ACTEX Learning

Exam 6 CAN Study Guide

5th Edition

Victoria Grossack, FCAS

A CAS Exam

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QUESTION 19 OF 704 | Question # | Go! | Prev | Next

Question — Difficulty: Advanced

An airport purchases an insurance policy to offset costs associated with excessive amounts of snowfall. The insurer pays the airport 300 for every full ten inches of snow in excess of 40 inches, up to a policy maximum of 700.

The following table shows the probability function for the random variable X of annual (winter season) snowfall, in inches, at the airport.

Inches	[0,20)	[20,30)	[30,40)	[40,50)	[50,60)	[60,70)	[70,80)	[80,90)	[90,inf)
Probability	0.06	0.18	0.26	0.22	0.14	0.06	0.04	0.04	0.00

Calculate the standard deviation of the amount paid under the policy.

Possible Answers

A 134 — ✓ 235 — X 271 — D 313 — E 352

Help Me Start

Find the probabilities for the four possible payment amounts: 0, 300, 600, and 700.

Solution

With the amount of snowfall as X and the amount paid under the policy as Y, we have

y	$f_Y(y) = P(Y = y)$
0	$P(Y = 0) = P(0 \le X < 50) = 0.72$
300	$P(Y = 300) = P(50 \le X < 60) = 0.14$
600	$P(Y = 600) = P(60 \le X < 70) = 0.06$
700	$P(Y = 700) = P(Y \ge 70) = 0.08$

The standard deviation of Y is $\sqrt{E(Y^2) - [E(Y)]^2}$.

$$E(Y) = 0.14 \times 300 + 0.06 \times 600 + 0.08 \times 700 = 134$$

$$E\left(Y^2\right) = 0.14 \times 300^2 + 0.06 \times 600^2 + 0.08 \times 700^2 = 73400$$

$$\sqrt{E\left(Y^2\right) - [E(Y)]^2} = \sqrt{73400 - 134^2} = 235.465$$

Common Questions & Errors

Students shouldn't overthink the problem with fractional payments of 300. Also, account for probabilities in which payment cap of 700 is reached.

In these problems, we must distinguish between the REALT RV (how much snow falls) and the PAYMENT RV (when does the insurer pay)?. The problem states "The insurer pays the airport 300 for every full ten inches of snow in excess of 40 inches, up to a policy maximum of 700 ." So the insurer will not start paying UNTIL AFTER 10 full inches in excess of 40 inches of snow is reached (say at 50+ or 51). In other words, the insurer will pay nothing if X<50.

Rate this problem: Excellent | Needs Improvement | Inadequate

Quickly access the Hub for additional learning.

Flag problems for review, record notes, and get instructor support.

View difficulty level.

Helpful strategies to get you started.

Full solutions with detailed explanations to deepen your understanding.

Commonly encountered errors.

Rate a problem or give feedback.

Contents

Introduction to the Guide for CAS 6C

The content outline for the CAS 6C exam contains many readings with more than a thousand pages. You'll encounter some formulas but also many, many words. We're here to make it easier. We'll guide you to the readings. Still, we won't kid you; passing this exam takes real work.

There are different ways to go about studying for this exam. You may want to go through the entire guide once, to become familiar with the broad outline, and then focus deeper on the topics most likely to be on the exam. You may choose to focus heavily on one section, using the readings and this guide together. We recommend that you take time to test yourself with problems, too, as you go through the material.

The large number of readings

The CAS 6C content outline has so many readings that the CAS has never given an exam with a question for every reading. We'll let you know what has never been tested as well as what has been tested every time.

However, each reading has a reason for being in the content outline. Even if you don't memorize the contents, being aware of what they say will make you a better actuary. Also, understanding why each reading has been included should help you master the information.

So, why are there so many different readings? It's because the industry is full of people and players with different perspectives. Regulation occurs at the federal level but it also happens at the provincial level – and more frequently, at the international level.

Regulators aren't the only players. There are the insurance companies themselves. The consumers. The rating agencies. The investors. The lawyers. The courts. The claimants. They don't all share the same perspective; in fact, frequently they are in conflict with each other. As an actuary rising in the ranks, you'll want to understand how each group thinks – what their objectives are – so you can do your work better.

There are also different lines of business. Private auto is different from agriculture and both are different from terrorism.

New topics also have to be addressed. Sometimes there are new phenomena due to changes in technology and business, such as usage-based automobile insurance and transportation network companies. Others involve addressing current challenges, such as flood, pandemics, terrorism, and changes to accounting at the international level.

Accounting is a major part of 6C. You'll get overviews on Canadian and international accounting practices, and you'll get readings that go into more detail, such as discounting and future income taxes. In other words, besides the overview of what is in the balance sheet and the income statement, some readings are on special topics of particular importance to actuaries.

Some readings have been around a long time, or are updated infrequently, because they're covering history that doesn't change. Other items, such as legal cases with an impact, are updated periodically.

You may only care about passing the exam, but we'll help you with that too, by guiding you to the areas that have been asked about most and areas that are mostly ignored in recent exams.

It's important to consider the areas this exam covers, and how much weight is to be given to each.

A. **Regulation of Insurance and Canadian Insurance Law:** 20-25 percent

B. **Canadian Government and Industry Insurance Programs:** 5-10 percent

C. **Canadian Financial Reporting, Solvency and Professional Responsibilities of an Actuary** 60-70 percent

Obviously, the most important material is in section C. You will not qualify as an actuary until you are competent with this material.

Let's consider the many ways the CAS may ask questions. The content outline contains the following about potential exam type questions:

Multiple Choice – Multiple answer choices are presented after a problem with only one correct answer.

Multiple Selection – Multiple answer choices are presented after a problem with more than one correct answer.

Point and Click – An image is presented after a problem where the candidate must identify the correct area of the image by clicking on the correct location in the image.

Fill in the Blank – One or more blank sections are presented after the problem or within a statement where the candidate must input the correct response(s).

Matching – Content columns are presented after a problem where the candidate must correctly match content from one column to another.

Constructed Response – A blank response area is presented after a problem where candidates must construct and develop their own answer.

Spreadsheet – Spreadsheet-type items are displayed to the candidate in a spreadsheet format, and candidates can make use of most spreadsheet functions. Please review the testing guide prior to sitting for your exam to note any differences between the Pearson Vue testing environment and common spreadsheet software (e.g., Excel, Google Sheets).

Understanding the different ways questions can be asked should help prepare you.

Note this manual is for **Spring 2025**. If you are studying for a later exam, it may be obsolete.

Let's get started!

Section B

Government and Industry Insurance Programs

Insurance companies aren't the only organizations that supply insurance to individuals and businesses. Sometimes a society decides, for example, the insurance industry should not be making a profit in supplying insurance to individuals, especially when it's for something as necessary as health care. Sometimes the direction of the decision-making is reversed, and the insurance industry determines a line of business, such as crop insurance, is simply not profitable. Yet society may still demand crop insurance, so government steps in.

Why, if insurance is being supplied by the government instead of an insurance company, should actuaries care?

First, even if a particular insurance is not being run by profit-seeking insurance companies, many of these organizations still use actuaries. After all, there are still losses and expenses and risk loads, and actuaries are the professionals with the expertise to calculate these things. Second, in other situations, government organizations work with insurance companies to complement the coverages offered by the market. As an actuary, you may have to work with the numbers from FARM or an RSP.

Besides, markets are always shifting, and what the government insures today may be offered by insurance companies tomorrow. If you master the principles in this section, you'll be in a better position to understand the factors that shape the market.

Here's what the content outline says about Section B.

The candidates are expected to understand and apply the objectives, operations, and effectiveness of the following insurance programs:

- **Agricultural Insurance**
- **Employment insurance**
- **Flood insurance**
- **Guaranty funds including the Canadian Property and Casualty Insurance Compensation Corporation ("PACICC")**
- **Health care insurance**
- **Residual personal insurance markets, e.g., auto, property**
- **Workers' compensation insurance**

Range of weight: 10 to 15%

The learning tasks are not, however, organized by the line of business, but are organized by different topics, such as the objectives, the operations, and the effectiveness. Occasionally, exams questions pose this way too. Here are the three tasks as described in the content outline:

1. Describe the origin, purpose, historical significance, and philosophy of specific government and insurance industry programs (e.g., Agricultural Programs, FARM, RSP, PRR).
2. Describe the operations and risk transfer process for each government and insurance industry program and interactions with the voluntary private insurance sector.
3. Evaluate the effectiveness of a government and insurance industry program (e.g., solvency, efficiencies, stability, viability and long-term prospects, effects of external factors).

As you can always go to each reading and review it in its original form, we're organizing this section by the tasks in the content outline rather than the readings. First, here are the readings:

Agricultural Programs. Chevalier, Sarah, "Agricultural Risk Management Programs in Canada," October 2014. Note the table on page 6 is for reference only.

Dutil. Dutil, R., "Facility Association," CAS Study Note, May 2008, including Facility Association Bulletin F2020-050, June 29, 2020, pp. 1-2 of cover memo.

GOC Flood Risks. Government of Canada's Task Force on Flood Insurance and Relocation, "Adapting to Rising Flood Risks – An Analysis of Insurance Solutions for Canada," August 2022, Sections 1-3, 5-8.

Government Insurers Study Note. Germani, W., et al., "Government Insurers Study Note," CAS Study Note, April 2017, pp. 1-5, excluding Crop Insurance.

Morneau Shepell. *Morneau Shepell Handbook of Canadian Pension and Benefit Plans*, 16th edition, LexisNexis Canada, 2016, Chapters 17-19.

PACICC. Property and Casualty Insurance Compensation Corporation, “Guide to Compensation Plan for Property and Casualty Insurers,” May 2010. Please use the link in the content outline to see the current limits.

You should begin with the **Government Insurers Study Note**. It explains five main reasons for government insurance and gives you a framework for processing the information in the other readings. Furthermore, frequently exam questions on part B use this reading as a basis for asking about other topics, such as evaluating the effectiveness of a government insurance such as Workers' Compensation.

All the other topics have been asked about on past exams. The readings, **Agriculture Programs**, **PACICC**, and **Dutil**, are asked about most frequently. They are a source of both verbal and numerical questions. **GOC Flood** is too recent to have been asked about on past published exams, but the subject of flood insurance has been tested. The **Morneau Shepell** readings on Employment Insurance, Health Care Insurance, and Workers' Compensation Insurance are less frequent sources for questions, but these subjects occasionally appear.

B1 Origin and Purpose

From the content outline:

Task: Describe the origin. purpose, historical significance and philosophy of specific government and insurance industry programs, (e.g., Agricultural programs, FARM, RSP, PRR).

B1a Government Insurers Study Note: Origin and Purpose

This note, published by the CAS for actuaries, gives an overview of the reasons that governments go beyond regulating private insurers to insuring individuals and businesses themselves. Government participation in insurance takes many forms, such as working as a partner with insurance companies to even operating as the sole provider in a market.

The study note discusses five main reasons for government to become involved in insurance, information that is useful for getting a perspective on the industry.

