

## **Integrated Travels**

### **Research Report #2**

**Revitalizing Transportation in Alberta: Lessons from Regional Rail Initiatives and the Reintroduction of Passenger Rail Between Calgary and Edmonton**

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# TABLE OF CONTENTS

INTRODUCTION .....	3
HISTORICAL PERSPECTIVE: DEVELOPMENT OF RAIL TRANSPORT VS. AIR AND ROAD TRANSPORT IN CANADA .....	5
COMPARATIVE ANALYSIS: WHY RAIL OUTPERFORMS AIR AND ROAD TRANSPORT .....	7
ENVIRONMENTAL IMPACT AND SUSTAINABILITY: WHY RAIL OUTPERFORMS AIR AND ROAD TRANSPORT .....	9
ECONOMIC EFFICIENCY: THE COST ADVANTAGE OF RAIL OVER AIR AND ROAD .....	13
EQUITY AND ACCESSIBILITY: RAIL AS THE MOST INCLUSIVE MODE OF TRANSPORT .....	16
POLICY IMPLICATIONS: REVIVING PASSENGER RAIL AND ITS BROADER IMPACT .....	20
CONCLUSION .....	25
REFERENCES .....	27



## Introduction

Transportation has been a cornerstone of Canada's economic and societal growth, facilitating the movement of people and goods across the country's vast and diverse landscapes. With an expansive geography and relatively low population density, Canada has long relied on three primary modes of transport: rail, road, and air. These systems have been integral to the nation's connectivity, trade, and overall development. However, as sustainability, economic efficiency, and accessibility become more pressing concerns, it is essential to evaluate which mode of transport offers the best long-term solution.

**Rail transport**, particularly through the adoption of sustainable technologies like hydrogen and electrification, presents a clear advantage over air and road transport. This report will demonstrate that rail transport is the most sustainable, cost-effective, and equitable mode of transportation for Canada's future.

The research papers that inform this report include:

- An overview of the development of air transportation in Canada, which highlights its role in connecting remote areas but also emphasizes the environmental and operational costs associated with air travel.
- A comparative analysis of hydrogen-powered and electrified rail systems, showing how rail offers significant environmental and economic advantages over road and air travel.
- An examination of the economic frameworks for accessing rail infrastructure, revealing that rail transport is a more cost-effective and scalable solution compared to air and road systems.
- A study on how public transport, particularly rail, plays a critical role in providing equitable access to jobs and services, especially for low-income populations.

## Purpose of the Report

The primary objective of this report is to evaluate the comparative advantages of rail transport over air and road transport in terms of environmental sustainability, economic efficiency, and social accessibility. Drawing insights from the research, this report argues that rail transport presents a superior solution to address Canada's long-term transportation needs.

## Key Findings

- **Environmental Sustainability:**
  - Rail transport, particularly through hydrogen and electrification technologies, can significantly reduce greenhouse gas emissions compared to air and road transport. Electrified rail lines provide immediate reductions in emissions, while hydrogen-powered trains offer a flexible, sustainable option for areas where electrification is less feasible.



- In contrast, air transport is associated with higher environmental costs due to significant fuel consumption, while road transport contributes heavily to emissions through reliance on fossil fuels.
- **Economic Efficiency:**
  - Rail transport offers significant economic advantages, particularly for freight and long-distance travel. Rail systems can transport large volumes of goods and passengers at a lower operational cost compared to air and road, which are more resource intensive.
  - While air transport plays a crucial role in international trade, its high operational costs and energy consumption make it less suitable for domestic travel and freight.
- **Social Equity and Accessibility:**
  - Rail transport provides greater equity in access to jobs and services, particularly for low-income populations. Public rail systems offer affordable and widespread access, especially in urban centers, whereas air and road transport often exclude lower-income groups due to higher costs.
  - Rail networks, both urban and intercity, enhance social mobility by providing reliable and cost-effective transportation options, helping to bridge the gap between urban and rural areas.

