes LNG** is another facility existing today, located close to Nanaimo, established in 2011 to reduce reliance on out-of-province storage and provides greater flexibility during peak usage times. Road transport fueling is now being offered.
- **BC Ferries** in July 2014 awarded a contract for three new intermediate class vessels that will be the first vessels in the BC Ferries fleet to operate as dual-fuel capable using Liquefied Natural Gas (LNG) or diesel fuel for propulsion and power generation.¹⁸

¹⁷ FortisBC Fact Sheet “Tilbury LNG Facility Expansion Project”, undated.

¹⁸ News release, July 3, 2014 <http://www.bcferries.com/bcferries/faces/attachments?id=85642>

Jobs, taxes, and social services – where are the connections?

Fulfilling the duty to secure a prosperous future for our children, in a physical environment that we have improved and passed down with care, is the greatest moral challenge of our times.

Eagle Mountain Gas Pipeline will bring \$520 million in spending and Woodfibre LNG's build-out will add \$243 million to regional GDP.

According to Woodfibre LNG, will create more than 650 jobs each year of construction and create a further 1,080 jobs through indirect and induced employment. During operations, Woodfibre LNG estimates that the project could result in more than 100 long-term jobs during operation, and a further 330+ indirect¹⁹ and induced²⁰ jobs during operation. This claim correlates to work done by the Squamish Lillooet Regional District that shows, among other things, a high number of additional jobs created by every 100 jobs in resource industries.

The pursuit of collective well-being, and the challenges that come with it, are reflected at the municipal, regional and provincial levels. This examination of the benefits of natural gas in the economy is drawn from Resource Works research and a variety of other sources.

Overall economic benefits

Woodfibre LNG

- Woodfibre LNG's estimated tax revenue for all three levels of government during the construction phase of the project: **\$83.7 million**
- Woodfibre LNG's estimated tax revenue for all three levels of government per year of operation: **\$86.5 million**
- Estimated added value to the District of Squamish, Resort Municipality of Whistler, Electoral Area D of Squamish-Lillooet Regional District, Squamish First Nation communities, and Metro Vancouver gross domestic product (GDP) during construction of Woodfibre LNG: **\$243 million**
- Added regional GDP value during operation: **\$122.8 million**
- Based on natural-gas industry wages data, 100 Woodfibre employees could have this much annual spending power in the community: **\$10 million**

Eagle Mountain-Woodfibre Gas Pipeline:

FortisBC, which is building the new pipeline, states it will ensure its contractor hires in Squamish first and that all sub trades offer opportunities for skill development and on-the-job training for apprentice workers, where practical.

- Estimated construction spending from 2014 to 2017: **\$520 million**
- Tax revenue to federal and provincial gov't during construction: **\$84 million**
- Tax revenues to all levels of government during the 50-year operating life of the project: **\$84 million**

¹⁹ Indirect impacts arise from changes in activity for suppliers.

²⁰ Induced impacts arise from shifts in spending on goods and services as a consequence of changes to the payroll of the directly and indirectly affected businesses.

- Additional revenues to the BC government in the form of carbon taxes and motor fuel taxes: **\$23.4 million**
- Estimated of employment during construction and a small number of permanent positions during operations: **1,144 person years**

1. Municipal level

Jobs

Woodfibre LNG officials have indicated they will continue to consult with various Aboriginal groups. Woodfibre LNG has offered to contribute more than \$2-million annually to the local tax base, with ripple effects to be felt across the region.

There would be more than 650 jobs at the peak of construction, and more than 100 workers are to be hired once the small-scale LNG operation opens.

Woodfibre LNG has committed to undertaking a local hiring strategy and a local training strategy to enhance the likelihood that local assessment area residents are well-positioned to seek these opportunities.

What kind of jobs generate pay raises today?

In the current economic climate, resource industry jobs are among the most likely to offer workers steadily increasing wages. Statistics Canada data shows a downward trend for BC wages in accommodation and health care, social assistance, arts and entertainment. The biggest gainers are in real estate and the natural gas/mining field.

Where do Squamish residents work today?

Statistics Canada data shows that Squamish residents spend slightly more time commuting than the average British Columbia resident. The average commuting duration in Squamish is 25.5 minutes, which is 0.5 minutes above average. Jobs in Vancouver and Whistler are presumed to be the explanation. In future, it can be assumed that more people will want to have jobs closer to home, and every well-paid job (or 100 jobs) will make a difference, especially if ones that pay above average. Natural resource jobs pay 58 per cent more than the average B.C. job.

What is the impact of 100 natural resource jobs on the Squamish area?

The proponents of Woodfibre LNG estimated that at least 100 permanent jobs will be created in the Squamish area by the ongoing needs of the project. What estimate can be derived about the impact of these jobs? We did some simple calculations based on CANSIM table [281-0063](#) from Statistics Canada. It shows average weekly earnings, by industry. The table presented here also shows rates of pay growth and decline. We calculated the annual total pay for 100 workers in each category.

One hundred residents of Squamish earning natural gas industry wages – the number of jobs Woodfibre LNG says it will create – would have \$10 million in annual income to spend. That is five times the spending impact of 100 residents with accommodation or food services jobs, who according to the data, report income of \$2 million.

Employment category²¹	Weekly wages – Nov. 2014	% chg – 11/13 – 11/14	Annualized earnings of 100 workers
Mining, quarrying, and oil and gas extraction	1,950.71	5.5	\$10,143,692
Utilities	1,732.56	2.1	\$9,009,312
Professional, scientific and technical services	1,269.55	1.0	\$6,601,660
Information and cultural industries	1,262.32	5.0	\$6,564,064
Public administration	1,201.30	3.5	\$6,246,760
Forestry, logging and support	1,074.21	-10.6	\$5,585,892
Construction	1,155.21	0.2	\$6,007,092
Real estate and rental and leasing	962.19	6.3	\$5,003,388
Industrial aggregate excluding unclassified businesses	904.31	1.7	\$4,702,412
Health care and social assistance	840.3	-5.7	\$4,369,560
Arts, entertainment and recreation	542.93	-0.9	\$2,823,236
Accommodation and food services	368.5	-1.3	\$1,916,200

²¹ Statistics Canada, CANSIM table 281-0063. <http://www.statcan.gc.ca/tables-tableaux/sum-som/I01/cst01/labor93k-eng.htm> Accessed 2015-02-20. The table depicted here is an abbreviated version; the full table can be seen at the website.

The hard-to-see impact of Sea to Sky's resource economy

As shown in the tables below, jobs in the natural resource sector produce higher than average spin-off jobs in other areas of the economy and pay some of the highest wages in the province.

Spin-off jobs by industry²²	
Industry	Spin-off jobs per 100
Pulp and paper	106
Mining	70
Sawmills	56
Film	54
Construction	53
Logging	43
Public sector	35
Tourism	22
High Tech	22

Wages by industry, BC, 2013²³		
Industry	Average weekly wage	Est. full-time yearly salary
Mining and energy	\$1,721	\$82,600
Public administration	\$1,205	\$57,800
Forestry	\$1,175	\$56,400
Manufacturing	\$992	\$47,600
Education	\$966	\$46,300
Health care	\$874	\$42,000
Culture and recreation	\$827	\$39,700
Retail, wholesale trade	\$662	\$31,800
Accommodation and food	\$426	\$20,400

Taxes

In the District of Squamish, fees and taxes are hitting taxpayers harder than ever. Squamish council was, in late February 2015, reported to be considering a possible 7.5 per cent increase to property tax revenue. Utility fees are rising 9.5 per cent in 2015, which concludes a five-year infrastructure program. Future increases have not been ruled out.

“The key drivers for the projected increase for property tax revenue are hikes to existing labour costs, RCMP contract increases, corrections in fleet allocations and general volume increases to contracts, service materials and utilities,” wrote The Squamish Chief, citing Christine Mathews, financial planning manager for the district. Forty to 50 per cent of the general budget is labour costs.²⁴

²² “Employment Projections for the Squamish - Lillooet Regional District,” Vann Struth Consulting Group, June 2013

²³ Statistics Canada, Cansim tables 281-0027 and 282-0072

²⁴ <http://www.squamishchief.com/news/local-news/council-considers-7-5-tax-revenue-increase-1.1775225>

What do we know about the benefits of having a diverse economy?

Squamish has prospered in recent years in large part due to its economic diversity. As forestry declined, tourism and real estate grew. Of course, trends can swing both ways. Tourism and real estate can be as vulnerable to market swings as natural resource industries. As many BC communities have learned, economic diversity is ultimately the best source of long-term economic security.

Much can be said about the economic benefits of resource industries, but it is important to recognize that highly resource-dependent communities bear many risks. As a trade-dependent region, BC is vulnerable to changes in economic conditions outside our control. Squamish has certainly experienced the effects of instability in the forestry sector, just as many Canadian communities are now experiencing the impacts of the recent drop in oil prices. Again, the takeaway is this: we need to continue to diversify the economy.