Filling needs unmet by private insurance: Insurance may be unavailable or unaffordable. However, as the government doesn't need to make a profit, and can subsidize by raising taxes, the government can charge less than actuarial rates. An example would be the US Federal Crime Insurance Program (1968-1995), which supplied coverage for property owners in high crime rate neighborhoods. This eventually expired as loss prevention methods made private market rates lower than government rates. Crop insurance in Canada is also only available because of subsidies.

Compulsory purchase of insurance: Sometimes a government requires the purchase of insurance to do something as necessary as drive, so making it available via the government can be seen as reasonable. Another point is that the fact that insurance is compulsory should not lead to excess profits in the private market, and that the government should provide a less expensive alternative (not-for-profit). The reading gives Workers' Compensation state funds as one example and high/risk subsidized auto insurance as another. Canadian examples would include the public auto insurance offered by provinces such as British Columbia and Manitoba.

Convenience: Sometimes the government can set up programs more quickly and easily than the private market can, especially when the government may also be already set up to provide services needed by insurance programs, such as loss mitigation development and funding. For example, in British Columbia, the provincial government can increase the number of cameras to discourage speeding, while a private insurer could not do that.

Greater efficiency: There is an argument that government insurance costs less than private insurance, and certainly it is not required to make a profit. The study note argues that the lower costs argument can be overstated, as many costs are identical for both government and private insurance: administration, consumer education, etc.

Social purposes: The study note posits that achieving a social purpose may be the main reason for government insurance programs, and that some goals may be achievable only through government, such as the rehabilitation and vocational training of injured workers, protecting the truly needy, or enforcing building codes.

Past exams: Questions based on these five reasons appear frequently on the exams, often asking the candidates to describe these reasons more fully or to give examples. Note that some of the examples described above are not in the actual study note, which focuses more on US-based examples.

Knowledge check – question

What are five arguments to make government an insurer?

Knowledge check – answer

Filling unmet needs; compulsory purchase of insurance; convenience; greater efficiency; social purposes.

B1b Agricultural Programs: Origin and Purpose

Having a stable food supply is vital to every country, so most countries want to have internal sources. However, growing food, either through crops or animals, is hard work, and the payoff is uncertain. To keep the food supply stable, people need to be encouraged to remain in these lines of work. It makes sense that the Canadian governments – federal and provincial – have created insurance programs to support farming and animal husbandry.

Growing Forward 2 (GF2) is the comprehensive federal-provincial-territorial framework designed for Canada's agricultural and agri-food sector. GF2's Business Risk Management (BRM) programs are designed to help producers manage income volatility arising from:

- Changes in market conditions
- Weather-related events
- Other natural perils

GF2 has two main risk management programs:

AgriInsurance – ndividual producers can obtain production insurance coverage guaranteeing predetermined level of production, with the goal of stabilizing revenue by minimizing losses from uncontrollable natural hazards.

AgriStability – Helps producers manage large production margin declines.

These income-stabilizing programs are intended to complement, rather than duplicate, each other.

Additional programs include:

AgriInvest – Deposit-matching program so producers can accumulate funds to manage income shortfalls or to make investments to manage farm risks.

AgriRecovery – Disaster relief framework with federal and provincial collaboration, operates on a case-by-case basis to help producers with extraordinary expenses to recover from natural disasters such as disease, pest, and weather events. It does not cover losses from pricing cycles or long-term downward trends.

Advanced Payments Program – (**APP**): Provides access to short-term low-interest loans to improve cash flow (cash flow is often a problem for agricultural producers). Producers can seek cash advance via an APP administrator for up to 50% of estimated value of agricultural production, subject to max of $400,000.

Western Livestock Price Insurance Program – (**WLPIP**). WLPIP is a pilot program launched in April 2014 to help livestock producers in case of unexpected price declines.

Past exams: This material has been covered frequently in past exams and is a fertile source for more questions.

Knowledge check – question

> Fully describe Growing Forward 2 and the purpose of the GF2 Business Risk Management programs.

Knowledge check – answer

> **Growing Forward 2 (GF2)** is the comprehensive federal-provincial-territorial framework designed for Canada's agricultural and agri-food sector. GF2's Business Risk Management (BRM) programs are designed to help producers manage income volatility arising from:
>
> - Changes in market conditions
> - Weather-related events
> - Other natural perils

Dutil, "Facility Association" (the residual auto market): Origin and Purpose

In order to function in society, many people need to be able to drive, and to drive they are required to have automobile insurance. However, some drivers, such as brand-new drivers, are considered too expensive by for-profit insurance companies to write. To deal with this gap, Canada created the Facility Association (FA).

The Facility Association (FA) has the goal of making automobile insurance available to every owner and driver who needs it. The FA is an unincorporated nonprofit organization created in 1977 to administer the involuntary residual market. All licensed insurers are required to be members, and it operates in all provinces except those with public automobile insurance (BC, MB, SK) and PQ. It serves an important role in ensuring availability of coverage.

Past exams have asked about the goal of the Facility Association.

B1c Morneau Shepell: Hospital and Medical Origin & Purpose

Chapter 17 "Provincial Hospital and Medical Insurance Plans" (2016) Origin and Purpose

For most people, staying healthy is a necessity, so access to medical care is generally not considered optional (at least not by Canadians). However, medical costs have been increasing and Canada's governments have been providing a decreasing amount of funding, leading to an increasing use of the private sector. This reading, however, reviews the role of the Canadian governments.

In Canada, the provinces have jurisdiction over health care, but Federal concerns regarding user fees and billing practices led to the passage of Canada Health Act (1984), authorizing penalties on provinces that create financial barriers to essential health care services. These are the Canada Health Care Criteria for Unreduced Federal Assistance:

- Public administration: a nonprofit basis, run by a public authority responsible to the provincial government.
- Comprehensiveness: this means the coverage of all necessary hospital and medical services, with additional services encouraged.
- Universality: this means it must be available to all eligible residents.
- Portability: this means it can be taken from one province to another; the waiting period for new residents not to exceed three months, and services are available for those temporarily out of home province.
- Accessibility: uniform terms for all residents; no impediments to insured services, meaning no deductibles.

Past exams: This list has been asked about on recent exams. Also, it is possible to see how the criteria could be applied to other types of insurance, which could make an interesting exam question.

Knowledge check – question

What are the five criteria for unreduced federal assistance for health care in the provinces?

Knowledge check – answer

Public administration, comprehensiveness, universality, portability, and accessibility

B1d Morneau Shepell: "Workers' Compensation" Origin and Purpose

Chapter 18

It's easy to see that Workers' Compensation (WC) plays an important role in society. In the beginning of 20$^{\text{th}}$ century, increasing industrialization led to more accidents at workplace. All provinces and territories have WC acts, with Ontario starting in 1915, the rest of the provinces by 1950, and Yukon & the Northwest Territories by 1977.

It's not completely clear why WC insurance is supplied by the government, although if health insurance is government insurance, it may make sense for WC to be as well. Anyway, WC is no-fault insurance, with the guarantee of benefits for injury, disease, or death arising out of and in the course of employment, in exchange for forfeiture of the right to sue. An employee does have the option of benefits or proceeding against a third party, but if WC benefits are claimed, the WC board (WCB) obtains subrogation rights. Also, an employee or employer may appeal an award.

WC is mandatory for most industrial classes, but some provinces have exemptions: domestic employees; casual employees; certain service workers; finance and insurance workers (knowledge industries); sole proprietors and executive officers. Employers may still choose to cover these employees.

Past exams: A few past exams have asked what purpose Workers' Compensation serves in society, or how Workers' Compensation should be evaluated in light of the five main reasons for government to get involved in insurance.

Knowledge check – question

> WC guarantees benefits for injury, disease, or death as a result of employment. What right does the employee give up?

Knowledge check – answer

> The employee gives up the right to sue, although there are certain exceptions.

B1e Morneau Shepell: "Employment Insurance" Origin and Purpose

Chapter 19

Being without a job is hard for any member of society, and a society suffers if a larger-than-usual portion of its population is without work. It makes sense for this to be run by the government (although funded, as we shall see, by employers and employees) because of the possibility of adverse selection and the fact that a recession could hurt many people at once. Also, the government may be in a better position than individuals or businesses to mitigate the problems.

Employment insurance (EI) provides temporary income replacement and promotes “active” re-employment assistance. Ever since 1940, the federal government has had exclusive jurisdiction over employment insurance, via the Unemployment Insurance Act (1940), an amendment to the British North America Act. Welfare assistance, however, is a provincial responsibility.

- In 1996, the Employment Insurance Act replaced the Unemployment Insurance Act with the goals of unifying all provisions for income support and employment assistance; providing assistance to start businesses; establishing job creation programs.
- Since 2005, all EI benefits have been delivered by Service Canada on behalf of Human Resources and Skills Development Canada (HRSDC).
- In 2010, the Employment Insurance Act was amended to establish a new EI operating account.
- In 2016, the Federal Budget proposed changes to improve the EI program: changes to rules for entrants and re-entrants; temporarily enhancing benefits in certain regions; investing in improved service delivery; reducing the waiting period for benefits to one week.

Past exams: EI has not been frequently asked about on the exams, but occasionally there has been a question about the goals of Employment Insurance.

B1f GOC Flood Risks: Origin and Purpose

This reading does not describe an actual program, but covers a real and growing problem, then discusses the pros and cons of various solutions. The problem is flood, one of Canada’s fastest growing risks, with several million homes vulnerable to the hazard and without access to adequate insurance.

To address the problem, the Government of Canada stood up the Task Force on Flood Insurance and Relocation (the Task Force) to explore solutions for insurance in high-risk areas and considerations for potential relocation of homes most at risk of repeat flooding.

Overview of Flood Risk in Canada

Flood risk combines the hazard (floodwater) with what is exposed to that hazard (e.g., people or assets), and provides information on the subsequent impacts or consequences. Flood insurance is a financial risk transfer mechanism, whereas strategic relocation is an effective means of eliminating physical flood exposure.

General types of flooding can include fluvial, pluvial, or coastal. How these different floods manifest, sometimes in combination can vary widely across regions. The Rocky Mountains, for example, are susceptible to flash flooding, whereas flooding in the prairies can sometimes be anticipated days in advance, allowing more time for flood preparation. In other regions, erosion caused by coastal storm surges and rising sea levels are a significant mechanism of flood losses.

Key Drivers of Canada's Flood Risk

Population growth and urban development: densification and development in urban areas already exposed to significant flood hazard is a major driver of flood risk. The rapidly rising cost of flood events is largely a result of growing exposure, through the increasing number of people and assets in at-risk areas, and the increasing value of those assets (e.g., finished basements).

Climate change: Canada's climate is warming at twice the global rate and three times faster in the North. Climate change impacts flood risk in several ways: Warmer temperatures increase the likelihood and magnitude of extreme precipitation events. This contributes topluvial flood risk, especially in cities full of concrete, where aging infrastructure may not have been designed for the higher end of extreme precipitation events. Intense rainfall can increasefluvial flood risk, especially if these events occur during late fall or early spring when a snowpack and frozen ground means more and faster runoff into streams and rivers. Rising sea levels along many Canadian coastlines over the coming decades will increasecoastal flood riskfor both tidal flooding and storm surges, and there is evidence that the storms may shift northward.