## Scope of the Report

This report will provide a detailed analysis of each mode of transport, focusing on their environmental, economic, and social impacts. The findings from the research will be synthesized to argue that rail transport, particularly through advancements in hydrogen and electrification technologies, presents the most viable solution for Canada's future transportation strategy. Additionally, the report will explore a case study on hydrogen vs. electrification, illustrating the potential of rail transport to outperform air and road systems in terms of sustainability and cost-effectiveness.

## Conclusion of the Introduction

In conclusion, this report aims to provide a comprehensive analysis of Canada's transportation system, showing that rail transport, with its sustainability, cost efficiency, and accessibility advantages, should be prioritized over air and road transport. By synthesizing key findings from the research, this report will demonstrate why rail transport is critical to Canada's future infrastructure and economic growth, providing a clear pathway to sustainability and equity in transport services.



# Historical Perspective: Development of Rail Transport vs. Air and Road Transport in Canada

Transportation has played a vital role in the development of Canada since the nation's early years. Rail, air, and road transport have each shaped the country's geography, economy, and population distribution. However, the historical evolution of these modes of transportation shows that rail has consistently provided the most effective and sustainable option for long-distance travel, large-scale goods movement, and connecting remote regions, especially when compared to the limitations of air and road transport.

## Rail Transport: The Backbone of Canada's Growth

Rail transport has been integral to Canada's development since the 19th century, particularly in the formation of the Canadian Pacific Railway (CPR), which was completed in 1885. The CPR linked the eastern provinces with the west, providing not only a means for moving goods across the country but also a method for settling and developing the Canadian frontier. The rail network enabled the transport of natural resources, such as timber, minerals, and agricultural products, from the western provinces to the industrial centers in the east, boosting economic growth.

As rail networks expanded, they helped lay the foundation for Canada's economy by connecting rural regions to urban centers, enabling the exchange of goods and services. Rail transport became particularly vital for industries reliant on heavy freight, such as mining and agriculture, where the efficiency and capacity of trains far surpassed the limitations of road vehicles. The ability to move large quantities of raw materials over long distances made rail an essential component of Canada's industrialization.

The rail system also played a key role in Canada's population distribution. Rail lines facilitated migration, allowing settlers to move from the densely populated areas of Ontario and Quebec to the prairies and the west coast. This westward expansion was made possible because the railways provided reliable access to remote regions, which would have been inaccessible by road. Moreover, rail stations often served as the nucleus around which towns and cities developed, further reinforcing the importance of rail in shaping Canada's demographic landscape.

## Air Transport: Early Promise with Limitations

The development of air transport in Canada began in the early 20th century, but it was during World War I and II that aviation took on a significant role in the country's transportation network. Canada's vast northern regions, many of which were difficult to access by rail or road, saw air transport as a vital tool for connecting isolated communities. Airplanes could cross difficult terrains, such as mountains and dense forests, making them the preferred option for reaching remote areas that were otherwise inaccessible.



During and after the war, air transport became essential for the delivery of mail, military supplies, and essential goods to remote communities. By the 1940s, commercial aviation began to take shape, with air transport companies emerging to serve both passengers and freight. The convenience and speed of air travel made it an attractive option for those looking to travel long distances quickly, and air transport became the primary means of international travel.

However, despite its advantages in reaching remote areas and facilitating long-distance travel, air transport has always been constrained by high operational costs, limited capacity, and significant environmental impacts. The high fuel consumption required for air travel contributes to its significant carbon footprint, making it less sustainable than rail transport. Additionally, the infrastructure needed for airports is costly and requires substantial investment, often making it impractical for smaller or rural areas. As a result, air transport is often limited to major urban centers, leaving many regions dependent on other forms of transportation, such as rail and road.

