Understanding and MANAGING RISK

FIRST NATIONS
LNG ALLIANCE

MANAGING RISK

Source: BCOGC

Whether it is energy, mining, or other natural resource activities, people often hear about the risks associated with projects. Companies will talk about the measures they take to manage risks, but people living in areas where development might occur often worry about the risk of an accident or environmental damage if a project goes ahead.

Developing a **liquefied natural gas** industry (LNG) in BC will require the construction of a range of different facilities to extract, process, deliver, and liquefy gas. Understanding and managing the risks associated with LNG operations is a key part of their design.

Risk has a specific meaning for the professionals and companies who build and operate projects. Knowing what risk means is an important part of being an informed participant and decision-maker. When communities are asked to review and consider projects it is helpful to understand how project proponents define risk.

This information sheet provides an overview of the ideas and concepts often used by experts when they talk about risk. Examples from daily life and industry are used to illustrate what different terms mean.

WHAT IS RISK?

Risk is something we face every day. It varies in terms of its potential impact to our lives and the frequency we are exposed to it. Risk can increase or decrease over time.

Understanding and managing risk is an important part of any project. Risk involves trying to understand uncertainty. Uncertainty is when we do not have full knowledge about the current state or future effect of something. Most people associate the word risk with something harmful, which comes from uncertainty. But we often take risks for what we see as benefits.

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Accident or incident

The words incident and accident are often used to mean the same thing. But in risk management each word has a different meaning. An **incident** is a sequence of actions or events. An **accident**, is the **consequence** of an incident. While an incident may occur, if there is no consequence then there is no accident. **For example**, if a car gets a flat tire while travelling but the driver is able to get the vehicle under control and safely stop, then an incident occurred but there was no accident. However, if the same incident occurs but the driver loses control and hits a tree, then an accident occurred.

Figure 1: What is risk?

Risk has two parts

To better understand what risk is, it helps to look at its parts. The easiest way to understand risk is to see it is the consequence of something happening and the likelihood that something will happen (Figure 1).

A consequence means the harm experienced if something (a risk) happens. Examples of consequences can be the loss of life, injuries, environmental damage, or even the costs of damage. For instance, if a driver is in an accident and suffers an injury, the consequence of the accident is the injury. Another instance would be if a flood happens and a house is damaged, then the consequence of the flood is the damaged house.

Likelihood is the **chance** that a risk will impact us. Some risk definitions will also talk about the **probability** of a risk being realized. This is about figuring out the likelihood a risk may happen.

If someone is driving to work we expect most days the drive will be incident-free. But think about where they are driving. If the person has a long drive to work, in a city with many cars on the road, poor road maintenance, and frequent bad weather, then there is an increased likelihood of having an incident and accident compared to a driver who has a short drive to work on a quiet road. Understanding the risk depends on understanding likelihood.

Is it a hazard or a risk?

A hazard and risk are not the same thing. A hazard is any source of potential **harm**. A harm is the injury or damage to the environment or people. For example, diesel may be a hazard on a construction site. If diesel spills into a stream while a truck is being fuelled, then it can cause harm to fish.

How vulnerable is it?

Vulnerability is how susceptible something is to harm. Vulnerability may increase the degree by which a risk impacts people or the environment. If we think about the diesel spill example, some water plants may be more vulnerable to a spill than others.

If it happens, can we deal with it?

Capacity is linked to vulnerability. Capacity is our ability to cope with the risk if it happens. If the vulnerability is greater than the capacity to deal with risk, then the potential impact of risk may be higher. These concepts – vulner-ability and capacity – are closely linked and often depend on the degree to which people or communities have access to resources to deal with risk (such as money, skills, or expe-rience in dealing with risks). For instance, do we have ways of dealing with a diesel spill if it happens?

Why is understanding risk important?

Our exposure to risk influences our safety. If we inform ourselves about possible risks – for example the risk of flooding – we can and make decisions that reduce or avoid it. Then we become safer.

Being informed allows us to make decisions based on understanding risk. For instance, if we are building a house in a valley bottom we can choose a site outside a river's flood plain. Or we can construct safeguards to reduce risk, such as building floodwalls to protect a community. But we also have to know how often a river floods and how high the water might get.

Analyzing Risk

A risk analysis helps us identify risks; including the causes, sources, consequences, and the likelihood it will happen.