Extreme heat also contributes to flood risk, although less directly: longer periods of higher temperatures increase the likelihood and severity of wildfires and droughts, which destroy vegetation and topsoil and therefore reduce the ability of local ecosystems to absorb water. This can lead to increased flooding and landslides.

It's complicated and difficult to predict, but the latest Intergovernmental Panel on Climate Change (IPCC) report cautions that as regions reach climatic tipping points, there is high confidence in the increased probability of severe local impacts and unprecedented weather.

Defining the Problem

Insurance is a way to cover flood damages predictably and comprehensively. In a mature and effective market, insurance sends a price signal about the true levels of risk, spreads the financial burden amongst different stakeholders, and can encourage whole-of-society risk reducing behaviors.

To be equitable and effective, flood insurance must be readily available and affordable for all Canadians, especially for those most exposed to flooding. However, coverage is only provided in low and medium risk areas, although high-risk areas account for about 90% of Canada's residential flood risk. This means leaving most flood damage costs to homeowners and to government disaster financial assistance (DFA) programs. The Task Force work is therefore: how to make flood insurance available and affordable for those living in high-risk areas.

In high-risk areas, flood insurance is cost-prohibitive, if available, especially so for low-income households. Furthermore, current flood maps are rarely available to homeowners, so most Canadians in high-risk areas (94%!) are not aware of their flood risk. Hence, no incentive to buy flood insurance or to invest in mitigation.

The system of FPT taxpayer funded DFA programs creates moral hazard on multiple levels. At the homeowner level, DFA provides no incentive to reduce risk or to purchase insurance. At the community level, local governments approve land-use decisions that can maintain or create new flood risk, while they, along with developers, are rewarded with increased property sale prices and tax revenues.

The Task Force on Flood Insurance and Relocation

Methodology: The Task Force's work (and they consulted others) involved several interconnected and concurrent work phases over eighteen months. We won't go into the processes here.

Scope: Properties in scope for this report include residential structures that are privately owned, and for which no other form of insurance, like commercial or agricultural, applies. Large multi-unit dwellings, such as apartments or condos, are included in the flood hazard modelling. In these cases, however, it is noted that commercial insurance would likely be in place for the structure. First Nations residences on-reserve are generally not included in this work due to data limitations and because of the parallel effort led by ISC and AFN.

The reading covers fluvial, pluvial, and coastal flooding. Other water-related hazards such as sewer back-up (when not related to overland flooding), burst pipes, ice damming on roofs, and tsunami risk are not included.

Finally, the following federal initiatives are not addressed because they are being covered elsewhere: Federal completion of all flood maps in Canada; Federal commitment to provide interest-free loans to homeowners for climate change mitigation to their homes; Promote flood risk awareness in Canada; Specific measures to improve flood mitigation in communities at risk of recurrent flooding; Examination of flood risk and context-specific insurance options for First Nations on-reserve communities.

Flood Risk Management in Canada

Traditional approaches to managing flood risk involve the government building expensive structural controls to keep people and property separate from sources of flooding. *Flood Risk Management (FRM),* however, shares responsibility across stakeholders and promotes the use of non-structural mitigation measures, FRM spans all orders of government, industry sectors, communities, non-government organizations, and individuals. The orders of government with specific areas of jurisdiction, and roles and responsibilities make FRM in Canada challenging.

Here's how they are currently allocated:

Federal Government

Emergency Management Act (EMA): the Minister of Public Safety and Emergency Preparedness is responsible for exercising leadership related to emergency management in Canada. This means coordinating with PTs in case of emergencies.

Department of Indigenous Services Act: the Minister of Indigenous Services is responsible for providing emergency management services to Indigenous individuals and governing bodies, in partnership with PT governments and third-party service providers.

Canada Water Act: the Minister of the Environment works with PTs in matters relating to water resources, e.g., the regulation, apportionment, monitoring or surveying of water resources. The federal government is responsible for providing critical hydrometric data needed to make informed water management decisions.

Disaster Financial Assistance Arrangements (DFAA): a federal cost-sharing program to assist PTs with response and recovery costs for large-scale disasters. Payouts have increased and are expected to increase with climate change.

Other relevant federal departments: Transport, Natural Resources; National Defense; Infrastructure; Heritage; Fisheries and Oceans; and Foreign Affairs. Data and technical guidance help support PTs in developing flood maps and flood forecasts. There's a large gap, however, with respect to publicly available, up-to-date, and comprehensive flood risk information for Canadians.

Insurance: some insurers are incorporated under federal legislation, which allows them to carry on the business of insurance throughout Canada, while others may choose to incorporate only in the specific jurisdictions they wish to operate. Regardless of where insurers choose to incorporate, business activities of these companies are generally regulated by the provinces.

Provincial and Territorial Government

Land use and conservation: PT governments are important because they regulate land use and construction. They also regulate the insurance industry. Sometimes they delegate to municipalities.

Legislation: Some PTs have legislation specific to emergency management to prepare for, respond to, and recover from emergencies, including flood events. Some often work closely with neighboring jurisdictions both in Canada and the United States and can request federal assistance and resources when required. Some provinces, like Quebec, do not authorize reconstruction if in a high-risk flooding zone.

Municipal Government

Local response: Municipalities may lead local response and recovery, but they depend on other levels of government for resources. Municipalities are responsible for enforcing by-laws. At times, municipalities may be limited in matters by PT environment or agricultural oversight bodies, however, municipalities may require local standards to be*higher* than PT minimums.

Coordination: Municipalities can work with PTs to identify flood risks, investing in structural and non-structural mitigation, and by implementing economic incentive programs such as subsidies, rebates, or risk-based surcharges. These efforts often require support from and collaboration with multiple levels of government. Local governments are often on the frontlines of FRM in Canada. There can be conflict: they have the responsibility to comply with PT land use planning regulations and policies, they also have an interest in maximizing property taxation revenue to fund programs and services for residents.

Indigenous Communities

Holistic approach: For generations, Indigenous communities of First Nations, Inuit and Métis peoples have turned to traditional knowledge to foster a holistic approach to disaster risk reduction. Emergency and FRM are handled through partnerships between Indigenous communities and their governments and non-governmental organizations.

Federally: Indigenous Services Canada (ISC) works closely with First Nations and partners to bolster emergency preparedness and administer the Emergency Management Assistance Program (EMAP) to reimburse on-reserve emergency management activities. Federal government has legal a Duty to Consult when contemplating any action that might adversely impact potential or established Aboriginal or Treaty rights.

Vulnerability: The vulnerability of many First Nations communities to emergencies continues to pose problems for Indigenous communities. Moreover, challenges exist in accessing flood insurance, partly due to a lack of availability and affordability, but also because efforts do not always align with Indigenous cultures.

Insurance Industry

Financial transfer of risk: Insurers offer different overland flood endorsements (fluvial and pluvial risk and sewer backup), while coastal storm surge coverage remains limited. Water-related claims are the primary cause of home insurance losses in Canada and are expected to increase.

Data collection: The industry also regularly participates in data collection, research, and public outreach initiatives.

Incentives: Flood insurance can incentivize risk reduction measures to lower premiums. Higher take-up rates shift some of the burden from the DFA. Also, private insurance usually pays faster than the government.

Preconditions for success: Before introducing overland flooding coverage in 2015, insurers articulated four necessary preconditions for success of a private insurance market: accurate and up-to-date flood mapping across Canada; adequate and ongoing investments in public and private flood defences; improved public awareness of flood risk; and limited or restructured post-disaster financial assistance to encourage flood mitigation investments. Federal support for the proposed conditions has been partly addressed through the National Disaster Mitigation Program, but continued support is required.

Non-Governmental and Civil Society Organizations: Many non-governmental and civil society organizations provide emergency services, such as the Canadian Red Cross. These organizations can be some of the first*boots on the ground* during incidents. They are also often best suited to attract, coordinate, and harness emergent groups of volunteers towards meaningful contributions to all phases of a disaster.

Communities and Individuals: Flood hazards pose significant risks to thousands of Canadians from coast to coast to coast. They experience the hardships; also, homeowners are also responsible for covering losses not insured or covered by DFA. When communities and individuals are more aware of flood risk, they are better equipped to take active roles in reducing the negative consequences of flooding. More generally, as taxpayers and contributors to the FPT coffers that provide DFA, all citizens have a vested interest in effective and efficient FRM. Yet some communities and individuals may have either limited risk awareness of potential losses from flooding, limited capacity to mitigate that risk, or both.

Impact of Risk Reduction: Within FRM, the concept of and need for risk reduction applies across all of society.

Household defences impactful risk reduction measures for smaller-scale events can often be implemented for less than a $250 investment, such as a backwater valve, a basement sump pump, etc.

Community flood mitigation efforts may greatly reduce flood risk on a larger scale. Local/regional governments could adopt climate best practices for regulations and land use; proactively upgrading or retrofitting infrastructure; and investing in natural infrastructure. Structural and non-structural mitigation at the community level have been shown to have a 6:1 return on investment.

National support for risk reduction can include up-to-date national climate and disaster-resilient building codes and standards, improved flood risk information, strategic leadership for climate-resilient investments, and funding for watershed-level mitigation projects. Research in the United States has shown a 7:1 return on investment for federal investment in mitigation over the past few decades.

Strategic relocation removes homes at the highest risk of repetitive flood damage and moving people out of harm's way. Property buyouts are politically challenging, however.

Flood Hazard and Damages in Canada: The Task Force needed to get estimates of the total cost of residential flooding in Canada for both the past and the future. This estimations were done by Public Safety Canada (PS).

Required inputs:

flood hazard − the size of a flood and its probability of occurrence

exposure − the people, property, infrastructure and other social or economic assets which may become affected by flood hazard; and the

consequence − the damage floodwater is likely to cause to particular exposed people or assets

The output is the financial risk, and the predicted losses, faced by people, properties, and infrastructure

The reading goes into more depth on each of these inputs, which is interesting to actuaries working on this problem, but probably won't be asked about on the exam. Note that AAL refers to annual average loss.

After the analysis, based on many methods, there are some key takeaways:

- The PTs with the greatest overall populations have the greatest aggregate exposure, e.g., Ontario, Quebec, British Columbia

- A PT with a high AAL is Yukon – it's got a high percentage of high-risk properties

This national flood damage estimate is higher than what has been referenced in previous national flood damage assessments, which are usually closer to $1.0 - $1.5 billion. Part of the reason for this higher estimate is that past residential address data usage has largely undercounted the true number of properties in Canada, which this research has improved upon. Secondly, this research factors in tail-risk flood events which have a low probability of occurrence, such as floods exceeding the 1 in 1000-year return period.

Knowledge check – question

Identify two ways PT governments are involved in managing flood risk.