What is the linkage between investment and local jobs?

The largest employment category in Squamish is construction. According to a Statistics Canada report in 2013, there were 1,290 workers in that industry, followed by information and culture, then accommodation and food services.²⁵

Table 4 Top industries for the employed labour force²⁶

Industry	Squamish			British Columbia		
	number	%	Rank	number	%	Rank
Construction	1,290	13.7	1	165,340	7.6	5
Retail trade	1,215	12.9	2	250,140	11.5	1
Accommodation and food services	1,075	11.4	3	165,955	7.6	4

The high number of construction-industry employees closely correlates to a large number of trades occupations seen in Squamish.

Top occupations for the employed labour force

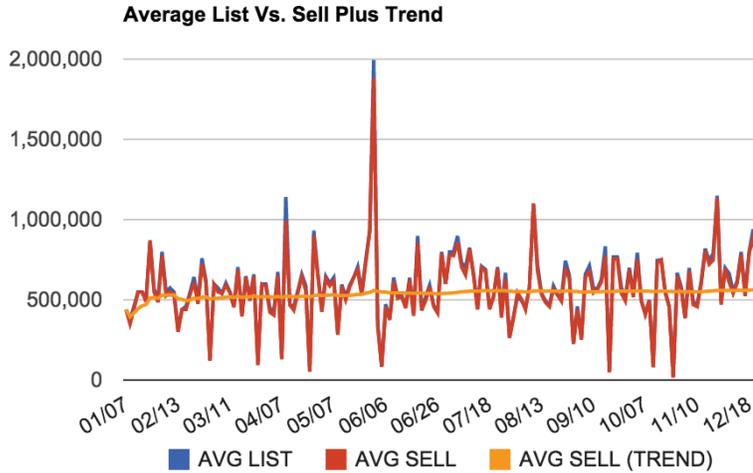
Occupation	Squamish			British Columbia		
	number	%	Rank	number	%	Rank
Service support and other service occupations, n.e.c.	775	8.2	1	115,570	5.3	2
Industrial, electrical and construction trades	750	7.9	2	117,675	5.4	1
Sales representatives and salespersons - Wholesale and retail trade	535	5.7	3	110,490	5.1	4

²⁵ <http://www12.statcan.gc.ca/nhs-enm/2011/as-sa/fogs-spg/Pages/FOG.cfm?lang=E&level=4&GeoCode=5931006>

²⁶ <http://www12.statcan.gc.ca/nhs-enm/2011/as-sa/fogs-spg/Pages/FOG.cfm?lang=E&level=4&GeoCode=5931006>

Consumers

What is housing affordability in Squamish vs income?



Squamish Real Estate All Detached Properties – List, sell and trend line average price

The average selling price of a Squamish detached home at the end of 2014 was \$563,600.²⁷ If a family put 20 per cent down on such a home that would mean carrying a mortgage of \$450,900.

According to the CMHC online mortgage calculator, a gross monthly income of \$6,500 (\$78,000 annualized) would be needed for such a mortgage to be classed as “affordable”, assuming a mortgage interest rate of 2.1 per cent. (At 4 per cent, the same down payment and income would allow for a \$460,000 home to be purchased.)

Jobs with higher earnings – including those in energy, public administration, and forestry – are among the ones most likely to help Squamish grow its population of residents who can look forward to being homeowners, earners of good wages, taxpayers, customers of local businesses, and breadwinners.

Building tourism and the diverse future economy

Building the Sea to Sky tourism industry is clearly identified as a shared value among local residents. As shown, the direct wages reflected by Statistics Canada data may not be on the same level as direct wages in the natural gas and utilities fields. But there are numerous other ways in which tourism is a powerful factor:

- In 2012, tourism GDP was worth \$7.6 billion.²⁸

²⁷ <http://www.robchipman.net/squamish-real-estate-average-price-graphs/>

- The tourism industry generated \$3.2 billion in export revenue in 2010, 6% higher than in 2009 (but 7% below 2000).
- In 2010, the tourism industry generated \$13.4 billion in revenue, an increase of 6% from 2009 and a 44% increase since 2000.
- There were 17,943 tourism-related business establishments operating in BC in 2010, suggesting an important source of small business opportunity.
- In 2010, the tourism industry employed 127,400 people, a decrease of 1% from 2009 but a 24% increase since 2000.²⁹

Could LNG mean higher natural gas prices in the home?

Experts we consulted said no. The evidence is that residents can expect lower prices when a larger and more efficient pipeline comes into service in Sea-to-Sky Country. This will be due to the large quantities of natural gas moving through the pipeline system.

The provincial government recently mandated a natural-gas transportation tariff that establishes the rate for LNG proponents and large-volume natural gas customers, including Woodfibre LNG. It means that large industrial projects will pay for the new investment as well as for part of the existing system.

Influence in job creation – comparison of resource jobs with tourism and high tech

Natural resource jobs pay a lot more than others, typically 58 per cent more than the average British Columbia job. For a community like Squamish where construction is the most prevalent occupation, construction job mean families can stay rooted in. Retaining a strong, diverse economy, one that creates jobs for possessors of these skill sets, makes sense.

Not alone: Municipalities in other BC regions are dealing with LNG, too

Our work with municipalities, such as the Northeast BC Resource Municipalities Coalition, has shown us that Squamish, Bowen Island, West Vancouver, Lions Bay and other Sea to Sky municipalities are not alone in facing challenges. One program we will be launching is a Sister City program linking resource communities in the Interior to municipalities in Southwestern BC so that there can be dialogue and joint problem solving.

Here is how one municipality in the Northeast has found its path in the LNG era:

Port Edward

- A property tax agreement worth \$150 million over 25 years was signed in December 2014 between Pacific NorthWest LNG and the District of Port Edward (a community near Prince Rupert).

²⁸ <http://www.fin.gov.bc.ca/tbs/F&Ereview14.pdf> p 68

²⁹ <http://www.destinationbc.ca/getattachment/Research/Industry-Performance/Value-of-Tourism/Value-of-Tourism-in-British-Columbia-May-2012/Value-of-Tourism-in-British-Columbia-May-2012.pdf.aspx>

- The landmark agreement guarantees the District of Port Edward \$3.25 million per year, escalating over the life of the agreement, paid in the form of property taxes complemented by front-end contributions by Pacific NorthWest LNG for district infrastructure improvements. The agreement was subject to the project proceeding to construction and will be effective upon the execution of a long-term lease with the Prince Rupert Port Authority.
- The District has committed to balanced stewardship of the environment and the economy. It encompasses two provincial parks, an ecological reserve and a major historical site at North Pacific Cannery. Outdoor recreation opportunities are abundant, and include fresh-water and salt-water sport fishing, hunting, hiking, camping, and boating.³⁰

2. Regional level

Will small business benefit from natural gas investment?

According to Woodfibre LNG, the company is actively engaging local businesses to provide services such as catering, graphic design, photography, printing and transportation. Woodfibre LNG, like the Eagle Mountain pipeline project, has committed to hiring a local workforce.

Size and impact of the natural gas industry

Common perceptions about BC's resource sector significantly underestimate its importance to BC's economy and to British Columbians' standard of living. For example, 50,900 British Columbians were employed in "Forestry, Fishing, Mining, Quarrying, Oil & Gas" in 2014 which was 11.3 percent of goods producing industries and only 2.2 percent of BC's total employment.

Yet by examining the impact, in greater depth, it appears that there is a much larger impact. As UBC economist Professor James Brander has noted, the resource sector in British Columbia can be likened to the CPU (central processing unit) of a computer: it may not be easy to see, but you will not be able to run your computer without it.

Path to "responsibility"

Will communities on the coast find a way to accommodate responsible resource industries? This is an important question today. It is also worth asking what happens to a region when it has a significant presence in the provincial economy.

Local community leaders have often pondered this over the years, but it is often difficult to arrive at a satisfactory answer. However, it appears there is compelling evidence that when it comes to natural resources, the resource-producing regions produce large amounts of export commodities despite their low populations.

³⁰ <http://www.newswire.ca/en/story/1463869/pacific-northwest-lng-and-the-district-of-port-edward-reach-property-tax-agreement>

Balancing the books while greening local communities

The District of Squamish is working to improve its green footprint and increase the level of citizen engagement with infrastructure projects. Efforts to increase the attractiveness of business areas, such as the Downtown Entrance Plan, are underway to ensure the area remains competitive.