Risk analysis involves qualitative and quantitative studies. But sometimes the information we have may not be enough to come up with a clear conclusion. This can be dealt with through systematic techniques to predict a particular risk.

1- Qualitative Risk Analysis: A qualitative risk analysis prioritizes the identified risks on a defined scale based on their likelihood of occurrence and the impacts. For example, a qualitative analysis might use a scale of "Low, Medium, High" to describe the likelihood of an event happening.

2- Quantitative Risk Analysis: To conduct a quantitative risk analysis, high-quality data is required. This type of analysis defines the probability of an event occurring. For example, let's say we have 3 risks with different probabilities: **risk 1** has a 90% chance of happening, **risk 2** has a 25% chance, and **risk 3** has a 5% chance. We know that risk 1 is more likely to happen than the others.

The use of either qualitative or quantitative risk analysis depends on the availability of data and information, the type of risk being analysed, and the amount of time we have to analyse the risk.

Risk indentification and assessment

The main objective of carrying out risk identification is to develop a list of risks. This includes understanding the sources of risk, area of impacts, and possible events and their causes. Risk identification provides a description of risk information.

The assessment of risk focuses on two key questions:

1. First, how likely is someone or something to be exposed to the source of the risk?

2. Second, what are the consequences if someone or something is exposed to the source of the risk?

Can you eliminate risk?

No project or activity is risk free and not all risks are known. The only way to eliminate risk from any action is not to do it. We may try reduce risks to an acceptable level based on our tolerance for risk. This is done by talking to the people who would be exposed to a risk to find out what they are concerned about and what they are willing to accept.

Risk assessment examines these two main components of risk to determine what can go wrong if the risk occurs.

For example, on a construction site we might want to know how likely it is that someone will be exposed to an uncovered source of electricity, and if they were what would be the consequence? Could they be shocked? If so, how severely? If we require that all sources of unprotected electricity be labelled and fenced off in a special way then we can help reduce the risk. And if we require all workers on the jobsite to have electric-hazard-rated workboots, then it would also help address risk and consequences.

Risk Evaluation

Risk evaluation is the process of identifying and measuring risk. Using this information we can create a risk profile. This would show us the significance or importance of a risk. The evaluation is done using a range of measures that may include legal requirements, social and economic considerations, and environmental effects.