Knowledge check – answer

Land use and conservation; Legislation

Past exams: This reading is too recent for past published exams.

B1g PACICC, "Guide to Compensation Plan for Property and Casualty Insurers," (2010) Origin and Purpose

The compensation plan for property and casualty insurers (the "Plan") is funded by property and casualty (P&C) insurance companies and is designed to operate when a P&C insurer becomes insolvent. All provincial and territorial Superintendents of Insurance have agreed to "prudential criteria," i.e., solvency standards, to be imposed on all P&C insurers in their jurisdictions. The Property and Casualty Insurance Compensation Corporation (PACICC) is the federal non-profit corporation that administers the Plan.

Note that the Plan is designed to provide reasonable recovery for claims of policyholders under most types of P&C insurance.

Past exams: Most questions on PACICC focus on either how assessments of insurers are made or what will be paid out in case of an insolvency. Note that PACICC does not prevent insolvencies; other organizations and requirements are tasked with that.

B2 Operations and Risk Transfer Process

Here's what's in the content outline:

> **Task:**
>
> **Describe the operations and risk transfer process for each government and insurance industry program and interactions with the voluntary private insurance sector.**

B2a Government Insurers Study Note: Operations and Risk Transfer

The CAS study note covers different ways that government can participate as an insurance provider:

- Exclusive insurer
- Partnership with private insurers: offering reinsurance on specific exposures. Federal examples: Terrorism, Flood, Crop; State examples: WC, Residual Auto, FAIR, Windstorm
- Competitor to private insurers: WC in some states

Past exams: Questions on this point have appeared on prior exams. It could also serve as a way of evaluating other programs.

Knowledge check – question

> Identify three different ways that government can participate as an insurance provider.

Knowledge check – answer

> Exclusive insurer; partnership with private insurers; competitor to private insurers

B2b Agricultural Programs: Operations and Risk Transfer

Canada's agricultural insurance programs are heavily subsidized by the provincial and federal governments. Producers – for example, farmers – are usually responsible for 40% of expected loss costs, while the governments are responsible for what remains. This means the government (taxpayers) funds the remaining **60% of expected loss costs** and **100% of administrative expenses**. The allocation between the provincial and federal governments is 40% and 60%, respectively.

The agricultural programs are not-for-profit programs. This means the premium rates do not include profit margins. However, they do include:

- An uncertainty margin (risk margin)

- A self-sustainability load to build or distribute surplus via premium contributions
- Reinsurance loads

The agricultural programs usually include an experience rating component to encourage good behavior and participation continuity. If the surplus of a provincial program is depleted, the province may access private reinsurance as well as government reinsurance (i.e., deficit financing). Production insurance plans come in two basic varieties: yield-based plans and non-yield-based plans.

Yield-Based Plans can either be based on individual yield or collective yield. For an individual yield program, the indemnity is paid out when the individual producer's production falls below the guarantee for a specified agricultural product. With a collective yield program, the indemnity is paid out when the collective production for given group falls below the collective guarantee for a specified agricultural product: indemnity determined regardless of individual actual production.

Sometimes the data for a given crop is unreliable, and the calculation will be based on another crop that has more reliable data. This is called proxy crop coverage.

Knowledge check – question

Yield-based plans can be based on two types of yields. What are they?

Knowledge check – answer

Yields can be based on individual yield or collective yield.

Non-Yield-Based Plans, obviously, are not based on yield, but they must be based on something! There are weather-derivative plans, for which the indemnity is paid out when pre-determined meteorological thresholds are triggered, regardless of actual production (the weather observations are proxies for yields). Other plans not based on yield include acre-based compensation for horticulture; coverage for perennial plants, e.g., trees; mortality insurance for livestock and poultry. In these cases, the indemnity, after a deductible, is paid out when actual production is less than the insured production.

Probable yield (only used in yield-based plans) is the expected yield per unit of exposure for a given producer, agricultural product, and crop year. The expected yield is usually based on the average producer's actual yields, and may apply a producer productivity index, a differential reflecting producer's expected performance relative to average (this is sometimes left out of exam problems). As equations can be easier to understand than words, let's imagine a producer has 10 acres. Average production of the wheat is 1,012 kg/acre, but the producer is northerly, and can expect 5% less production than average. The producer's expected production would then be:

$$\begin{aligned}\text{Probable yield} &= \text{acres} \ \times \ \text{average producer's actual yields} \ \times \ \text{producer productivity index} \\ &= 10 \text{ acres} \times 1{,}012 \text{ kg/acre} \times (1.00 - 0.05) \ = 9,614 \text{ kg}\end{aligned}$$

Some adjustments to historical probable yields may be based on changes in farming or management practices, insurance program design, adjustments for the maturity of perennial plants, changes in data sources and in data collection methodologies, and more.

Probable yields are typically provided by program administrators, but they are discussed with an actuary, who reviews selected trends and discloses reliance on a province's agronomical experts. An actuary may use credibility-weighting, especially when there is insufficient data. Probable yield methodologies must balance responsiveness with stability, so often they include stabilizing techniques, such as:

- Long-term averaging methods
- Cushioning (occurrences outside of a given statistical measure of deviation around the mean may be allocated smaller weights)
- Smoothing (applying floors and ceilings to historical yields outside of a given statistical measure of deviation around the mean)
- Capping in year-over-year changes in probable yield

Knowledge check – question

What is a producer productivity index and how is it used in determining a producer's probable yield?

Knowledge check – answer

The producer productivity index is a differential reflecting the producer's expected performance relative to average. Probable yield = acres × average producer's actual yields × producer productivity index.

Production Guarantee and Liability – Yield-Based Plans

In addition to considering what the probable yield is, producers must choose a coverage level for their crops. Generally, this is between 50% and 90% of total production; most choose in the range of 70% to 80%.

Production Guarantee = Insured Area × Probable Yield per Unit of Area × Coverage Level

The liability is the amount of insurance coverage (maximum exposure to loss at harvest):

Liability = Production Guarantee × Insured Price.

Calculation of the indemnity, or how much is paid if a producer reports a claim. For a Yield-Based Plan, if actual total production falls below the production guarantee due to one or more insurable perils:

Indemnity = Max (0, Production Guarantee – Actual Production) × Insured Price

Past exams: Calculation of this indemnity has appeared on several past exams, so it's worth understanding that equation as well as the others that feed into it.

Some optional benefits for a producer include quality loss protection; reseeding benefits, when damages occur early in the season; unseeded acreage benefits, if crops remain unseeded as of a given date due to excessive moisture; establishment benefits, for crops that fail to establish due to insurable causes; hail spot loss coverage; storage coverage; emergency works benefits, to mitigate further damages; floating price options, where insured price varies with market prices at harvest (and more in reading).

Non-Yield-Based Plans

Indemnities for weather-derivative plans based on weather observations at designated weather stations, such as excess rainfall, drought, and/or freeze.

Indemnity = $f(\textit{Number of units affected},\ \textit{selected deductible level},\ \textit{predetermined insured price})$

The premiums paid by producers include:

- An expected loss component (but not all, 60% borne by the government)
- Loadings for uncertainty margins, self-sustainability loads, reinsurance
- An adjustment for the level of coverage

Not included in agricultural insurance premiums are administrative expenses (funded by the government) and profit (not meant to be profitable).

Non-Yield-Based Plans have a similar approach to premium as the yield-based plans, but weather-derivative plans include data from studies determining how weather events affect production losses.

Cost Sharing between Producer, Provincial and Federal governments:

- Comprehensive cost: Prod (40%); Prov (24%); Fed (36%)
- High cost (risk-splitting benefits and coverage levels above 80% for agricultural products with premium costs > 9% of production value): Prod (66.7%); Prov (13.3%); Fed (20.0%)
- Catastrophic cost (Subject to conditions, portion of premiums may be subject to catastrophic cost share; if so, then catastrophic cost share applies to premium rate portion beyond 93$^{\text{rd}}$ percentile loss level): Prod (0%); Prov (40%); Fed (60%)
- Administrative expense: Prod (0%); Prov (40%); Fed (60%)

Past exams: Exam questions about agricultural program premiums have been concerned mostly with verbal descriptions of the components; however, it is easy to see how this information could be used to make a numerical exam question.

B2c Dutil: Operations and Risk Transfer

The FA has a Board of Directors that is made up of elected/appointed representatives from member insurers and insurance brokers. It manages and controls the FA including the following:

- Approving rate changes and filings
- Authorizing expenses
- Establishing and maintaining standards for servicing carriers and users of the RSP
- Appointing committees and subcommittees

A member's votes are proportional to the latest calendar year's auto third-party liability direct written premium. If a matter affects only one jurisdiction, the votes are based on that jurisdiction's premium.

The FA has several ways of insuring the high-risk or otherwise difficult-to-insure drivers. The mechanisms it administers include:

- Traditional residual market (FARM): operates in all FA jurisdictions
- Risk sharing pools: ON, AB, NB, and NS
- Uninsured automobile funds: Atlantic Provinces
- In PQ, Groupement des Assureurs Automobiles (GAA) administers a risk sharing pool: "Plan de Répartition des Risques" (PRR)

Knowledge check – question

Identify two duties of the Board of Directors of the Facility Association.

Knowledge check – answer

Two of the following: Approving rate changes and filings; Authorizing expenses; Establishing and maintaining standards for servicing carriers and users of the RSP; or Appointing committees and subcommittees

Facility Association Residual Market (FARM): This is the residual market for owners and operators of personal and commercial motor vehicles who may encounter availability problems. Contracted servicing carriers issue policies and adjust claims. Here are elements of FARM:

- All policies must follow FA rates, rules, and classes, which require provincial approval. An agent/broker contacts a servicing carrier who issues a FA policy; policyholder is thus **aware** of FA assignment.
- The policy must be for at least the statutory minimum coverage and the risk must be a residual market risk, which is one of the following:

a Motor vehicle is either not a PP vehicle, or

b A PP vehicle which an insurer may refuse to cover or renew.

- Financial results are pooled among licensed insurers based on participation ratios.

Risk Sharing Pools (RSPs): These allow insurers to transfer some exposures to industrywide pools (more details later).

- These exposures are unqualified for FARM and represent higher risk of loss. An RSP acts as an unobservable reinsurance mechanisms; the policyholder is **unaware** of RSP assignment.
- The policies are written using company rates and rules.
- Like FARM, financial results are pooled among licensed insurers.

Knowledge check – question

Give an example in which the insured drivers are aware they are considered high risk by their insurer and an example of a mechanism where they are not aware of this classification.

Knowledge check – answer

Under FARM, insured drivers are aware they have been classed as high risk; under risk sharing pools, they are not.

Uninsured Automobile Funds: These provide financial compensation when unable to have damages not paid when there is either no insurance or inadequate insurance.

- Provincial Insurance Acts govern payment.
- FA supervises defense and claim settlement through selected firms and insurers

Past exams have asked about the three different mechanisms for insuring hard-to-insure drivers.