Yet, according to the 2013 financial plan, a reduced industrial tax base over the last decade “has resulted in business and residential customers paying a larger share of the total tax bill than was historically the case.” According to one news report, “The financial plan also has a suggestion that councillors could do well to take to heart: ‘To prosper, Squamish will need to continue to attract new business investment.’”³¹

The 2014-18 five-year financial plan for the District of Squamish shows that citizen services such as library hours and children’s services programming have been reduced.³² The plan reported fire services and bylaw enforcement FTE reductions in fiscal 2014 over 2013.³³

One of the benefits of an industrial plant like Woodfibre LNG is the tax revenues that will result. These revenues should result in a positive outcome for decision makers in Squamish, creating options that would not exist otherwise.

3. Provincial level

The LNG export industry has the potential to transform British Columbia and help pay down provincial debt, based on expected [tax revenue](#) from LNG projects. (Expectations on the number of ultimate terminals have been dampened since the LNG mission took off in earnest in 2012.)

Since the new millennium started, BC’s petroleum royalties have brought in \$14.1 billion in royalties. The industry now spends \$8 billion a year in the province while supporting thousands of family incomes.

What if we cease the export of BC natural gas?

Four municipalities in the North East Peace region recently released a study of the economic impact of the area. It found that natural gas helped to offset declines in forestry and mining when the value of those commodities fell due to price declines. (The natural gas industry in 2013 was responsible for \$8.3 billion in spending across BC, according to figures from CAPP.)

Of BC’s \$90 billion export market, Northeast BC accounts for 9% with only 2% of the population. Contribution to provincial export revenue:

³¹ With Industry Gone, Tax Burden Falls on Residential, The Squamish Reporter, April 6, 2013 <http://www.squamishreporter.com/2013/04/06/with-industry-gone-tax-burden-falls-on-residential/#.VOuZ01PF8sj>

³² <http://www.squamish.ca/assets/2014-budget/2014-2018-Financial-Plan-Report-V4.pdf> p. 19

³³ <http://www.squamish.ca/assets/2014-budget/2014-2018-Financial-Plan-Report-V4.pdf> p. 24

- \$182,878 per worker in the Peace region
- \$198,474 in Northeast BC
- \$33,709 on average for the remainder of the province

Not approving LNG exports from the west coast would have the effect of curbing the production and export of natural gas, and in turn the disproportionately high benefits that these regions contribute. In this way, the prosperity of all British Columbians would be affected.

How are royalties collected on LNG?

Companies in Northeast BC that produce the natural gas Woodfibre LNG buys for liquefaction will pay royalties. LNG operators do not pay royalties (unless they are the ones developing the upstream resource). Woodfibre LNG does not currently own any gas assets in British Columbia and therefore would not be paying royalties.

The major transmission pipeline (owned and operated by Spectra Energy) that will deliver the natural gas from northeast BC to the FortisBC pipeline system pays various taxes in the province.

What additional taxes will Woodfibre LNG pay?

Over the past several years, the provincial government developed an additional taxation structure so that in addition to royalties, LNG produces further public benefits. This is the purpose of the LNG Income Tax, which applies to income derived from liquefaction of natural gas at LNG facilities in B.C.

- The LNG Income Tax rate on net income will be 3.5% for taxation years beginning on or after January 1, 2017
- 5% for taxation years beginning on or after January 1, 2037 (rate to be confirmed in legislation).

How do today's natural gas royalties compare to other sources of revenue?

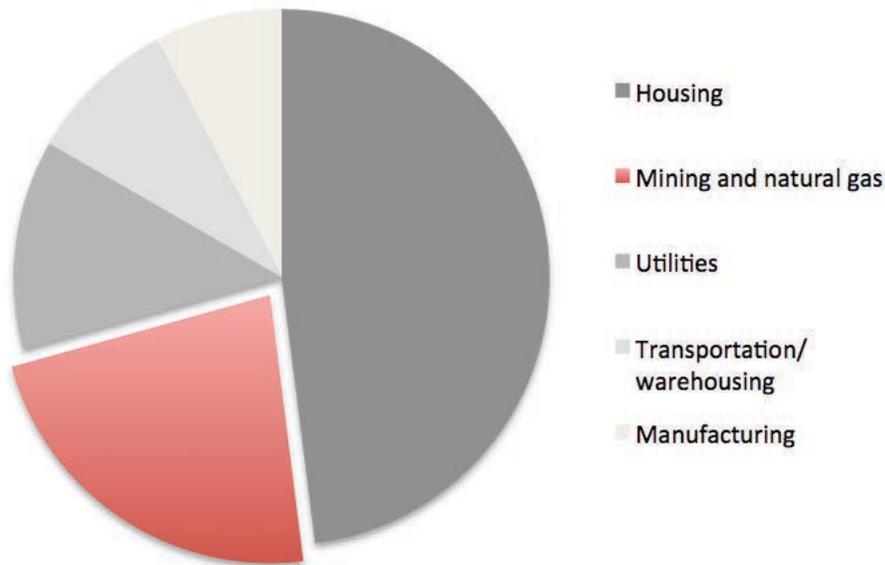
- Direct B.C. government revenue from natural gas and oil (in BC, oil is a tiny fraction of the petroleum sector), according to BC Ministry of Natural Gas Development service plan 2013/14: **\$1.124 billion**³⁴
- Budgeted target in 2015/16 for income from the Crown-owned BC Lottery Corporation: **\$1.206 billion**

Does investment elsewhere in the province affect Sea to Sky?

After housing, the largest source of capital investment in British Columbia in 2014 was the combined mining and natural sector. The sector posted spending intentions for the year of \$7.3 billion. (This was no aberration: actual spending in the previous five years in that sector alone was \$39 billion, likely at least \$30 billion of it construction.)³⁵

³⁴ http://www.bcbudget.gov.bc.ca/2013_june_update/sp/pdf/ministry/mngd.pdf p. 19

³⁵ <http://www.fin.gov.bc.ca/tbs/F&Ereview14.PDF> p74. Accessed Feb. 20 2015.



2014 capital spending intentions in B.C.

(Construction accounted for 77% of all-sector 2014 investment, equipment the remaining 23%.)

For workers in construction – including the 750 Squamish residents who Statistics Canada says work in this field – the connection could not be clearer. Mining and natural gas are disproportionately influential in creating construction employment.

Further work could be done on where the 750 Squamish construction workers are employed today, but it seems fair to say that it is not likely that they are all employed in the area at the same time.

- Across British Columbia, construction work in remote areas draws workers, and does so consistently over long periods of time as one project is finished and another begins.
- With an estimated \$163 billion in slated projects in central and northern BC alone at present, it would seem that Sea to Sky families that depend on construction breadwinners can look to the resource sector, including natural gas investment, for a long time to come.

LNG: Soon to be part of our economic bedrock?

For several years now, Canadian and international companies have been assembling proposals for the development of a new export market in British Columbia: liquefied natural gas. British Columbians have heard numbers that seemed almost grandiosely out of proportion – 100,000 jobs, \$100 billion in revenues over 30 years.

Based on the known past, these numbers actually do make sense. In the decade to 2013, royalties and fees to government in BC amounted to \$17.6 billion. Three such decades would equal royalties of \$53 billion. Once our natural gas can be traded in the global marketplace, market dynamics will, in the long run, ensure it is fetching the highest attainable price and not just what is dictated to us by our lone customer, the USA. So a higher income figure like \$100 billion, supported by higher output as cleaner energy sources become more highly prized in Asian nations facing critical air pollution issues, does appear to be based on an expert appreciation of the market trends.

It is a fact that the spot price for LNG in Asia has declined over the past eight months. The natural gas industry's evaluation of this is that commodity prices to be cyclical in nature: prices rise and fall over time based on emerging market conditions. That is one of the reasons why proponents evaluate long-term price performance when making long-term investment decisions including whether to build a new gas pipeline or LNG facility.

To increase the stability of their projects, many LNG proponents lock into long-term supply contracts with their customers prior to making a final investment decision ("FID") so as to ensure a guaranteed revenue stream.

So today's natural gas prices often may not be the primary factor in determining whether or not to proceed with a new project that will take several years to build because that project's viability is tied to a future price.

Other common decision factors:

- Expected price several years out
- World demand trends
- The premium buyers will pay for long-term certainty
- Capital costs

Myths about the resource economy

Resource Works recently conducted research about the British Columbia resource economy and found that it is influential in every corner of the province – decisions made in localities have implications for all citizens:³⁶

- Every dollar of additional output in natural resources generates \$1.74 of higher incomes in B.C.
- Unlike other industries, BC's resource industries have the potential to boost Gross Domestic Product by whole percentage points, far more than the mere fractions touted by governments when adopting new trade or tax policies.
- A 10-per-cent nominal increase in B.C.'s resource sector boosts its GDP by \$3.7 billion, or 1.9 per cent of its GDP.