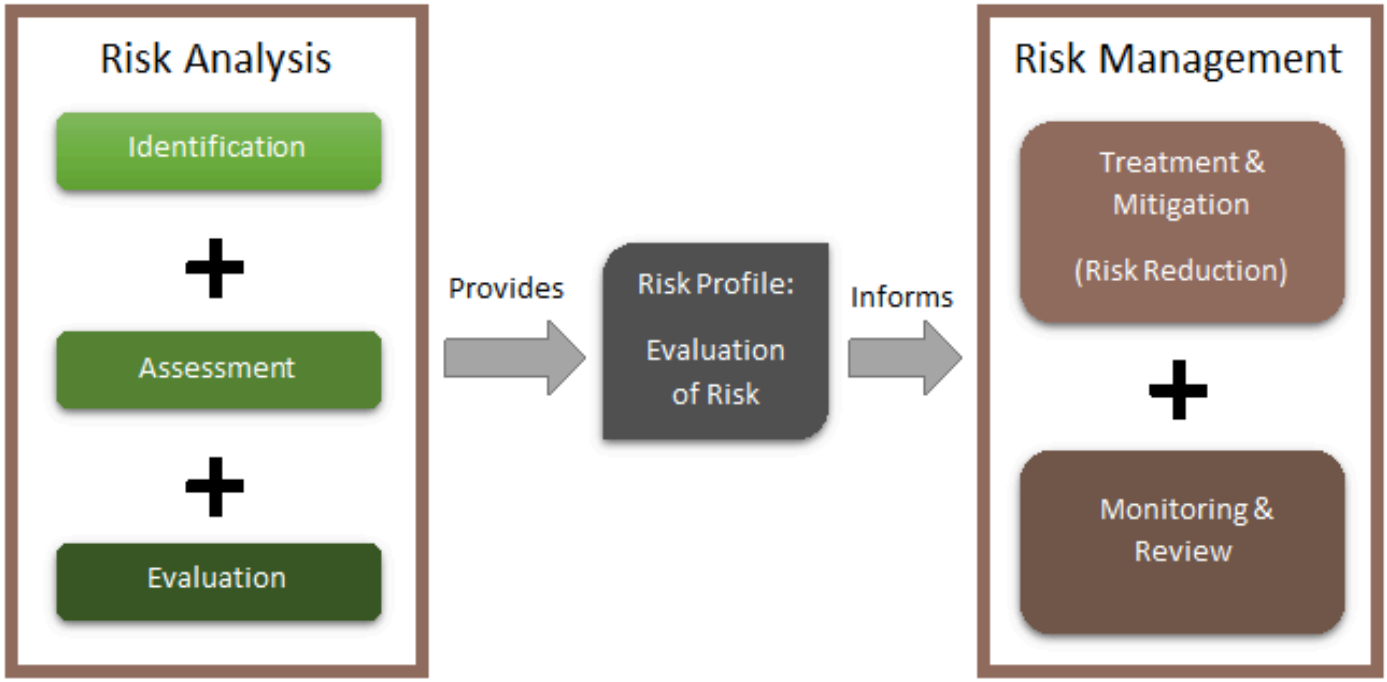

Figure 2. The Processes of Risk Analysis and Risk Management (adapted)

Managing Risk

Understanding the risk helps us manage it and improve safety. If we reduce consequences or likelihood, or both, we then reduce risk. The key to risk management is risk treatment and mitigation. There are four ways of managing a risk:

1 **Avoid it:** Sometimes we can eliminate or reduce a risk. For example, if we are concerned about flooding then we can choose to live outside a flood plain.

2 **Transfer it:** This is when we accept that a risk may happen, but we allow the risk to be shared or transferred to a third party. This is typically done by having insurance to protect us from the costs if a risk happens.

3 **Mitigate or reduce it:** Before a risk happens, there may be things we can do to reduce the risk. Mitigation means taking early actions to prevent or reduce the likelihood or consequences of risk. An example would be a driver who decides to work from home twice a week. This will reduce the likelihood they are in a car accident.

4 **Contingency:** This is about having access to a back-up until we can get back to normal conditions. For example, if we are worried about the likelihood of a power outage, we can have a diesel generator as a back-up.

Depending on what is learned from an evaluation of risks, we may simply accept the consequence of a risk happening. This is called **risk acceptance.** But likelihood and consequence can change over time. This means that at some point in the future a risk may no longer be acceptable.

For example, at one time the consequences of a flood may not have been very expensive. But as time goes and we add more buildings and spend more money on improving the land, we find that the cost of a flood clean-up and replacing buildings becomes much more expensive. So the flood risk might no longer be acceptable.

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Risk monitoring and review

Once risks have been analysed and addressed it is important to continually track them to ensure that the decisions we made were right, and that the treatments or controls we put in place are effective.

Having a strong record of risks helps us manage them. This record is called a risk registry: A registry would have 6 basic ingredients:

1 A description of the risk

2 Knowing the factors that may contribute to risk (such as vulnerability, or other com pounding or cumulative factors)

3 Understanding the impacts of the risk if it happens, and to who and how severe

4 What has been done to treat and/or mitigate the risk

5 An assessment of risks after any treat ment/mitigation

6 Deciding on further actions required if too much risk remains after treatment/mitigation

Risk is part of our daily lives. Educating ourselves about it helps us make knowledge-based and informed decisions. Identifying and understanding risks and managing them is a key part of designing and operating projects. Managing risks also means ensuring that communities understand the ways that risks are defined, managed, and communicated.