The following shows how participation ratios and sharing are calculated. First, let's consider the classes of business that determine a member's participation. They are:

- Private passenger nonfleet nonpool automobile business
- All automobile business other than private passenger nonfleet nonpool automobile business or business transferred to an RSP
- Business transferred to a pool other than an RSP in AB, NB, or NS or to a ON catastrophic claim fund
- Business transferred to an RSP in AB, NB, or NS

- Uninsured or unidentified motorist claims and amounts expended in connection with a pool or catastrophic claim fund in ON covering statutory benefit claims due from an insolvent insurer

Ratios are established separately for each class of business by jurisdiction by accident year.

Past exams have asked about these classes.

Facts about Risk Sharing Pools

- The goal of RSPs is to assist insurers in retaining higher risk exposures (often inexperienced drivers). The FA establishes the rules for transfer.
- As these involve accepted risks whose rates are inadequate, RSPs operate at a loss.
- Participation ratios are based on total voluntary private passenger auto third-party liability direct earned car years; in ON, ratios are also based on the number of ceded risks.

Requirements for Risk Transfers (essentially reinsurance)

- Private passenger vehicles only
- No residual market risks
- Risk must carry at least the minimum third-party liability statutory limit
- Company follows appropriate classification and rating procedures and requests all appropriate documents
- Premiums charged are approved ones
- Specific limitations on the proportion of each risk that can be transferred and on the transfer of certain coverages, e.g., higher limits
- Premium transferred equals actual premium charged less premium payment service charges; insurer then receives an expense allowance for acquisition, operating, and loss adjustment expenses (not premium tax and professional fees)
- Limitation may also apply to total company transfers based on calendar year voluntary private passenger auto third-party liability direct written car years

Different provinces have different rules for their RSPs:

Ontario Risk Sharing Pool

Established in 1993, this was the first RSP. The ON RSP covers 85% of each risk transferred, whereas other pools cover 100%, subject to limits. Also, the ON RSP has a 5% limit of member's voluntary private passenger nonfleet written exposures.

Alberta Risk Sharing Pools

In 2004, Alberta established two pools, a Grid pool and a Nongrid pool. The **Grid pool** covers risks that are subject to the statutory maximum premium, with no limit as the company has no control over the price charged. The **Nongrid pool** is for risks that exhibit higher risk characteristics, with a 4% limit of member's voluntary private passenger nonfleet written exposures not transferred to the grid pool.

New Brunswick First Chance Risk Sharing Pool

The New Brunswick RSP was established in 2005. This RSP covers exposures with at least one driver who receives a discount for recently licensed drivers (why it is called "first chance") with good driving records. 8% limit of member's voluntary private passenger nonfleet written exposures may be ceded to the NB RSP.

Nova Scotia Inexperience Driver Risk Sharing Pool

The NS RSP was established in 2007. It covers exposures with at least one driver with less than six years of driving experience and no accidents or convictions. There is no limit to the number of risks that can be transferred.

Past exams: Some questions on prior exams ask for comparisons of the RSPs in different provinces, for example that ON only permits for 85% of the risk to be transferred. These questions also sometimes ask why there's a limit; it is to encourage the insurance company, by still bearing a portion of the risk, to do what it can to manage or mitigate the exposure.

Everything changes, including the Facility Association. To keep up with the times, FA Bulletin 2020-50 has included the information below.

First, to justify their recommendations, the bulletin states the main tenets of the Working Group's Guiding Principles: Conducting a review in the context of FA's mission, vision, and values; Considerations that any proposed amendments to the RSPs would maintain or increase the availability of automobile insurance to the consumer; Proposed changes would not deliberately favor one type of insurer over another.

On May 11, 2020, the Facility Association Board of Directors passed a resolution approving **amending the Alberta Non-Grid RSP member transfer limit from 4% to 5% effective January 1, 2022.**

The following changes require amendment to the Plan of Operation and are recommended by the Board of Directors for members' approval:

1. The **Ontario Risk Sharing Pool** proportion of risk (premium and claims) transferred to the RSP will be amended from the current 85% to 100%, to align with the other RSPs.

2. The **New Brunswick Risk Sharing Pool** will be amended to allow for the transfer of all PPV class vehicles in alignment with the Ontario, Alberta Non-Grid and Newfoundland & Labrador Pools.

3. The **Nova Scotia Risk Sharing Pool** will be amended to allow for the transfer of all PPV class vehicles in alignment with the Ontario, Alberta Non-Grid and Newfoundland & Labrador Pools. A member transfer limit, to be set by the Board, will be established.

Pending member approval and regulatory approval of the above Plan of Operation changes, the FA Board will be asked to approve a resolution establishing the member transfer limit at 5% for both the New Brunswick RSP and the Nova Scotia RSP.

Members should be aware that no changes are proposed to the Alberta Grid Pool, which has no transfer limit as long as risks are subject to the grid cap. Members should also be aware that no change is proposed at this time to the Ontario Risk Sharing Pool sharing formula, which will retain its current structure of loss sharing based 50% on market share, and 50% on pool usage.

Knowledge check – question

> Give an example showing how the Facility Association Board of Directors is trying to harmonize the RSPs across the provinces.

Knowledge check – answer

> One of the following, subject to approval by the members of the FA:
>
> 1. The **Ontario Risk Sharing Pool** proportion of risk (premium and claims) transferred to the RSP will be amended from the current 85% to 100%, to align with the other RSPs.
> 2. The **New Brunswick Risk Sharing Pool** will be amended to allow for the transfer of all PPV class vehicles in alignment with the Ontario, Alberta Non-Grid and Newfoundland & Labrador Pools.
> 3. The **Nova Scotia Risk Sharing Pool** will be amended to allow for the transfer of all PPV class vehicles in alignment with the Ontario, Alberta Non-Grid and Newfoundland & Labrador Pools. A member transfer limit, to be set by the Board, will be established.

B2d Morneau Shepell, Hospital and Medical: Operations and Risk Transfer

This section covers the financing and benefits of these hospital and insurance plans.

Financing

Federal: Previously, federal and provincial shares were equal, but recently, the federal share has fallen. The federal government, however, can still penalize provinces that don't meet their standards. The federal government also provides financing for certain groups outside of provincial plans: the Armed forces; the Royal Canadian Mounted Police; and Native Canadians

Provincial: Each province establishes a funding method for the share of costs not covered by federal transfer payments. Basic provincial financing depends on the province:

- BC, ON, PQ: direct cost sharing by residents and employers.
- PQ, NL, MB, ON: payroll tax on employers, but PQ planning to reduce, starting in 2017.
- Other provinces: general revenues.
- ON, PQ, MB: also retail sales tax on group benefit premiums and self-insured plans.

Taxation

- Health premiums paid by individuals are not tax-exempt; the exception is a 30% tax credit on contributions to the Quebec Health Services Fund.
- Premiums paid by an employer are taxable income for the employee.
- There is a tax credit for medical expenses if above a certain amount or for working individuals with low incomes.
- Employer contributions to a private health plan do not create taxable income for the employees, except in PQ.

Past exams: No questions have been on the above items on recent published exams.

To meet the criterion of Comprehensiveness (one of the Canada Health Care Criteria for Unreduced Federal Assistance), the following items must be covered in provincial hospital and medical insurance plans:

Hospital costs – Necessary costs of hospitalization up to ward level rates, including accommodation at the ward level; nursing care; drugs; operating room and anesthetic facilities; lab and diagnostic services; radiotherapy and physiotherapy in a hospital; out-patient services for emergencies; medically necessary physician service, with no time limit on medically necessary stays.

Note that some jurisdictions cover ambulances and rehabilitation expenses; elective services not provided, e.g., private rooms; user fees allowed only for chronic care situations if individual is a permanent resident; about half of the jurisdictions levy such fees.

Medical services – Necessary services are covered, including physician services; administration of anesthetics, X-ray, diagnostic and lab tests; surgery, including some oral procedures done in a hospital.

Payments to physicians – extra billing by participating physicians not allowed; nonparticipating physicians may bill the patient, who then submits a claim. Most provinces limit reimbursement to the applicable schedule; Quebec does not reimburse nonparticipating physicians at all.

Supplementary Benefits, not part of the requirements:

- Common benefit enhancements: dental care for children, annual eye exams, prescription drug coverage for over 65 and/or receiving social assistance.
- Paramedical services, majority of cost not covered: chiropractors, physiotherapists, osteopaths, podiatrists, massage therapists, psychologists, optometrists
- Medical supplies such as wheelchairs and crutches also often not covered.

- Jurisdictions looking to reduce medical care costs: May delist costs covered; may apply user fees or premium taxes. If not covered by provincial plans, can be covered under other benefit programs, e.g., employer-sponsored.
- Drug coverage benefits vary from province to province. A "Formulary" exists in each province: list of drugs covered. Provincial plans increasingly looking to fees (co-payments and deductibles) to keep necessary drugs affordable. Some provinces provide coverage for seniors and social assistance recipients. Some differences between provinces lead to inequities and may violate the principle of uniform coverage.

  Attention has been given to the idea of universal pharmacare, but it's a political challenge. In 2016, the federal government said it would join the pan-Canadian pharmaceutical alliance, to facilitate negotiation of drug prices. Quebec introduced a universal drug plan through RAMQ (program stipulates all Quebec residents must be covered through the plan or privately).
- Most provinces cover some sort of vision care.

Out-of-Province Benefits

- Except for Quebec, reciprocal fee arrangements apply to out-of-province medical services. The jurisdiction where services are provided pays the provider and then gets reimbursed by the home province. In Quebec, a nonresident pays the provider and then gets reimbursed by the home plan.
- Most plans cover emergency services outside of Canada, up to the cost of such services performed in the province or to a specific limit.
- In some cases, non-emergency services outside of Canada are also covered if the patient has prior approval and no acceptable equivalent is available within the province.
- Noncovered charges can be covered under private plans.

Private Clinics & Wait Times

- Most provinces prohibit residents from seeking reimbursement for services provided by the public plan through private clinics.
- Chaoulli decision – in Quebec, patients may seek reimbursement for private services when the public plan has unreasonable wait times.
- Because of the decision, provinces have reduced wait times instead of publicly funding private services.

Past exams: For the most part, what is covered and what is not covered by the provincial health plans has NOT been asked about on past published exams. What is more likely is that an exam question will discuss some benefits and ask if what is provided meets the Canada Health Care Criteria for Unreduced Federal Assistance or not.

Knowledge check – question

What is the Chaoulli decision? What has been the result?

Knowledge check – answer

The Chaoulli decision allowed a patient to seek reimbursement for private services when the public plan has unreasonable wait times. Because of this decision, provinces have worked to reduce wait times.