New job opportunities for BC residents

It has been a stated matter of provincial government policy that:

- British Columbians will be first in line for job opportunities arising from LNG.
 - Education programs and apprenticeship systems with the labour market demand to ensure is it training workers for the job openings that will be available as a result of the LNG opportunity.
 - A document titled [B.C.'s Skills for Jobs Blueprint: Re-engineering Education and Training](#) states provincial commitment to skill up the workforce needed.
- There will be a need to attract workers from the rest of Canada

³⁶ Seven Myths of BC's Resource Economy, Resource Works Society, April 2014.
<http://www.resourceworks.com/seven-myths--cross.html>

- Additional workforce will have to be met externally, via recruitment of temporary foreign workers (TWF) and permanent immigrants. TWFs have been a politically sensitive topic and we have to presume that government will continue to take steps to avoid too much reliance on newcomers. At the same time, an ageing population means workers will retire. Immigration will inevitably be a crucial component in Canadian population stability into the future.

Outlook for British Columbia

The recent provincial budget depicts forecasts for the coming three fiscal years. Across a range of measurements shown in in Budget 2015 documents, British Columbia appears to be facing an era of low growth, even though costs for health care continue to rise as the needs of an aging population become greater. Consumer expenditures, GDP growth, business investment, retail sales, housing starts and job growth are all facing a flat or declining trend:

Table 1.2 Comparison of Major Factors Underlying Revenue

Calendar Year	February 17, 2015				February 18, 2014			
	2014	2015	2016	2017	2014	2015	2016	2017
Per cent growth unless otherwise indicated								
Real GDP	2.2	2.3	2.4	2.3	2.0	2.3	2.5	2.5
Nominal GDP	3.9	3.8	4.3	4.3	3.6	4.3	4.4	4.5
Household income	3.0	3.5	3.8	4.0	3.3	3.9	4.0	4.1
Net operating surplus	5.3	3.3	6.3	5.8	1.8	6.1	6.7	6.7
Consumer expenditures	4.7	4.3	4.5	4.5	4.2	4.7	4.6	4.7
Consumer expenditures on durable goods	8.3	1.3	1.6	1.5	1.2	1.5	1.6	1.6
Business investment	5.6	3.9	4.5	4.6	4.4	4.0	4.7	4.9
Residential investment	6.0	3.4	4.7	4.9	3.4	3.3	4.7	4.8
Retail sales	5.4	3.3	3.7	3.6	3.0	3.5	3.7	3.7
Employment	0.6	1.0	1.2	1.2	1.0	1.3	1.4	1.4
BC Housing starts	4.8	-2.7	-0.2	-1.9	-7.8	2.0	2.2	0.1
US Housing starts	8.7	-0.6	2.5	2.4	2.9	5.3	2.5	2.4
SPF 2x4 price (\$US/thousand board feet)	\$353	\$344	\$340	\$340	\$345	\$335	\$335	\$335
Pulp (\$US/tonne)	\$925	\$888	\$838	\$825	\$838	\$825	\$825	\$825
Exchange rate (US cents/Canadian dollar)	90.5	85.3	85.5	87.0	93.2	92.7	91.7	91.0
Fiscal Year								
	2014/15	2015/16	2016/17	2017/18	2014/15	2015/16	2016/17	2017/18
Natural gas price (\$Cdn/GJ at plant inlet)	\$2.69	\$2.09	\$2.32	\$2.54	\$2.45	\$2.65	\$2.90	\$3.28
Bonus bid average bid price per hectare (\$)	\$2,404	\$1,000	\$1,025	\$1,100	\$750	\$750	\$800	\$850
Electricity price (\$US/mega-watt hour, Mid-C)	\$33	\$28	\$31	\$35	\$40	\$38	\$39	\$40
Metallurgical coal price (\$US/tonne, fob west coast) ..	\$119	\$128	\$138	\$138	\$176	\$210	\$216	\$222
Copper price (\$US/lb)	\$3.10	\$3.02	\$3.35	\$3.04	\$3.16	\$3.10	\$3.05	\$2.99
Crown harvest volumes (million cubic metres)	61.0	63.0	63.0	64.0	65.0	66.0	66.0	66.0

Amid these trends, we must look for opportunities for growth where we can find them. Natural gas exports do appear to represent a credible opportunity in this regard.

The outlook for British Columbia is relatively strong. A recent Conference Board of Canada poll rated its economy as having the brightest outlook of any province or territory. Yet over the coming three years it is less clear what factors will lead the recovery.

For those concerned about how public services are to be paid for, any economic opportunity represents a chance to maintain at least a modest amount of growth. If we can manage to do this, ever-growing expenses in areas like health care for our aging population can be supported.

Balancing Act: The example of BC Budget 2015

The provincial budget presented February 17, 2015 shows that in the short term it will continue to be a challenge for the Crown to derive revenues from natural resources. These improving revenue sources are partly offset by forecasted declining natural resource revenues mainly due to falling Crown land lease revenue.

Over the next two years, average growth is expected to be 2.4 per cent annually reflecting strengthening economic conditions, rising energy prices and increasing federal government transfers and commercial Crown corporation net income.³⁷ There is a strong linkage between economic growth at healthy levels and the British Columbia energy export sector. Annual growth in 2015/16 is forecast to be only 1.3 per cent as the effects of 3.8 per cent nominal GDP growth in 2015 are partly offset by the impacts of lower energy prices and one-time revenues recorded in 2014/15.

While lower energy prices will provide a downward drag, rising prices take the trend in a positive direction. Over the next two years, average British Columbia growth is expected to be 2.4 per cent annually reflecting strengthening economic conditions, rising energy prices and increasing federal government transfers and commercial Crown corporation net income.

Natural resource revenue is forecast to decline 6.9 per cent in 2015/16 due to lower revenue from natural gas and other energy sources, reflecting lower natural gas, oil and electricity price projections. Over the next two years, natural resource revenue is expected to average a 1.3 per cent annual decline mainly due to falling revenue from Crown land tenures.

When the 2015/16 budget was presented, a number of groups issued statements requesting that larger allocations be made available to social institutions and socio-economic groups in society that face difficult challenges.³⁸

Health care costs continue to climb, growing by hundreds of millions of dollars and consuming a growing portion of public spending

The government in Victoria indicated clearly that it would remain committed to the principle of balanced budgets.

On the bright side, there is an expectation that resource revenues will come back. Excluding Crown land tenures, natural resource revenue is expected to average 7.6 per cent annual growth over the next two years, in line with expected rising commodity prices and forest harvest stumpage rates.³⁹

First Nations and LNG

Around British Columbia, a number of First Nations groups have chosen to join proposals for the maritime exports of natural gas. Groups with First Nations participation include:

Haisla

The Haisla First Nation are currently involved in several major LNG projects that are at various stages of development. They [include](#):

1. Kitimat LNG (KLNG) (with Apache Canada and Chevron Canada)

³⁷ <http://bcbudget.gov.bc.ca/2015/default.htm>

³⁸ <http://www.theglobeandmail.com/news/british-columbia/bctf-lawsuit-looms-large-over-budget-projections/article23041679/>

³⁹ Three-year fiscal plan, p 10

2. Pacific Trail Pipeline (with Apache, Chevron and 14 other BC First Nations)
3. Douglas Channel Energy Project (with LNG partners)
4. LNG Canada (with Shell, Mitsubishi, Korean Gas and PetroChina)

Huu-ay-aht

Huu-ay-aht First Nations, a self-governing Nation whose lands are located in the Barclay Sound at the entrance to the Port Alberni inlet, voted in favour of continuing to explore participation in the proposed Steelhead LNG project at their People's Assembly.⁴⁰

Benefits agreements

At this writing, 16 First Nations [have signed](#) natural gas pipeline benefits agreements.

⁴⁰ <http://huuayaht.org/2015/02/18/steelhead-lng-and-worleyparsons-sign-30-million-engineering-contract-for-proposed-sarita-bay-lng-project/>

Securing the environment

How have citizens been consulted about LNG in Sea to Sky Country?

The Citizen's Guide to LNG in Sea to Sky canvassed the following sources to better understand the access to decision-making processes. We consulted:

- Regulators
- Province of British Columbia
- Municipal councils
- The proponent group for Woodfibre LNG
- The company (FortisBC) planning the Eagle Mountain-Woodfibre Gas Pipeline

The Environmental Assessment Process: How does it work?

This process exists to review major projects to assess their potential impacts. For a major project to proceed, it must pass the EA review process, then be greenlighted by two provincial government ministers. The accompanying diagram illustrates the process.

Environmental Assessment Office

Before Woodfibre LNG submitted its application, EAO's consultation centered on the Valued Component Selection document that helped inform the Proponent's Application development (June 12 – July 11, 2014).

- During this "pre-application phase" EAO hosted an open house event in Squamish on June 18, 2014.
- A 60-day public comment period that ends March 27, 2015.
- Open house events during the application review public comment period in Squamish (January 28), West Vancouver (January 29) and Bowen Island (January 30).