### Road Transport: Flexibility with Environmental and Economic Costs

The development of road transport in Canada followed the rise of the automobile in the early 20th century. As cars became more affordable and road infrastructure expanded, road transport became increasingly popular for both personal and commercial use. Roads provided flexibility in travel, allowing vehicles to reach locations not served by rail or air. This flexibility was particularly valuable in densely populated urban areas, where short-distance travel between locations was most efficiently handled by cars, trucks, and buses.

In the post-World War II period, road transport began to dominate in urban centers and became the primary mode of transportation for short to medium distances. Highways and intercity roads were built across the country, facilitating the movement of goods and people between cities and regions. The rise of trucking as a dominant freight transportation method in the mid-20th century further cemented the role of road transport in Canada's economy. Trucks could deliver goods to areas not easily accessible by rail or air, and their flexibility allowed for just-in-time delivery systems that were crucial to modern logistics.

However, despite its flexibility, road transport is burdened by several limitations. The environmental impact of road transport is significant, with cars and trucks accounting for a large portion of Canada's greenhouse gas emissions. The reliance on fossil fuels, traffic congestion, and wear and tear on infrastructure lead to high maintenance costs and environmental degradation. Moreover, road transport's efficiency diminishes over long distances, where rail is more suited to moving large volumes of freight and passengers.



# Comparative Analysis: Why Rail Outperforms Air and Road Transport

The historical development of rail, air, and road transport in Canada reveals a clear pattern: while air and road transport each have their strengths, rail transport consistently emerges as the most efficient and sustainable mode of transportation, particularly for long-distance travel and heavy freight.

## Efficiency

Rail transport has always been the most efficient option for moving large quantities of goods and passengers over long distances. The ability of trains to carry heavy loads at lower operational costs than road or air transport has made it the backbone of freight transport in Canada. For example, a single train can carry the equivalent of hundreds of trucks, reducing congestion on highways and lowering transportation costs for businesses. In contrast, air transport, while faster, is much more expensive and is limited in the amount of cargo it can carry. Road transport, though flexible, becomes inefficient for long-distance travel due to high fuel consumption and infrastructure maintenance costs.

## Environmental Impact

Rail transport, especially with the integration of electrified and hydrogen-powered trains, offers a significant reduction in greenhouse gas emissions. Trains have a lower carbon footprint than planes or trucks, making them a more sustainable option for Canada's future transportation needs. Electrification and hydrogen technologies offer even greater environmental benefits, as they reduce reliance on fossil fuels. Air transport, on the other hand, is a major contributor to carbon emissions, and despite technological advances, remains one of the least sustainable forms of transport. Road transport also contributes heavily to pollution and traffic congestion, particularly in urban areas.

## Capacity and Scalability

The scalability of rail transport is another key advantage over air and road. Rail networks can be expanded to meet the growing demands of freight and passenger travel, and trains can be lengthened or increased in frequency to accommodate more cargo or commuters. In contrast, the expansion of air transport is limited by the high costs of building and maintaining airports, as well as the environmental impact of increasing flights. Road transport, while scalable in theory, faces limitations in the form of traffic congestion, road maintenance, and environmental concerns.



## Accessibility

Rail transport also provides more equitable access to transportation. Public rail systems, particularly in urban areas, offer affordable and reliable transportation options for people of all income levels. This contrasts with air transport, which is often cost-prohibitive for low-income travelers, and road transport, which requires access to personal vehicles or public buses, both of which have their own limitations. Rail systems can connect urban and rural areas more effectively, providing greater mobility and access to jobs and services for all Canadians.

## Conclusion

The historical development of rail, air, and road transport in Canada illustrates that while all three modes of transport have played crucial roles in the country's growth, rail transport has consistently proven to be the most efficient, sustainable, and scalable solution. From its early role in connecting Canada's regions and enabling industrial growth to its current potential in reducing emissions and providing equitable access to transportation, rail remains the backbone of the nation's transport system. As Canada looks to the future, investments in rail infrastructure, particularly in electrification and hydrogen technologies, will be key to ensuring sustainable and inclusive growth. The limitations of air and road transport—such as high operational costs, environmental impact, and limited scalability—reinforce the need to prioritize rail as the most effective long-term transportation solution for Canada.