B2e Morneau Shepell, Workers' Compensation: Operations and Risk Transfer

Funding Workers' Compensation

- Assessments are only on employers (employees may not contribute).
- Some assessments are based on **individual liability**. This applies to some groups (Government and public agencies; Crown corporations; Large public transport organizations). These entities are self-insured or liable as costs occur (pay-as-you-go); the costs equal claims plus administrative expenses.
- Most assessments (vast majority) are based on **collective liability**. Employers are divided into industry classes and/or rate groups; the cost components = Expected current and future benefit costs of new claims + Administration expenses, loss prevention costs, other statutory obligations + Adjustments to meet funding requirements. Rates vary by class and are applied to payroll up to the assessable earnings maximum (varies significantly by jurisdiction)

Accountability – Experience Rating for employers using collective liability

- The purpose of experience rating is to manage the cost of accidents by encouraging participation in accident prevention and return-to-work programs.
- Experience rating can go in two directions. **Prospective rating** – rating involving adjustments based on past experience, while **Retrospective rating** – rating involving adjustments based on the year's actual experience.
- Provinces vary regarding type of rating as four use only prospective, four use only retrospective, and five use both. Yukon uses none.
- PQ also allows employers to create mutual groups for experience rating.

Taxation

- Employer contribution is a tax-deductible operating expense.
- Employer contribution is not a taxable benefit for employees.
- Payments to injured employees are not subject to tax.

Past exams: A recent published exam asked about individual liability in workers' compensation and when it was used. It is easy to envision questions based on individual vs. collective liability, or asking about experience rating, especially as setting reserves for experience rated policies can be a task for actuaries (even those working for the government).

Knowledge check – question

Who in Workers' Compensation uses individual liability for their assessments?

Knowledge check – answer

Some groups (Government and public agencies; Crown corporations; Large public transport organizations). These entities are self-insured or liable as costs occur (pay-as-you-go); the costs equal claims plus administrative expenses.

Benefits in Workers' Compensation come in five categories:

Health Care – Expenses resulting from workplace accident or disease; can include hospital charges, physician/surgeon charges, drugs, ancillary services such as transportation costs, clothing allowances, and long-term care allowances.

Short-Term Disability – Benefits payable until the employee is able to return to the pre-accident occupation or earn at the pre-accident level. They vary by jurisdiction, usually ranging from 75% of gross earnings to 90% of net earnings. If an employee can't go back to work, they become eligible for long-term disability.

Long-Term Disability – First approach, prior to wage loss system, the injuries categorized into permanent total and permanent partial and the benefit linked to the nature and extent of the injury/disease and payable for life. Second approach: dual award in some jurisdictions, with a monthly benefit based on earnings loss (usually 90% of net earnings, paid until age 65) as well as a lump sum for noneconomic impacts as a base amount with adjustments.

Rehabilitation – Can include medical or vocational program of the WC board, such as counseling, job search assistance, ergonomic modifications, tuition, homemaker assistance, on-the-job training, relocation assistance, self-employment, and legal service.

Survivor Benefits – Death results in an income replacement benefit for the spouse and dependent children; all jurisdictions also pay a lump-sum burial benefit. Benefits include a pension either for a short term or up to age 65 and possibly a lump sum. Other factors that may affect benefits include the spouse's age, the number and ages of dependent children, and any disabilities.

Past exams: This has not appeared on many recent published exams.

B2f Morneau Shepell, Employment Insurance: Operations and Risk Transfer

The financing of employment insurance is done through contributions from the employee and employer (1.4 times that of the employee).

- Refund of the employee's (not the employer's) contributions for those earning $2,000 or less
- Rate reduction for employers with an approved wage loss replacement plan

Premium Reduction Program

EI is always the second payer, after the first payer, an employer plan. An approved employer-operated short-term disability plan reduces benefits and premiums paid by EI (because the employee will be receiving what is needed). To be approved, an employer plan must:

- Be a written agreement on how savings are to be returned to employers
- 5/12 of the reduction given as income to the employees
- Provide new or increased benefits or more holidays
- Apply annually for reduction
- Amount of reduction varies with the type of plan
- Provide a written commitment to pay benefits after three straight months of employment
- Offer disability benefits of at least 55% of insurable earnings
- Begin benefits no later than the 15th day of disability (8^{th} day as of 2017)
- Minimum of fifteen weeks of benefits for each disability occurrence
- Allow eligibility to claim benefits within 3 months of continuous employment
- Offer 24-hour coverage
- Be the first payer, that is, no reduction for EI benefits during the same period
- For weekly indemnity plans, reinstatement of full coverage within one month of return to work for a different cause or three months for the same cause

Past exams: not many past published exams have asked about the requirements for an employer plan to qualify for premium reduction, but it has happened occasionally.

Supplemental Plans (may also be deducted from EI)

Payment not deducted from EI if the following requirements are met:

- Payment and EI benefits do not exceed gross salary
- Payment is not used to reduce other accumulated employment benefits
- Can be paid during the EI waiting period
- Is not considered insurable earnings
- Supplemental Unemployment Benefits (SUB) plan: Purpose is to provide supplemental payments to EI during training or disability, and the program must be registered with Service Canada

Taxes and Repayment with respect to Employment Insurance

- Premiums are deductible for an employer but not income to the employee
- Premiums paid by an employee produces a federal tax credit of 15%
- Benefits are taxable income for the recipient
- Benefit repayment aka "clawback" is not applicable to the following categories: **First-time claimants** – "those who were paid regular benefits for less than one week in the 10 taxation years before the current taxation years" or those who receive special benefits (maternity, parental, sickness, compassionate care). However, if net income in a year exceeds \$63,500, the lesser of 30% of regular benefits or 30% of excess income must be repaid.

Past exams: Tax treatment of EI premiums and benefits have occasionally appeared on past exams.

Knowledge check – question

Compare who pays the premiums for Workers' Compensation (WC) versus who pays the premiums for Employment Insurance (EI).

Knowledge check – answer

Workers' compensation is always paid for by the employer, while employment insurance receives contributions from both the employer and the employee (although the employer pays more).

B2g GOC Flood Risks: Operations and Risk Transfer

This reading is not a review of actual flood insurance in Canada, because that doesn't really exist. Instead it's a review of possible flood insurance options in Canada.

Solutions in other countries

The Task Force compared the national insurance regimes of Australia, France, the United Kingdom, and the United States. These flood insurance models vary considerably, including: the role of government; whether purchase is voluntary or compulsory; a standalone product or bundled with other perils; and whether premiums are risk-adjusted or uniform. All flood insurance models require trade-offs, and the sections below highlight the benefits and limitations of each system.

Australia: a fully private market with minimal intervention from the government, except for regulation of a standard definition of flood for insurance purposes. Both the offer (by insurers) and take-up (by residents) of flood insurance is voluntary. Premiums charged by insurers are risk-adjusted and are neither regulated nor subsidized by the Government. Those with the highest risk may encounter problems with availability and affordability.

Australia's system costs the government little and makes strong use of private partnerships in flood risk management. Homeowners shoulder much of the burden. The standard definition of flood can increase market penetration by having a clear product consumers can compare to their property-level flood risk and subsequently choose to purchase.

France: residential flood insurance in France is provided through the*Catastrophe Naturelle* or "CatNat" scheme, an extension of private insurance coverage for other large-scale natural disasters. Residents pay a uniform 12% surcharge on their home insurance policies. Local governments are encouraged to adopt a*Plan de Prévention des Risques* (PPR). The CatNat deductible is lower for communities with an approved plan.

Insurers can reinsure through the*Caisse Centrale de Réassurance* (CCR), a state-owned facility backed by the French government. When a disaster occurs, claims are paid by insurers. Insurers are compensated by the CCR based on the proportion of premiums ceded. When an*extreme* disaster occurs (defined by ministerial decree), insurers are compensated by the CCR for the full amount of losses, minus a deductible. Property owners with a mortgage are required to have home insurance, but purchase is optional if the property is owned outright.

Strengths: good market penetration, availability, and affordability. Potential weaknesses: poor risk reduction, value for money, and transparency.

United Kingdom: Flood Re relies on private insurers to provide coverage to high-risk areas. Insurers cede the flood portion of residential property insurance policies and premiums to a high-risk reinsurance pool when premiums fall above a pre-determined affordability cap. Affordability is the goal, so premiums don't reflect risk. The pool is topped up by a levy on insurers that is passed on to all residential policies. The private sector operates Flood Re, a not-for-profit entity accountable to the government. The arrangement was designed to be in place until 2039, with the goal that properties would be sufficiently de-risked by this time to move towards risk-based pricing.

System strengths: availability, affordability, market penetration, and compensation. Insurance is available to most high-risk properties (i.e., does not cover those built after 2009), high level of take-up, and value for money. Weaknesses: lack of equity and little incentive for risk reduction. Some wealthy, high-value, property owners are being subsidized by the broader population.

United States: US Flood insurance is primarily administered through the federal National Flood Insurance Program (NFIP), operated by the Federal Emergency Management Agency (FEMA). The federal government underwrites the insurance policies sold, while private insurers can have roles of varying degrees and are paid a fee. Roles range from adjusting policies to writing, selling, and settling policies for the NFIP.

Flood insurance is separate from homeowner insurance and is mandatory for federally-backed mortgages in flood-prone areas (voluntary outside those areas). Premiums are fully risk-based in principle and based on rate maps developed by the government. FEMA operates a Community Rating System program, rewarding communities voluntarily implementing risk-reduction measures with premium discounts. Policies for homes in high-risk areas (grandfathered) are beginning to see their premiums increase.

Strengths of the NFIP: availability and affordability, although prices may go up as older policies and premiums are transitioned to reflect true risk. Weaknesses include low market penetration (about 30% in designated high-risk areas), risk reduction, and value for money. With no additional cost for repetitive loss properties, incentives are weak for property-level risk reduction. Finally, the overall cost of the NFIP for the federal government has been high due to the deep unfunded historical discounts provided and the fact that few policies are sold outside high-risk areas..

Guiding Insights for Canada

Based on this analysis and on broader research of international best practices, the Task Force identified **Policy Objectives for Flood Insurance**:

Adequate coverage – Coverage should be reliable, consistent, and clear (standardized); Efficient – settle claims quickly and accurately; be accountable, transparent, and have good governance.

Incentivize risk-mitigation – Improve risk awareness for people, communities, and governments; Reduce perverse incentives that sustain/increase residential flood risk; focus on ways to change behavior; price flood risk in an efficient and transparent manner, considering climate change and risk mitigation.

Affordable to residents of high-risk areas – with specific consideration for marginalized populations – Means of making insurance affordable is transparent to consumers; inclusive, equitable access to insurance; maximize participation of residents in high-risk areas; ensure that within any option selected, uptake is maximized; solution should leverage, where appropriate, industry capacity, and minimize price inequities with existing flood insurance markets.

Provide value for money for governments and taxpayers – Over time, reduce burden on public DFA for flooding, shifting expenditures from recovery to mitigation and adaptation; be cost-effective and sustainable.

The above led the Task Force to develop the following Public Policy Objectives

Focus on availability by way of increasing affordability (i.e., accessibility) may reduce the financial incentive to help drive property-level risk reduction, and likely increases costs to governments.

Prioritizing risk-based pricing will impact the number of residents that are likely or able to participate

Prioritizing affordability requires balancing the trade-offs between what is deemed an adequate level of coverage and an acceptable financial burden to the general public

Focusing on cost-effectiveness specifically for FPT governments may shift the burden to homeowners or to municipalities. Flood risk cost does not go away with different arrangements; costs are simply shared differently; risk can only be reduced through mitigation and prevention.