Province of British Columbia

- Hosted a series of eight interactive Regional LNG Energy Seminars (RLNGES) around British Columbia to respond to public interest in LNG generally. The format is designed to bring citizens to a place where they can have direct personal conversations with government staff and potential employers and business decision makers.
- On Dec.16-17, 2014, an RLNGES was held Squamish after being advertised in local newspapers, through social media and on www.LNGinBC.ca. A proponent panel included representatives from the LNG Alliance, FortisBC and Woodfibre.

Municipal level

Municipal councils have, in 2014 and 2015, been presented with information from a whole range of voices including professional practitioners, industry experts, proponent companies, and groups and individuals that expressed varying levels of support for natural gas export activity in Sea to Sky Country – including some with very clear positions against LNG. A number of motions have been passed that indicate councils are still working to assess the level of acceptance in their communities, particularly in the area of safety for local residents.

What municipal councillors need most in 2015 is an ability to ensure that the voices of their communities are authentically represented. It is when just a single voice is seen as dominant that problems occur. These voices could be:

- Those who support all industrial activity regardless of what it means for the environment; or
- Those who oppose all industrial development regardless of what it means for people, their health, and their livelihoods.

On October 31, 2014, Resource Works staff and volunteers hosted a community dialogue session as part of an eight-part series called *Community Conversations on Natural Resources*. Twenty-four Squamish residents joined us at the Squamish Seniors' Centre to share their perspectives on resource development. The two-hour event was designed to address two key questions: How would you describe responsible resource development? And how do we build productive public dialogue?

We found that the topic of natural gas exports was high on the list of topics brought to the table. Three themes emerged in our discussion:

1. Community involvement
2. Environmental protection
3. Innovation

Woodfibre LNG

- 300+ community meetings to date plus, hosted two telephone town halls,
- Now in third round of formal public consultations.
- A community office was opened in Squamish
- As a result of local concerns on specific issues, Woodfibre LNG appears to have made the following design changes
 - Marine noise – Proposed floating liquefaction plant was rethought, and moved to land
 - Gas turbine to run the plant – this plan was dropped in favour of electricity from BC Hydro, reducing greenhouse gas emissions by about 80 per cent.

Project documents can be viewed at [this](#) website:

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_408.html

Eagle Mountain-Woodfibre Gas Pipeline

Project documents can be viewed at [this](#) website:

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_doc_index_406.html

FortisBC's planned "horizontal directional drilling" would go 50-70 metres below the Squamish riverbed, and far away from any wildlife. It's the same technology that was safely used when the company moved its pipeline on the Fraser River to make way for the Port Mann Bridge expansion.

How can I obtain more details about these applications?

An appendix to the Citizen's Guide contains the most recent available information.

Upstream to Downstream: A legislation and regulation review

The natural gas industry uses the terms upstream, midstream and downstream to describe the distinct phases of gas development and relocation of the commodity to customers.

1. Upstream

Natural gas wells and supporting infrastructure

Specified enactments exist under these acts:

- [Forest Act](#)
- [Heritage Conservation Act](#)
- [Land Act](#)
- [Environmental Management Act](#) (last updated March 18, 2013)
- [Water Act](#)

Legislation/Regulations in place

[Petroleum and Natural Gas Act](#)

[Oil and Gas Activities Act](#)

[Geophysical Exploration Regulation](#)

[Drilling and Production Regulation](#)

[Consultation and Notification Regulation](#)

[Fee, Levy and Security Regulation](#)

[Oil and Gas Activities Act General Regulation](#)

[Pipeline Crossings Regulation](#)

[Environmental Protection and Management Regulation](#)

[Administrative Penalties Regulation](#)

[Service Regulation](#)

[Oil and Gas Road Regulation](#)

[Oil and Gas Waste Regulation](#)

[Emergency Management Regulation](#)

In addition, Ministry of Forests, Lands and Natural Resource Operations (FLNRO), through FrontCounter BC and Crown Lands, is responsible for:

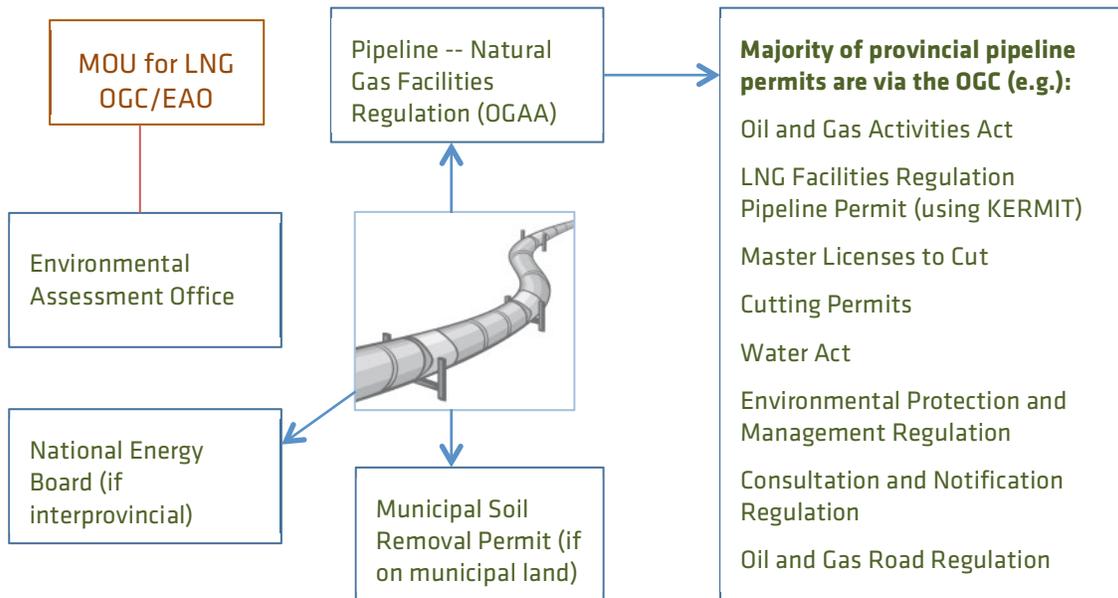
issuing and administering all Land Act tenures for federally-regulated pipelines; and authorizing surface uses that are secondary or ancillary to oil and gas activity including electric power lines, wireless and linear telecommunications, gravel pits, campsites and airstrips.

2. Midstream

Pipelines

For pipelines, the majority of provincial permitting falls within the Oil and Gas Commission's Pipeline Permit Process. There can be hundreds of permits along a pipeline route, and pipelines do include compressor stations and metering stations.

Those that cross provincial boundaries fall under the National Energy Board regulatory



oversight. This includes the main Spectra Energy system.

(Source: OGC Pipeline Permit Application Manual (Jan., 2015))

[Pipeline Regulation](#)

Acts

[Oil and Gas Activities Act](#)

[Petroleum and Natural Gas Act](#)

[Environmental Management Act](#)

Regulations

[Geophysical Exploration Regulation](#)

[Drilling and Production Regulation](#)

[Pipeline Regulation](#)

[Consultation and Notification Regulation](#)

[Fee, Levy and Security Regulation](#)

[Oil and Gas Activities Act General Regulation](#)

[Pipeline Crossings Regulation](#)

[Environmental Protection and Management Regulation](#)

[Administrative Penalties Regulation](#)

[Service Regulation](#)

[Oil and Gas Road Regulation](#)

[Oil and Gas Waste Regulation](#)