# Environmental Impact and Sustainability: Why Rail Outperforms Air and Road Transport

The environmental challenges posed by the transportation sector have become increasingly significant in the 21st century, especially with the global push toward reducing greenhouse gas emissions and combating climate change. In Canada, transportation accounts for a substantial portion of the country's total carbon emissions, with road and air transport contributing the largest share. Rail transport, by contrast, offers a far more environmentally sustainable alternative, particularly when supported by technological advancements such as electrification and hydrogen-powered trains. This section explores the environmental impacts of rail, air, and road transport, highlighting why rail emerges as the most sustainable solution for Canada's future transportation needs.

- **Rail Transport: A Low-Carbon Alternative**

Rail transport has long been recognized as one of the most energy-efficient modes of transportation, especially when it comes to moving large volumes of freight and passengers over long distances. Trains, by design, have a much lower energy consumption per ton-mile or per passenger-kilometer compared to road vehicles and aircraft. The key factor contributing to rail's environmental advantage is its ability to carry heavy loads efficiently. A single freight train can replace hundreds of trucks, reducing the need for road traffic and subsequently cutting down emissions.

**Electrification of Rail Networks:** One of the most promising advancements in rail transport is the move toward electrification. Electrified rail lines, which rely on electricity rather than fossil fuels, offer an immediate reduction in greenhouse gas emissions, especially when the electricity comes from renewable sources such as hydro, wind, or solar power. By transitioning to electric trains, Canada can significantly lower its transportation-related emissions, making it a key strategy in the country's goal of achieving net-zero emissions by 2050.

Electrified rail systems have already been implemented successfully in many parts of the world, including Europe and Japan, where they are used for both high-speed passenger trains and freight transport. In Canada, the electrification of key rail corridors, such as those used for intercity travel and freight movement, presents an opportunity to reduce the carbon footprint of transportation without compromising efficiency or capacity.

**Hydrogen-Powered Trains:** Another exciting development in sustainable rail transport is the use of hydrogen as an alternative fuel. Hydrogen-powered trains are seen as a game-changer, particularly for regions where electrification may be too costly or technically challenging. Hydrogen trains use fuel cells to convert hydrogen into electricity, emitting only water vapor as a byproduct. This makes them a zero-emission alternative to diesel-powered trains, which are still prevalent in many parts of Canada.



Hydrogen trains offer a flexible solution for reducing emissions on non-electrified rail lines, particularly in rural or remote areas where the cost of installing electric infrastructure is prohibitive. Additionally, hydrogen can be produced using renewable energy, further enhancing its environmental benefits. As Canada continues to explore green hydrogen production, hydrogen-powered trains could become a critical component of the country's sustainable transport strategy.

- **Air Transport: A Major Source of Emissions**

While air transport plays a crucial role in connecting distant regions and facilitating international trade, it is also one of the most environmentally damaging modes of transportation. Aviation accounts for a significant share of global carbon emissions, and its impact is particularly pronounced in Canada due to the country's reliance on long-distance flights for both domestic and international travel.

**High Fuel Consumption:** The primary environmental challenge with air transport is its high fuel consumption. Aircraft burn large amounts of aviation fuel, a type of kerosene, which releases significant quantities of carbon dioxide (CO<sub>2</sub>) into the atmosphere. Unlike road and rail transport, where electrification is becoming more widespread, aviation has fewer options for reducing its reliance on fossil fuels. Although biofuels and electric aircraft are being researched, their current technological limitations make it unlikely that they will become mainstream in the near future.

**Non-CO<sub>2</sub> Emissions:** In addition to CO<sub>2</sub> emissions, air transport also generates non-CO<sub>2</sub> pollutants, such as nitrogen oxides (NO<sub>x</sub>) and particulate matter, which contribute to the formation of ozone and other harmful pollutants at high altitudes. These non-CO<sub>2</sub> emissions further exacerbate the environmental impact of aviation, as they contribute to global warming and can have long-term effects on climate change.