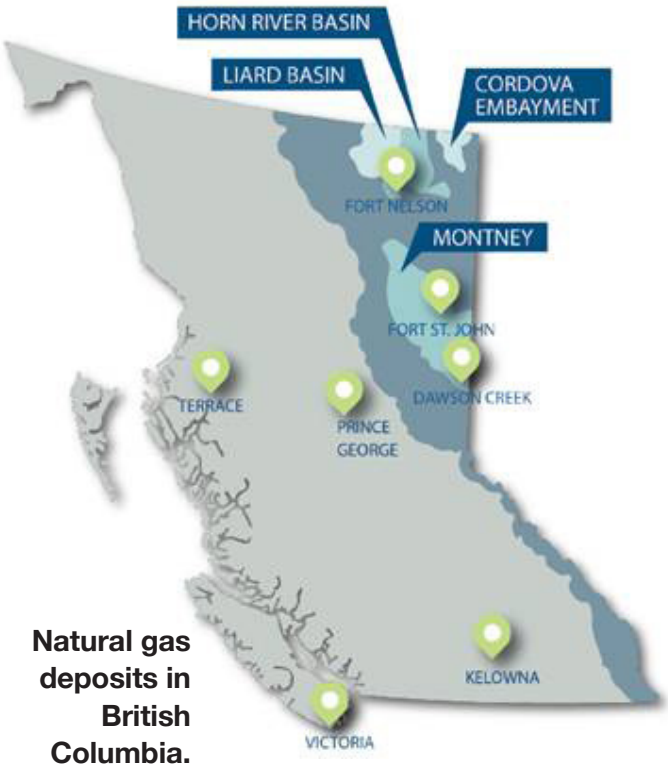
Natural Gas Liquefaction and Transport

Risks are part of any industry, including natural-gas projects. Natural gas (NG) exploration and extraction activities have been underway in BC since the 1950s.

BC's natural gas industry is located in the northeast part of the province. In BC, the places where natural gas is found are far from the locations where the gas will be turned into liquefied natural gas (LNG) for shipment overseas. This will require long-distance pipelines and the construction of liquefaction plants and ship loading facilities.

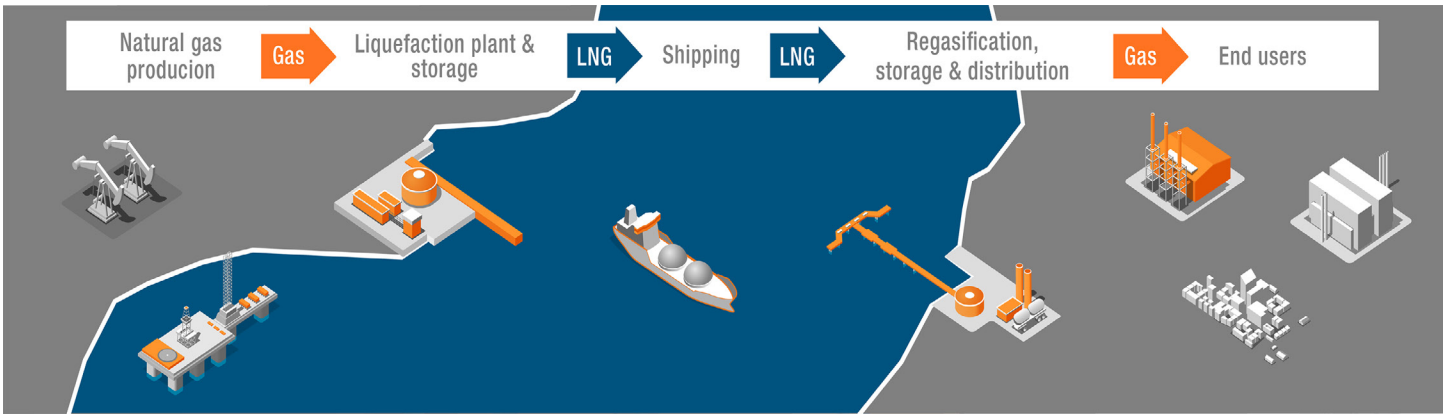
When we look at the LNG supply chain, (see diagram on page 7) BC will host only the first 3 stages. The LNG industry is an export trade. There are many proposals to build gas pipelines and LNG production facilities in BC.

There are now 14 LNG production related facilities at different stages of planning and review in BC. But as of 2018 no LNG export terminals or liquefaction plants had been constructed.



Natural gas deposits in British Columbia.

Source: BCOGC



LNG supply chain

Source: Wartsila

Pipelines

Natural gas pipeline accidents are rare in Canada. There are many thousands of kilometres of gas pipeline across the country. Larger diameter lines carry natural gas over long distances; smaller ones are used to deliver it to homes and businesses.

Building and operating a natural gas pipeline has the potential to impact a range of environmental qualities; such as wildlife migration patterns, streams and rivers, and allowing access to remote areas by people. Such risks can be mitigated during construction and operation.