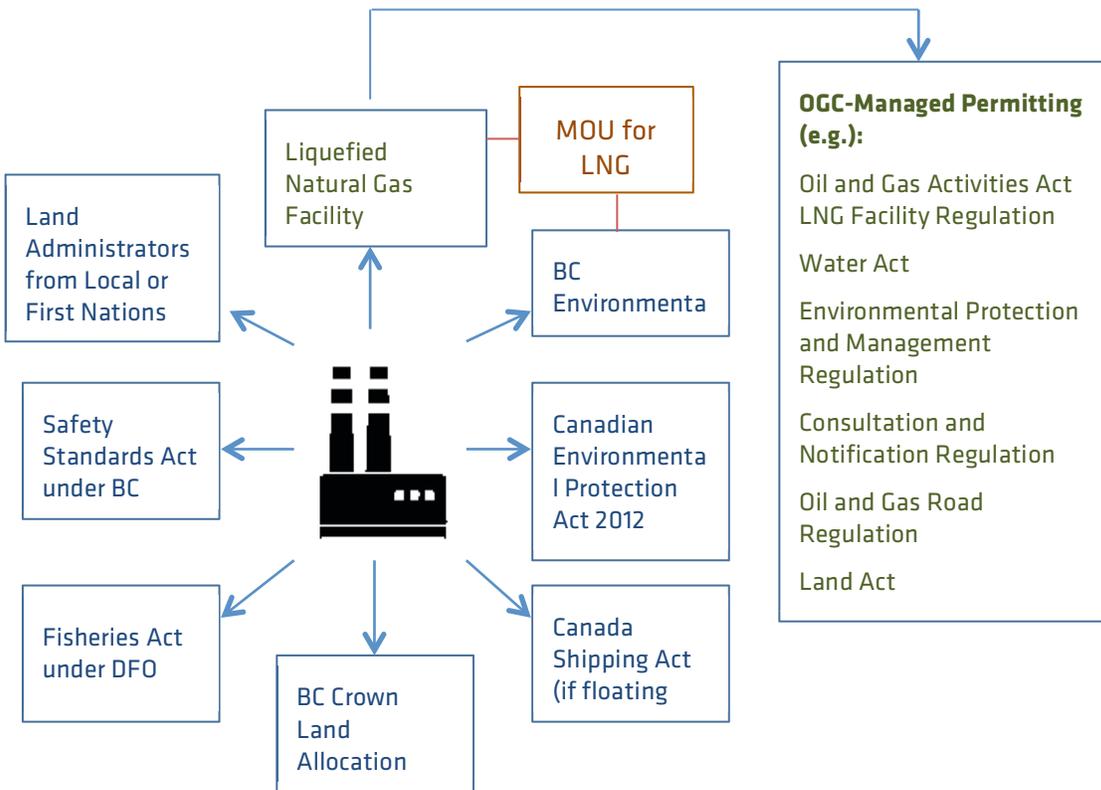
[Emergency Management Regulation](#)

[Liquefied Natural Gas Facility Regulation](#)

Can this pipeline be modified to carry oil (like the Energy East pipeline proposal)?

No, it is prohibited in B.C. for LNG-related pipelines to be converted to oil. BC developed a regulation to prohibit the conversion of a natural gas pipeline to transmit oil or diluted bitumen. The natural gas pipeline serving the proposed Woodfibre facility was specifically named in this regulation

3. Downstream



LNG Liquefaction Plant and Marine Terminal

Our study located more than 20 individual accountability processes pertaining to liquefied natural gas that apply to Howe Sound operations, as illustrated in this visual:

Legislation applying to LNG facilities

[Liquefied Natural Gas Facility Regulation](#)

Additional Information

[Gas Plant Design Capacities](#)

[Liquefied Natural Gas Facility Regulation](#)

Topics in the regulation of natural gas extraction in BC

Resource Works commissioned an expert in natural gas regulation to provide an analysis of the current state of the regulations that apply to the natural gas industry as it exists in British Columbia today.

Hydraulic fracturing

What share of natural gas exports will be based on fracking?

More than half. This share is expected to continue increase over time. Today, horizontal well drilling and multi-well pads have made extraction from these shale and tight sand basins economically and technically feasible.

Is fracking safe?

Hydraulic fracturing has been used in conventional gas and oil production since the 1960s. BC has a huge amount of natural gas trapped in shale rock reservoirs which are considered an unconventional reservoir type. The appropriate production techniques to effectively produce shale gas are directional drilling and hydraulic fracturing. B.C. has extensive experience in developing gas resources and has a strong regulatory framework in place.

A documentary film looking at fracking in the United States has led some to fear that the practice is inherently unsafe. We have not found evidence to support a connection between the film's claims and hydraulic fracturing in British Columbia. Gas deposits in B.C. are located deep (>2km) underground. To protect groundwater, steel and cement casings are used. The gas industry has a long record of safety.

The regulations that apply to safety and environmental accountability are examined in detail here starting on page 42.

Natural gas from both conventional and unconventional sources is processed and transported by pipelines to customers in BC and North America.

The Oil and Gas Commission is an independent regulator and the MNGD sits on its board.

The Ministry of Natural Gas Development files an annual service plan stating its goals. The 2013 service plan⁴¹ listed the following performance targets that pertain to natural gas safety:⁴²

- Continuously improve geological and resource assessments for natural gas, through collaboration with industry, industry associations, and academic and research institutes.
- Continue to develop a coordinated, transparent permitting and approval process with clear timelines for natural gas and oil resource development projects.

⁴¹ http://www.bcbudget.gov.bc.ca/2013_june_update/sp/pdf/ministry/mngd.pdf

⁴² http://www.bcbudget.gov.bc.ca/2013_june_update/sp/pdf/ministry/mngd.pdf pp 20-21.

Water integrity

The environmental groups Western Canada Wilderness Committee and Sierra Club of British Columbia Foundation decided to challenge a large Canadian company operating in BC, saying Encana was being granted short term approvals for water use in the province's gas-producing region.

When a ruling came down in late 2014, it showed that the regulatory processes in place, and industry compliance with them, are sound and well managed.

In an overwhelming endorsement of current practices in water protection, Justice Fitzpatrick of the BC Supreme Court concluded that when it comes to the regulation of industry's water usage, British Columbia is in good shape with a "justifiable, transparent and intelligible framework for the regulation of short term water use."

"Over the last few decades, the world has become increasingly aware that water is a precious resource," stated Madame Fitzpatrick in her [October 2014 ruling](#).

"This heightened awareness has caused many persons, including public interest groups such as the petitioners, to question the management of our water resources, particularly as it relates to the use of publicly owned water by industry."

In finding in favour of the Encana company, Justice Fitzpatrick praised the environmental groups for seeking a deeper judicial examination of the issues in play.

The "protection of waterways, fish habitats and other environmental values is a matter of vital public interest in British Columbia," wrote Madame Fitzpatrick.

"The petitioners are non-profit societies that have taken on an important advocacy role on those issues. The issue they raised ... is an important one that no one directly connected with the matter had any interest in raising."

Public protection

Goal 2 of the Ministry of Natural Gas Development service plan was entitled "Safe and environmentally responsible natural gas resource development and use" with the following objectives:

1. Standards that protect the public and the environment.
2. Efficient and effective natural gas policy, legislation and regulation in the public interest of British Columbians.
3. Clean energy resources, fuels and related technologies complemented by energy efficiency and conservation.

Government accountability

The natural gas development ministry released an updated Service Plan on Feb. 17, 2015. Much of the plan focuses on economic matters. Objective 1.2 is entitled: "A robust regulatory framework that supports environmentally and socially responsible LNG development in B.C." The strategies listed in support of this objective are:

1. Continue to work with the Oil and Gas Commission, permitting agencies, local authorities and the Environmental Assessment Office to ensure streamlined, integrated and robust regulatory and permitting processes.

2. Work with the Ministry of Aboriginal Relations and Reconciliation to develop and implement policies that result in First Nations' meaningful engagement specific to the development of a LNG industry.
3. In consultation with the Climate Action Secretariat and the federal government, implement world-leading GHG emission benchmarks that ensure British Columbia LNG facilities are the cleanest in the world, while providing strong incentives for the use of clean energy from the BC Hydro grid.
4. Work with the Ministry of Environment and, in consultation with the federal government, implement air emission standards and interim ambient air quality objectives that protect health, are consistent with leading jurisdictions and encourage clean LNG facilities.
5. Work with First Nations, communities and the federal government to ensure best practices are in place to guide marine traffic and the safe shipment of LNG to export markets.
6. Work with the federal government and the Port of Prince Rupert to ensure that the regulation of LNG facilities and related pipeline projects on federal lands in the Port of Prince Rupert occurs in substantially the same manner as other projects in the Province.

British Columbia's regulatory environment for LNG

This section summarizes the laws and regulations in place that pertain to the extraction and transportation of natural gas. To understand the policy environment, we commissioned an expert analysis of regulations in place. What we discovered was a complex regulatory environment consisting of numerous legal obligations in place for government agencies to perform permitting and monitoring of a wide range of activities.

We were able to find strong evidence that British Columbia's natural gas industry has been operating safely for more than half a century. As early as the 1930s, evidence shows that British Columbians have been aware of the benefits that can come from natural gas extraction. The regulatory framework was developed under the watch of a succession of governments, with the broad trajectory toward a safe and beneficial industry evidence – regardless of the political party of the day.

As recently as Fall 2014, legal challenges to processes in place have helped to add transparency and accountability so that citizens can better understand the risks faced. British Columbia's tradition of environmental activism is one of the factors that ensured rules and processes have been put into place that allow for transparency and accountability. This is one of the unique characteristics of British Columbia's natural resource sector generally that sets it apart from many places in the world where safety and environmental protection can be closed to public scrutiny and accountability.

A survey of safety rules in place in British Columbia

Regulatory responsibility is delegated to the Oil and Gas Commission through the Oil and Gas Activities Act (OGAA). The OGC is known as a “full life-cycle: regulator using a single-window structure to exercise its authority to provide most permits required for oil and gas activities, including those under separate provincial acts. Personnel who work at the OGC are subject-area experts, decision makers and inspectors. Together, they hold authority for compliance related to all permits.