Maximizing participation, especially when mandatory provisions are combined with government funding premium caps and subsidies, increases government costs, and needs to be balanced with relative benefit of closing protection gap.

Insurance Models for Canada

The Task Force proposed six conceptual risk-sharing models for further study. Two were discarded as they did not meet the policy objectives; the remaining four were provided to actuarial researchers. The four models are:

1. Flat Cap High-Risk Pool
2. Tiered High-Risk Pool
3. Public Insurance
4. Public Reinsurance (Layered)

All of these models would conceptually have a limited life-span of approximately 25 years, to allow time for the market to transition to full risk-based pricing and for governments, communities, and individuals to make the necessary investments to mitigate risk.

Knowledge check – question

What are four public policy objectives for a Canadian flood insurance programme?

Knowledge check – answer

Available; Encourage risk mitigation; Affordable; Give value for the money

Now that we have covered some of the operations and risk transfer with respect to high-risk flood insurance, let's return to the business of insolvencies.

B2h PACICC: Operations and Risk Transfer

In this part of the guide we'll cover how the Plan works, including how it is organized, how it is funded, and then cover what the Plan pays out in case of an insurer insolvency. Let's start with **organization and operation**: All participating insurance companies are members of PACICC. A participating company is a company licensed in a participating jurisdiction to sell a class of insurance covered by PACICC. All jurisdictions require P&C insurers be members of PACICC, although some jurisdictions have exemptions, e.g., for reinsurers, farm mutuals, reciprocals. A participant may not withdraw its membership, nor may PACICC terminate its membership. Membership is terminated six months after cancellation of an insurance company's license, unless another license means continued eligibility.

PACICC has a Board of Directors elected by its members; this board works closely with federal and provincial Superintendents of Insurance. It may appoint an advisory committee as to any specific insolvency. Superintendents are entitled to designate non-voting representatives to participate in Board or advisory committee discussions.

Financial obligations of PACICC occur only upon formal winding up order under the federal Winding-Up and Restructuring Act (PACICC helped develop a model wind-up order). Usually this starts with informal consultations; for example, when an insolvency is imminent, PACICC discusses with the relevant Superintendent as to pre-selecting the liquidator. The major accounting firms tend to be invited for the selection process, although the audit firm of the insolvent insurer is excluded from consideration.

The Court appoints a liquidator; PACICC consults with the liquidator immediately after a wind-up order is made. PACICC's Memorandum of Operation is sufficiently flexible to permit working arrangements appropriate for the factual situation.

The Liquidator and PACICC review procedures to settle policyholder claims. Once there is consensus, PACICC is prepared to pay adjusted claims. PACICC may simply make payment to a policyholder for a settled claim, but it is entitled to review the settlement for reasonableness. PACICC generally requires minimal staff resources due to its cooperation with the liquidator.

Past exams: Although the above is useful background information, few questions have been asked about the steps during a formal winding up order. More focus has been on what comes next, on how PACICC is funded.

Knowledge check – question

In case of an insurer insolvency, a liquidator needs to be appointed. Who is usually considered? Of this group, who is usually excluded?

Knowledge check – answer

Usually the major accounting firms are asked to apply for the position of liquidator, but the insolvent insurer's audit firm is excluded.

Assessment process: PACICC recovers the amounts it advanced to and on behalf of policyholders through assessments on participating insurers licensed in the jurisdictions where the insolvent insurer was writing business. Separate assessments are made with respect to each jurisdiction.

The assessments are limited to the shortfall between amounts advanced by PACICC and the amounts recovered by it from the insolvent insurer and third parties. The assessment formula is:

$$A = B \times \frac{C}{D},$$

where:

- "A" is the assessment to be borne by the particular participating insurer in respect of the relevant participating jurisdiction;
- "B" is the total amount being assessed against all participating insurers in respect of the relevant participating jurisdiction;
- "C" is the total direct written premiums for protected policies of the particular participating insurer in respect of the relevant participating jurisdiction; and
- "D" is the total direct written premiums for protected policies of all participating insurers in respect of the relevant participating jurisdiction.

The maximum annual levy against an insurer in a particular jurisdiction is 1.5% of its direct written premium for that jurisdiction. PACICC also has a Compensation Fund to improve the liquidity for its obligations, which was established with a special levy made on its members.

PACICC generally makes an assessment early in the course of an insolvency, reflecting the maximum exposure anticipated. Subsequently, levying draws on that assessment as the need for funds arises. PACICC may borrow money from its Compensation Fund and delay implementation of any assessment. Members are assessed to repay the money borrowed with interest.

PACICC may also levy for its administrative expenses; in 2009, administrative assessments varied from $1,850 to $9,200 by company.

If the making of compensation payments is likely to cause financial difficulty to the P&C industry or to PACICC, PACICC is required to discuss with regulators the modification of the compensation arrangements, and possibly to defer making payments.

Past exams: Asking about how much an insurance company will be assessed in the case of another insurance company's insolvency has shown up in past exams. It is important to remember that assessments are proportional to direct written premium for a jurisdiction, and that they are limited to 1.5% of the DWP for that jurisdiction.

Paying out claims: The costs are borne by the insolvent insurer (if any assets remain) and then by the policyholders and the other insurance companies. Let's look at what gets covered:

The Plan is designed to provide reasonable recovery for claims of policyholders under most types of P&C insurance. Life, which has its own plan, is excluded from being compensated by PACICC, as are some P&C lines with distinctive characteristics, such as Aircraft, Credit, Crop, Directors'

& Officers', Employer's liability, Errors & Omissions – only certain types (medical malpractice is not excluded), Fidelity, Financial guarantee, Marine, Mortgage, Surety, Title insurance. Also, the Plan does not step in where other compensation plans apply, such as Automobile insurance in Manitoba and Saskatchewan, Bodily Injury arising from automobile accidents occurring in Quebec, and Accident & Sickness Insurance when it is covered by the life insurance industry plan. The Life insurance industry plan applies whenever the insurer writes A&S only or with life insurance. The Plan applies to A&S when the insurer also writes at least one class of general insurance.

Past exams: One type of question on recent exams describes the insolvency of an insurer, give the date, and then describe several examples which may or may not have been paid. Frequently, one of the examples will be for a line of business that is not covered by PACICC, so knowing which lines of business are excluded can win you at least part of a point.

Initially, **policyholder claims for unearned premium** were not covered. However, starting in 1996, the Plan covers unearned premium with 30% coinsurance, subject to a maximum unearned premium of $1,000 (i.e., maximum payment of $700). (After all, the policyholders need the money in order to purchase coverage from another company.)

Past exams: This is often asked about on exams as well. When calculating the potential recovery, it is important to remember first to calculate how much of the premium remains unearned, by comparing it to the date the insurer was declared insolvent. Then you have to apply the 70% and the $700 limit.

Claims payments for claims which occurred before the insurer was declared insolvent are covered. The maximum recovery from PACICC is $250,000 with respect to all unpaid claims for losses arising from a single occurrence, with an except $300,000 limit for personal property policies. There is no coinsurance as with the unearned premium, but deductibles are applied.

Knowledge check – question

Give three reasons why a claim for an insolvent insurer may not be (completely) covered by PACICC.

Knowledge check – answer

Three of the following (others possible):

- The claim may be for an ineligible line of business.
- The claim may have happened after the insurer was declared insolvent.
- The claim may be below the policy's deductible.
- A claim may be for an amount in excess of what PACICC will pay.

Calculating the compensation:

First step: apply relevant provisions of the policy, such as deductibles or coinsurance, are considered (as well as the line of business). Second step: the effect of the cap is applied.

For example:

- A \$300,000 automobile claim with \$500 deductible will be compensated \$250,000.
- A \$175,000 automobile claim with \$500 deductible will be compensated \$174,500.
- A \$275,000 personal property claim with \$1000 deductible will be compensated \$274,000.
- A \$100,000 for D&O will be compensated \$0 as this line of business is excluded.

Claims asserted by persons who have a special relationship with the insolvent insurer may be excluded.

Past exams: Calculation of compensation via PACICC for specific claims as well as unearned premiums is asked fairly often on the exams.

B3 Evaluation of Effectiveness

Government programs may not need to be profitable as shareholders are not involved. Still, the government should have an interest in making sure the taxpayers' money is not wasted. This section evaluates the effectiveness of government insurance programs.

Here's what's in the content outline:

> **Task:**
>
> **Evaluate the effectiveness of a government and insurance industry program (e.g., solvency, efficiencies, stability, viability and long-term prospects, effects of external factors)**

B3a Government Insurers Study Note: Evaluation of Effectiveness

The study note provides some criteria for evaluating the effectiveness of a government insurance program by posing the following questions:

- Is the provision of the insurance by the government necessary or does it achieve a social purpose that cannot be provided by private insurance?
- Is it insurance or a social welfare program?
- Is the program efficient, is it accepted by the public?

The reading also reviews whether or not US Flood Insurance has been effective by evaluating the answers to these three questions. Is US flood insurance necessary? Yes, flood insurance is a major concern due to changing weather and other conditions. Private coverage is not enough, therefore the NFIP is required to fill needs. Is it insurance or a social welfare program? NFIP can be considered insurance as people pay premiums before loss, and only those that incur losses are indemnified. Efficient? Yes, as government programs are already undertaking some of the work in other departments, e.g., property valuation etc. reduces cost, no commission, lower cost. (Note that some would disagree with the efficiency of NFIP.)

Past exams: the three questions occasionally pop up on the 6C exams, and even though you would expect 6C not to have a question about the effectiveness of US Flood insurance. Nevertheless, it has been asked, possibly because Canada has been considering whether or not to start offering Flood insurance.

Knowledge check – question

> What three questions does the Government Insurers Study Note ask with respect to determining the effectiveness of a government insurance program?

Knowledge check – answer

- Is the provision of the insurance by the government necessary or does it achieve a social purpose that cannot be provided by private insurance?
- Is it insurance or a social welfare program?
- Is the program efficient, is it accepted by the public?

B3b Agricultural Programs: Evaluation of Effectiveness

Agricultural programs are not required to be profitable, but the production insurance programs must meet Canada Production Insurance Regulations, which require actuarial involvement. The key elements of these regulations include:

- The offered coverage level may not exceed 90% of probable yield/value of production (producers retain minimum loss deductible of 10%).
- Probable yields must accurately reflect the product's demonstrated production capability and province must submit probable yield tests to show that the methodologies do not result in over-insurance.

Premium rates must:

- Be actuarially sound
- Include a self-sustainability load
- Reflect all elements with cost implications other than administration expenses.

Probable Yield Tests

Actuarial certification must compare probable and actual historical yields. The tests are performed at the provincial level. This is required per federal legislation to ensure no over-insurance. If the data is insufficient for credibility, the tests are deemed inconclusive. The actuary provides recommendations, especially when tests are failed, such as how to improve methodology and data sources, and gives guidance on common actuarial practices (see the CSOPs).