The route a company chooses for a pipeline can also be an important part of reducing impacts on communities and businesses.

By avoiding some areas we avoid disturbing people during construction, or reduce the potential for other activities (such as construction) to damage a pipeline itself once it is operating.

If a pipeline is located away from settled areas then the potential for it to harm people or property if there is an accident is also reduced. But it is not always possible to avoid built-up areas. The route choice may also be used to mitigate impacts on environmentally sensitive areas – by avoiding them.

Timing decisions can be used to help reduce impacts on wildlife during pipeline construction or maintenance. For example, we can schedule construction activities so that we avoid the migration times of a specific animal.

Monitoring equipment and routine inspections also help determine if repairs are needed or if there are any risks to a pipeline from the surrounding environment; for example from stream erosion or landslides.

Ian King/Photo

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Liquefaction

Moving natural gas by ship requires that the gas be turned into a liquid. Turning gaseous NG into liquefied natural gas reduces its volume to 1/600th. This requires cooling the gas to -160° Celsius until it becomes a liquid. This is done at a liquefaction plant.

At a liquefaction facility, the risks often considered include explosion or fire, hazardous material from fuels spills, an LNG spill, or a ship collision at the docking area or nearby.

The outcomes of any incident will depend on the ability to handle the incident and prevent it from having significant impacts on people or the environment.

As part of the design and operation stages, LNG companies develop plans for prevention and dealing with incidents if they happen.

An LNG carrier

Shipping

Shipping accidents at sea are very rare, but minor incidents do occur. There have been no major LNG accidents similar in scale or impacts to large spills seen over the history of shipping oil. But the global oil industry has a longer shipping history, there are more oil tankers in operation, and there are many more oil terminals around the world than there are for LNG.

The major risks associated with LNG shipping are collision, grounding, human contact with LNG, fire and explosion, and incidents (such as spills) during loading or unloading at an LNG terminal. In BC, any LNG facility will result in new shipping, or increases to existing shipping frequency, which will affect the likelihood of an event happening.

Shipping activities may affect marine environments and related community activities. Routing and timing decisions can also help lessen risks at important times of the year when a key marine species may be migrating or using an area for feeding.

The use of state-of-the-art navigation technology, facility location, selection of shipping routes, and other precautions can help reduce the likelihood of an incident.

Social and Cultural

Risk analysts commonly define social risks as the impacts that a project might have on communities nearby. Natural gas projects may affect access to traditional lands and resources, or impact quality of life.

Pipelines will be routed through landscapes that host a range of traditional and other uses, or they may be located near communities. The decisions a company makes about the sites of their facilities and the timing of operations can help reduce some risks during construction and operation.

Managing risk should include an understanding of how people use land and other resources, the cultural values they attach to specific places, and what risks a project might pose to these qualities.

Source: Government of B.C.

Economic

The promotion of an LNG project by industry often focuses on the economic benefits that projects will bring. For example, land and other taxation at the various levels of government may be used for community services. The economic risk argument made by government and industry is a different type of risk than most people think about. They would suggest that without a facility or pipeline, these funds might not be available to support local, provincial and national economies.

The economic risk they present is lost opportunity. This is the loss of potential income to provide services to communities. If an incident resulted in significant environmental damage, health impacts to local communities, and the loss of traditional land uses or resources, and then economic benefits may be lost.

The only way to completely eliminate those risks is to not build the project. But then communities and governments may lose tax revenues that could be used for health care services, social programs, new roads, education, or public transportation.

Economic risk should be considered alongside social, safety, and cultural and environmental risks.

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Front page photo: Beach near Kitamaat. Source: LNG Canada

Cover photo source: Kitimat LNG

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The Information Series is produced by the First Nations LNG Alliance in collaboration with the Centre for Environmental Assessment Research at UBC. The series provides information for individuals and communities interested in learning about the nature, structure, operation and impacts of the LNG industry and natural gas resource development in British Columbia. Where possible the information sheets are developed using sources available online. This is so readers can more easily access the sources used by the author. Information sheets may be updated periodically. Please check the date of issue for the most current version.

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First Nations Issues and the Development of BC's LNG Industry
The Review and Assessment of LNG Projects
Understanding and Managing Risk
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