Flaring, water safety, seismicity, abandoned gas wells, fracking, and pipeline safety are some of the topics subject to supervision by the OGC.

Officials in the OGC are legally obliged to carry out Section 4 of the Oil and Gas Activities Act, including these specific provisions:⁴³

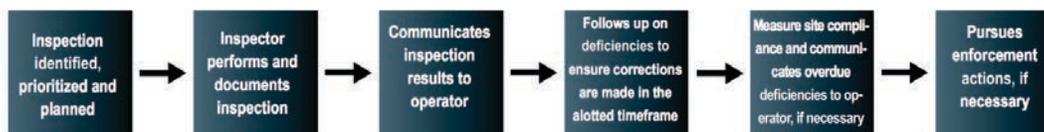
- the sound development of the oil and gas sector, by fostering a healthy environment, a sound economy and social well-being;
- conserving petroleum and natural gas resources;
- ensuring safe and efficient practices
- assisting owners of petroleum and natural gas resources to participate equitably in the production of shared pools of petroleum and natural gas

During 2013/14, the OGC performed 4,467 site inspections. According to the commission, its inspectors conduct site inspections and enter their findings into a database. Operators are required to fix any problems within a set time frame to fall into compliance. Failing to meet

⁴³ 2013/14 Annual Service Plan Report, BC Oil and Gas Commission, p. 5.

standards means the operator is subject to a more formal enforcement, further investigation and enforcement actions.

Infographic: Oil and Gas Commission Inspection Process⁴⁴



The OGC’s annual report states: “There is increased public interest in potential health effects from oil and gas development, specifically from noise, traffic, dust, air quality and hydraulic fracturing.

“Water use in shale gas extraction continues to be of particular interest to stakeholders. The Commission has implemented a regulatory requirement for companies to disclose the ingredients, combination and concentration of chemicals in hydraulic fracturing fluids used at each well where the technique is performed.”⁴⁵

The Oil and Gas Commission approves and regulates the following:⁴⁶

- Exploration, development, production, processing, storage and disposal of oil and gas and associated water
- Construction and operation of provincially regulated pipelines for oil, gas and associated water
- Gas plants and facilities
- Emergency Response Plans
- Oil and gas roads
- Water allocation
- Air emissions & liquid waste discharges
- Crown Land use (includes some aggregate extraction)
- Regulation of all petroleum and natural gas activities;

⁴⁴ BC OGC Compliance and Enforcement Activity Report for 2010/2011

<http://www.bcogc.ca/node/6107/download>, p. 7

⁴⁵ 2013/14 Annual Service Plan Report, BC Oil and Gas Commission, p. 19.

<https://www.bcogc.ca/node/11258/download>

⁴⁶ *LNG from Well Head to Global Markets*, presentation BC Oil & Gas Commission to SPE/ASME – October 23, 2014.

- Regulation of all provincially regulated pipelines; and,
- Issuing *Land Act* tenures for oil and gas drill sites, well sites, access roads as well as campsites, air strips, gravel pits, power and telecommunication lines and provincial pipelines, any of which are used solely for oil and gas production purposes.
- Timber harvesting (Crown land only)
- Environmental protection
- Archaeological impacts
- Remediation and reclamation
- Some provincial permits on federally regulated projects
- First Nations and stakeholder consultation related to above
- Some projects normally regulated federally
- All compliance and enforcement for the above
- Geophysical Exploration Regulation Service Regulation

Municipal documentation

The District of Squamish website is a source of reports that have been received by the district:

<http://squamish.ca/business-and-development/economic-development/projects-in-our-community/woodfibre-lng-community-committee/agendas-minutes-and-presentation-materials/>

Background resources

Download a form here to make your voice heard about Woodfibre LNG or the FortisBC Eagle Mountain Gas Pipeline: <http://www.eao.gov.bc.ca/pcp/index.html>

The District of Squamish maintains a repository of documents related to the Woodfibre LNG proposal: <http://squamish.ca/business-and-development/economic-development/projects-in-our-community/woodfibre-lng-community-committee/agendas-minutes-and-presentation-materials/>

EA Office files on Woodfibre LNG and the Eagle Mountain-Woodfibre Gas Pipeline:

Woodfibre LNG:

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_408.html

Eagle Mountain

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_doc_index_406.html

Peeling Back the Layers of LNG Development – A Primer on the Regulatory Framework for LNG Projects in B.C. http://www.mccarthy.ca/article_detail.aspx?id=6561

Natural Gas: A Primer <http://www.nrcan.gc.ca/energy/natural-gas/5641>

The following resources have been created by the provincial government of British Columbia:

www.LNGinBC.ca

LNG 101: A Guide to BC's Liquefied Natural Gas Sector

<http://www.gov.bc.ca/mngd/doc/LNG101.pdf>

LNG Information Kit

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About the authors

Stewart Muir



Stewart Muir is the founding Executive Director of the Resource Works Society, the second most influential Canadian think tank in social media terms. He is interested today in the challenges of balancing a responsible approach to the environment with meeting the needs of the world's human population.

Stewart's columns on responsible resource development and environmental stewardship are widely published and he is a regular commentator on radio. He is a co-author of *The Sea Among Us: The Amazing Strait of Georgia*, a 2014 book that was the first to examine the Strait from all perspectives. In February 2014, *The Sea Among Us* won the American Fishery Society's Haig Brown Award. Recently it was shortlisted for the 2015 Basil Stuart-Stubbs Book Prize.

As a historian with a master's degree from the University of British Columbia, Stewart won the 1994 NUFFIC fellowship at the IGEER institute at Leiden University in The Netherlands, where he studied the history of environmental change. He has served for two terms on the board of the Nature Trust of British Columbia. He has published work on the history of racism in British Columbia. As lead writer and editor of the official review of the 2011 Vancouver Stanley Cup Riot, he worked alongside legal and policing experts to deliver more than 50 recommendations to government. In Fall 2014, he made recommendations to the NEBC Resource Municipalities Coalition Mayors' Partnership in connection with the development of community interests in the resource economy.

A Commonwealth Press Union Harry Brittain Fellow in 2000, he served as managing director of a division of The Canadian Press in 2009-11 and was deputy managing editor of The Vancouver Sun from 2004 to 2008. In addition to Vancouver and Victoria, he has been based in Ottawa, Banff, Toronto, London, Hong Kong, and Brisbane. He was a reporter, and later editor and publisher, of The Whistler Question.



Barinder Rasode

Barinder Rasode is Director of Social Responsibility of the Resource Works Society. A board member of Fraser Health, she is a community organizer and served two terms on the council of Canada's 12th largest municipality, the City of Surrey.

Her career in public service has focused around her passion and commitment to creating a better city and a better future for her family. Barinder has also led a number of projects focused on preventing violence against women such as the Surrey Coalition against Domestic Abuse and the Rakhi Project. Her interest in responsible resource development comes from her commitment to public safety, strong economic growth, and healthy, sustainable communities that will benefit the next generation. She has built her career on including stakeholders, citizens, and interest groups through partnerships and conversations in order to find and implement creative solutions to complex problems. Barinder grew up in Kamloops and now lives in Surrey with her three children.

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A submission to the District of Squamish

Is Squamish a “resource town” or isn’t it? Perspectives on economic development in Squamish

Prepared for: District of Squamish Council
Prepared by: Barinder Rasode, Resource Works Director of Social Sustainability and Stewart Muir,
Executive Director
Date: March 3, 2015

Overview

There is an energetic debate today in Squamish that can be roughly characterized by the following question: Is Squamish a “resource town” or isn’t it? In this short report, we argue that this question presents a false choice. No community should have to choose between different economic sectors. In fact, embracing diverse industries is one of the best strategies for ensuring long-term economic security.

Wrestling with the concept of a “resource town”

Perhaps more than any other municipality in BC, Squamish has been forced to wrestle with its relationship to natural resource industries. Forestry has played an important role in the history of Squamish, but the district’s identity has shifted in its recent years, most notably after the closing of the Woodfibre Pulp Mill in 2006. The district has displayed remarkable economic resilience, growing an impressive consumer-oriented local economy focused on tourism, recreation and real estate.

And now, with a proposal to build an LNG export facility at the site of the old Woodfibre mill, an opportunity has arrived to once again strengthen Squamish’s resource economy. In response to this opportunity, many Squamish residents are asking valid questions about what this means for their community. Is this still who we are? Are we – and do we want to be – a “resource town”?

Resource Works has played a small role in this conversation, visiting Squamish in October 2014 to host an open dialogue session with Squamish residents to explore their ideas about resource development. Based on what we heard from Squamish residents in that session, we offer a few perspectives that we hope Council will find helpful as it considers the District’s future economic development.