Probable yield methodologies, premium rate methodologies and assessments of self-sustainability must be:

- Certified by an actuary
- Meet National Certification Guidelines established by Agriculture and Agri-Food Canada (AAFC)

If a province does not submit the three actuarial certifications (probable yield, premium rate, and self-sustainability), the federal government may reduce premium contributions to the province's agricultural insurance program.

Provinces may rely on certified methodologies for up to 5 years, but new certifications, including self-sustainability, are required when there are significant changes.

Simulations are a way of testing the sustainability of a production insurance program. Simulations must:

- Be based on the insurance program design.
- Use certified methodologies for probable yields and premium rates.
- Contain modeled elements that reasonably replicate reality.
- Be consistent with overall historical data.
- Be adjusted for expected changes over the projection period.

Output of the model: aggregate balance sheet and income statement projections that can be evaluated at various percentiles over a 25-year period. Actuaries should especially review:

- Expected surplus fund balances and ranges of potential surplus fund balances at various points in the projection period
- Premium rate volatility
- Recovery periods from large deficits
- Sensitivity testing to determine conditions that could compromise program self-sustainability
- The base scenario, and the actuary would also identify and model relevant adverse scenarios, such as:
- Increase in liabilities: Higher liabilities mean higher maximum exposure to loss
- Decrease in liabilities: Can be dangerous when the surplus position is vulnerable
- Introduction of new major insurance plans
- Deterioration in the market value of investments

For all scenarios, including the base, the actuary must calculate the 95^{th} percentile deficit of the fund balance at the end of the 6^{th} year of the projection, then calculate the recovery period to a zero-deficit based on re-running the scenario using the 95^{th} percentile deficit as the starting financial position. A production insurance program is considered self-sustainable under federal legislation **IF**:

- Recovery from the 95^{th} percentile deficit occurs, on average, within 15 years AND
- Recovery from the 95^{th} percentile deficit occurs, with 80% probability, within 25 years

Past exams, at least those that have been published, have not asked about how to test for the sustainability of agricultural programs, but as they require actuarial involvement, it is a potential source for exam questions.

Knowledge check – question

The federal government may reduce premium contributions to the province's agricultural insurance program unless a province submits three actuarial certifications. What are these certifications?

Knowledge check – answer

Actuarial certifications are required for probable yield, premium rate, and self-sustainability.

Government reinsurance is available. This is for the provinces that may not be able to afford their portion of the agricultural insurance. Instead of traditional reinsurance, however, it is deficit-financing.

- A province may establish a provincial reinsurance fund, as well as a federal reinsurance fund.
- Provincial production programs contribute part of premiums to provincial and federal reinsurance funds based on their surplus position.
- The percentage of contribution is lower when the financial position is stronger and vice versa.
- The percentage of contribution varies by province to recognize different risk profiles and surplus fund balances.
- The percentages are selected so that the reinsurance funds are self-sustaining over 25 years.
- Government reinsurance is triggered when the surplus of the production insurance fund is depleted.
- Indemnities net of private reinsurance are paid out of the production insurance fund first.
- When this fund depleted, province must retain minimum of 2.5% of liabilities, typically financed through interest-free loan from: Provincial government OR Provincial reinsurance fund.

The remaining deficit is financed at 75% by federal reinsurance fund and at 25% by provincial reinsurance fund. If the reinsurance funds are insufficient to pay claims, additional cash advances can be made by the federal and provincial governments. Alberta, Saskatchewan, Manitoba, New Brunswick, and Nova Scotia currently participate in government reinsurance funding.

Past exams, at least those that have been published, have not asked about this reinsurance, and it is probably less likely than the topics requiring greater actuarial involvement.

B3c Morneau Shepell, Hospital and Medical: Evaluation of Effectiveness

There are solvency concerns, or at least pressures, due to demographics (the baby boomers) and the rising costs of pharmaceuticals.

Past exams: There are no recent exam questions published on this issue, but it could come up.

B3d Morneau Shepell, Workers' Compensation: Evaluation of Effectiveness

This was not covered in the reading. However, you could be asked to give your own evaluation by using the principles from the **Government Insurers Study Note**.

B3e Morneau Shepell, Employment Insurance: Evaluation of Effectiveness

This was not covered in the reading. However, you could be asked to give your own evaluation by using the principles from the **Government Insurers Study Note**.

B3f GOC Flood: Evaluation of Effectiveness

There is no Canadian flood insurance government program, so its effectiveness cannot be evaluated. The effectiveness of flood insurance government programs in other countries is discussed in B2. The risk of flood is increasing, however, and it can be considered a threat, if not to the insurance industry (as it is not covered), to individuals and the governments that that will have to pay for the costs of floods.

B3g GOC Flood Risks: Evaluation of Effectiveness

Even though the models don't exist in the real world, they can still be evaluated for how well they are predicted to meet various criteria. The predicted results showcase relative strengths and weaknesses of different approaches, but not exact costs. Let's evaluate them within the framework of the Task Force's previously stated **Public Policy Objectives**.

Adequacy and Predictability of Compensation

- Adequacy matters. It's not enough to know how many Canadians have flood insurance; we need to be sure they have enough flood insurance.
- Coverage needs to be clear. Don't want to learn after the flood that certain perils are not covered, especially when considering lower income people, Indigenous peoples, elderly residents, people with physical or mental disabilities, and people living alone; clear policy language can help to ensure adequate coverage for diverse populations.

- How the models fared:
  - ▷ Flat cap high-risk pool: evaluation average. If insurance is optional, some will not buy or will not buy enough.
  - ▷ Tiered high-risk pool: evaluation average. Mandatory take-up for mortgage holders increases participation but still may not be adequate.
  - ▷ Public insurer: evaluation strong. A public insurer could ensure clear, consistent, and standardized policy language and flood coverage to all homeowners at all levels of risk
  - ▷ Layered public reinsurer: evaluation strong. Mandatory take-up at higher loss levels (in Layer 2) would ensure that homeowners are sufficiently insured for major flood events, and standardized policy language and coverage types increases adequacy for all homeowners.

Risk Reduction

- Insurance alone is not likely to substantially reduce risk. Risk-based premiums can incentivize some mitigation, but high up-front costs are still a problem. Need to mobilize governments and communities to improve risk-informed decision-making.
- Willingness to undertake risk reduction comes down to 'skin in the game'.
- Community-level mitigation could be further incentivized through linking insurance with the development of a community rating system.
- How the models fared:
  - ▷ Flat cap high-risk pool: evaluation average.
  - ▷ Tiered high-risk pool: evaluation average.
  - ▷ Public insurer: evaluation average.
  - ▷ Layered public reinsurer: evaluation strong. Incentivizes both the homeowners and the governments to reduce risk.

Affordability

- Defining an affordability threshold is incredibly complex. A set price does not consider ability to pay, relative income, or regional differences.
- Investments in affordable insurance protect Canadians better than the status quo.
- Affordability is critical for program equity. More social vulnerability in high-risk areas. In the North and in many off-reserve Indigenous communities, housing affordability and lower income levels remain persistent issues.

- How the models fared:
  - ▷ Flat cap high-risk pool: evaluation strong. Still, regressive, a lot of subsidization for wealthy, high-risk property owners.
  - ▷ Tiered high-risk pool: evaluation average. May not subsidize where needed most.
  - ▷ Public insurer: evaluation strong.
  - ▷ Layered public reinsurer: evaluation average.

Availability

- Flood insurance is not uniformly available in Canada, even for low/medium risk areas. After a flooding event, insurance can be more difficult to obtain. Models that rely on the private market to provide insurance need to consider how to ensure coverage remains available even after a flood.
- How the models fared. All models were evaluated as strong, but they were designed to consider availability as a primary objective. That may not be true with other approaches.

Participation

- Current take-up of flood insurance is low.
- Mandatory offer of flood insurance is required.
- Mandatory purchase is the best way to protect the most people.
- Increased risk awareness and the application of behavioral insights and choice architecture can be employed to nudge participation rates up. With enhanced public awareness of property-level flood risk, the expanded availability of insurance within high-risk areas, and withdrawal of FPT DFA programs, all models are expected to raise participation rates above what we currently observe in the insurance market.
- How the models fared:
  - ▷ Flat cap high-risk pool: evaluation weak
  - ▷ Tiered high-risk pool: evaluation average.
  - ▷ Public insurer: evaluation strong.
  - ▷ Layered public reinsurer: evaluation average.

Value for Money. This policy objective is intended to maximize the efficiency of public funds and ensure effective and equitable outcomes for Canadians.

- Assessing value for money will require more extensive investigation.
- A government backstop can reduce how much risk insurance needs to cover, but at a cost. The governments are already the de facto backstop; making it mandatory will help financial planning.
- Government intervention in flood risk management should be clear and predictable. Government investments in mitigation should target the highest-risk areas.
- How the models fared:

- Flat cap high-risk pool: evaluation weak
- Tiered high-risk pool: evaluation average.
- Public insurer: evaluation strong.
- Layered public reinsurer: evaluation average.

Key Findings

- Total residential flood risk in Canada is estimated at $2.9 billion per year, markedly higher than previous estimates.
- The majority of risk is concentrated in a small number of the highest risk homes; 89.3% in the top 10%, and 34.1% in the top 1% of highest risk homes.
- Some standardization is needed in the market. Language, comprehensive, seamless, bundled.
- Participation is key and requires interventions and a carefully designed flood insurance solution.
- Greater public intervention can more fully close protection gaps, but at a cost. There is no scenario in which these costs disappear without significant investments to remove, or reduce, the risk.
- Relocation can be a powerful risk reduction tool, removing risk rather than transferring or mitigating it. Obviously, it is controversial.
- Relocation must be informed at the community level, and especially significant for Indigenous communities with strong ties to their ancestral, traditional land.
- Affordability of flood insurance premiums is key to enabling equitable access. For mandatory insurance models, consideration must be given to individuals and communities for whom insurance may not be an appropriate solution.
- Pathways to accessing insurance are about more than just money. The realities for many Indigenous and Northern communities also call for balance and cohesion with related initiatives on housing, poverty, and health.

- The cultural connections of Indigenous peoples to water and land must be respected Indigenous knowledge, culture, and perspectives on the natural world must be respected, and should be recognized as foundational in informing how all stakeholders can approach flood risk management across Canada.

Knowledge check – question

What is the most effective way to deal with flood risk? What is the drawback?

Knowledge check – answer

The most effective way to deal with flood risk is to relocate people from the highest-risk areas as it effectively gets rid of the risk. However, it is highly controversial, because many people do not want to move, and many Indigenous peoples have especial attachment to their lands.

B3h PACICC: Evaluation of Effectiveness

PACICC is not in charge of keeping insurers solvent; its function is to protect policyholders if an insurer becomes insolvent. Nevertheless, before amending prudential criteria, a jurisdiction is required to consult with PACICC.

Past exams: Occasionally an exam has a question about the reason for the existence of PACICC.