The role of natural resources in a diversified economy

According to the most recent available analysis of the Squamish regional economy, 9.3 percent of jobs in the region depend on natural resources, either directly or indirectly.¹ This puts the region very close to the provincial average in terms of resource-dependent workers. According to recent research by

¹ In “Employment Projections for the Squamish - Lillooet Regional District” (June 2013) the Vann Struth Consulting Group estimates that there were 1,182 direct and indirect jobs in the region related to natural resources, which is 9.3 percent of the total estimated 2012 workforce in the district.

Resource Works, 9.7 percent of workers in BC have jobs that depend on natural resources, either directly or indirectly.² Looking at employment numbers alone will therefore not help resolve the question of whether Squamish is a “resource town.” Resource jobs are a significant part of the Squamish labour force, but they do not dominate the local economy to the extent seen in other BC communities. Squamish stands in a middle ground, with one foot in the resource sector and one foot in consumer-focused industries.

It is worth noting that the impact of the resource sector is not always well represented by its share of local employment. As shown in the tables below, jobs in the natural resource sector produce higher than average spin-off jobs in other areas of the economy and pay some of the highest wages in the province.

Spin-off jobs by industry ³	
Industry	Spin-off jobs per 100
Pulp and paper	106
Mining	70
Sawmills	56
Film	54
Construction	53
Logging	43
Public sector	35
Tourism	22
High Tech	22

Wages by industry, BC, 2013 ⁴		
Industry	Average weekly wage	Est. full-time yearly salary
Mining and energy	\$1,721	\$82,600
Public administration	\$1,205	\$57,800
Forestry	\$1,175	\$56,400
Manufacturing	\$992	\$47,600
Education	\$966	\$46,300
Health care	\$874	\$42,000
Culture and recreation	\$827	\$39,700
Retail, wholesale trade	\$662	\$31,800
Accommodation and food	\$426	\$20,400

Much can be said about the economic benefits of resource industries, but it is important to recognize that highly resource-dependent communities bear many risks. As a trade-dependent region, BC is vulnerable to changes in economic conditions outside our control. Squamish has certainly experienced the effects of instability in the forestry sector, just as many Canadian communities are now experiencing the impacts of the recent drop in oil prices.

Squamish has prospered in recent years in large part due to its economic diversity. As forestry declined, tourism and real estate grew. Of course, trends can swing both ways. Tourism and real estate can be as vulnerable to market swings as natural resource industries. As many BC communities have learned, economic diversity is ultimately the best source of long-term economic security.

² “Community Impacts,” Resource Works Society, October 2015

³ “Employment Projections for the Squamish - Lillooet Regional District,” Vann Struth Consulting Group, June 2013

⁴ Statistics Canada, Cansim tables 281-0027 and 282-0072

Squamish residents are looking for balance and facts

On October 31, 2014, Resource Works staff and volunteers hosted a community dialogue session as part of an eight-part series called *Community Conversations on Natural Resources*. Twenty-four Squamish residents⁵ joined us at the Squamish Seniors' Centre to share their perspectives on resource development. The two-hour event was designed to address two key questions: How would you describe responsible resource development? And how do we build productive public dialogue?

We recorded what we heard at that event and afterward performed methodical content analysis to identify the key ideas expressed by our participants. (Results from all eight of our sessions are available in the *Community Conversations* report at resourceworks.com)

Responsible resource development: Community, environment and innovation

When asked to describe what “responsible resource development” meant to them, our Squamish participants emphasized three major themes: community involvement, environmental protection and innovation.

⁵ Of these, 11 were involved in municipal government (including candidates running in the 2014 municipal election), seven were associated with natural resource industries and four were associated with local environmental organizations

Participants emphasized that responsible resource development must involve community input and provide community benefits. Residents said that they expect resource proponents to engage in meaningful consultation that addresses the concerns of community members, with special consideration for the concerns of First Nations communities. As well, participants said that responsible resource development must be mutually beneficial, with affected communities benefiting from jobs, training and other economic impacts.

Values describing responsible resource development	
Value	Times selected
Environmental sustainability	10
Safety	9
Integrity	8
Innovation	6
Community involvement	5
Trust and reliability	5
Economic growth	4
Wealth and prosperity	4
Continuous learning	4
Job creation	3

Environmental protection was another key theme in these discussions. Participants emphasized that resource development must not negatively impact local environments, with a focus on preserving the quality of affected areas’ air and water quality and preserving local ecosystems.

The third major theme that emerged is that responsible resource development entails innovation, particularly developing methods to better protect the environment. Some participants emphasized the need for industry to support a global transition to low-carbon energy.

All participants were also asked to describe responsible resource development by selecting concepts from a list of broad values. The top 10 choices are shown in the table above.

WHAT WE HEARD IN SQUAMISH

“When you acknowledge people’s values, you can create understanding.”

“We need to transition away from non-renewables.”

“The proponent needs to do a better job educating the public, and be willing to change their practices and policies.”

“For a dialogue, you must have diverse views at the table. It’s better to get to creative solutions

“There’s a lack of openness and far too much PR. We should be talking to people, not at them.”

“Public dialogue is presented as either-or – you’re trying to kill the environment or you’re trying to destroy the economy. If we focused on values we could focus on our commonalities not our differences.”

“True engagement means that you do not assume an outcome, letting go of control and accepting whatever comes out from the dialogue.”

“People just want information that supports their bias. Facts should inform your beliefs.”

“People want to engage with the facts and make informed decisions in the future.”

Productive public dialogue: Information, inclusion, flexibility

The second part of our conversation session focused on how British Columbians can help build a more productive public dialogue on natural resource issues. The most prominent themes in this discussion were: reliable information, inclusion and flexibility.

The most commonly identified factor required for productive dialogue was reliable information. Many Squamish participants said they find it difficult to know who to trust in public discussions about natural resources, and many expressed a desire for neutral, credible information with which to reach decisions. Many expressed dissatisfaction with public dialogue characterized by misinformation, incomplete information and emotionally manipulative messaging.

Inclusion was another major theme in this conversation, with participants emphasizing that a broad segment of the community should be encouraged to participate in public dialogue on resource decisions. Many participants said that it's important for industry proponents, government leaders, regulators and citizens themselves to hear a broad range of voices.

The third main theme is that people engaged in dialogue must be prepared to change their thinking and their behaviour based on what they hear. Participants in our conversation sessions said they wanted more flexibility and open-mindedness and less behaviour characterized by narrow self-interest and ideology.

Conclusion: Pursuing a balanced, diversified regional economy

This report shows that the role of natural resource industries in Squamish need not be an all-or-nothing, either-or question. The economic data shows that Squamish is a diverse region that benefits from both resource industries and consumer-focused industries. And recent history shows that Squamish has benefitted greatly from this diversity.

Our conversations with Squamish residents also show a rejection of absolutist yes-or-no attitudes toward resource development. Even participants who came into the room with very different attitudes on resource issues were able to agree on certain fundamental values that should guide resource development. They expressed a desire to have a better public dialogue on resource development, one that includes more community participation, better information and more willingness to incorporate community values into project planning.

And so, is Squamish a “resource town” or isn’t it? We argue that this question presents a false choice. Squamish has an inspiring story where it has created a diverse regional economy that includes both resource and non-resource industries, something many municipalities in BC still struggle to accomplish.

Our recommendation is that Squamish Council not limit its economic development goals to be either resource-based or non-resource-based. Rather, we recommend pursuing a diversified regional economy, which we argue is the best way to ensure long-term economic stability in face of uncertain global markets. Based on our conversations with Squamish residents, there is an appetite for an inclusive, credible conversation on how to achieve responsible resource development that reflects their values. We encourage Squamish Council to support that worthwhile process.

Our next steps

Resource Works is committed to continuing its research on responsible natural resource development in British Columbia. We are aware that the topic of Woodfibre LNG and associated infrastructure is one that has stimulated public interest and is a sensitive matter in the community. Our Squamish conversation participants clearly flagged for us the need for neutral sources of information.

1. Today, Resource Works is publishing the *Citizen’s Guide to LNG (Sea to Sky Country Edition)*, a document that examines environmental, safety, economic and social themes connected with the maritime export of natural gas in a diversified modern economy. We have seen the need for a balanced source of information that can be trusted. We look forward to developing our research and sharing it with the public.
2. We are aware of two District of Squamish processes that have short-term strategic importance:
 - a. The economic development strategy.
 - b. The Official Community Plan review.

In both cases, Resource Works is committed to continuing its work in Sea to Sky Country by providing a neutral platform for citizens from all walks of life to be included in important conversations. We look forward to receiving guidance from Council on how our programs could most constructively be directed, going forward, in terms of 2a and 2b.