**Limited Scalability of Electric Aircraft:** While there have been some advances in the development of electric aircraft, they are currently limited to small planes that can carry a handful of passengers over short distances. The energy density of current battery technology is far too low to power large commercial aircraft, which means that electric planes are unlikely to replace conventional aircraft for long-distance travel anytime soon. As a result, air transport remains one of the least sustainable modes of transportation, especially when compared to rail.

- **Road Transport: Flexibility at an Environmental Cost**

Road transport, which includes personal vehicles, buses, and trucks, is the dominant mode of transportation in Canada, accounting for the majority of passenger and freight movement across the country. While road transport offers flexibility and convenience, it is also a significant contributor to Canada's greenhouse gas emissions.



**Heavy Reliance on Fossil Fuels:** The vast majority of vehicles on Canadian roads are powered by internal combustion engines that burn gasoline or diesel, both of which are fossil fuels. This heavy reliance on fossil fuels makes road transport one of the largest sources of CO<sub>2</sub> emissions in the country. Additionally, trucks used for freight transport are responsible for a disproportionate share of road-related emissions due to their size and fuel consumption.

**Traffic Congestion and Idling:** In urban areas, traffic congestion is a major environmental concern. Vehicles stuck in traffic produce emissions even when they are idling, contributing to air pollution and increasing fuel consumption. Congestion also leads to longer travel times, which in turn increases the amount of fuel required for transportation. As Canada's urban centers continue to grow, road transport's environmental impact is likely to worsen unless significant efforts are made to reduce car dependency.

**Electric Vehicles (EVs): A Partial Solution:** One potential solution to the environmental challenges of road transport is the adoption of electric vehicles (EVs). EVs produce zero tailpipe emissions and can help reduce the carbon footprint of road transport when powered by clean energy sources. However, while the use of EVs is growing, they still face challenges related to range, charging infrastructure, and the environmental impact of battery production. Additionally, EVs are primarily suited for personal vehicles, and while there is some progress in developing electric trucks and buses, these are not yet widely available for long-haul freight transport.

- **Comparative Environmental Impact: Rail as the Sustainable Choice**

When comparing the environmental impacts of rail, air, and road transport, it is clear that rail offers the most sustainable option. Electrified and hydrogen-powered trains are far less polluting than planes and trucks, making rail transport the most viable solution for reducing Canada's transportation-related emissions.

**Energy Efficiency:** Rail transport is significantly more energy-efficient than both air and road transport. Trains consume less energy per passenger-kilometer or ton-kilometer, making them the ideal choice for moving large volumes of goods and people over long distances. This efficiency translates directly into lower fuel consumption and reduced emissions, especially when compared to the energy-intensive nature of air travel and long-haul trucking.

**Lower Carbon Footprint:** The carbon footprint of rail transport is already much lower than that of air and road transport, and it will continue to decrease as more rail lines are electrified and hydrogen trains are introduced. In contrast, air and road transport face greater challenges in reducing their reliance on fossil fuels, as electric and hydrogen technologies for these modes are still in their infancy or are not scalable for long-distance travel.



**Potential for Renewable Energy Integration:** One of the key advantages of rail transport is its ability to integrate with renewable energy sources. Electrified rail lines can be powered by clean energy, such as hydro, wind, and solar power, further reducing their environmental impact. Hydrogen-powered trains also offer the potential to run on green hydrogen, produced using renewable energy. This makes rail transport not only more sustainable in the present but also more adaptable to future clean energy advancements.

## **Conclusion**

In terms of environmental sustainability, rail transport outperforms air and road transport by a significant margin. Electrified and hydrogen-powered rail systems offer the most immediate and scalable solutions for reducing greenhouse gas emissions and improving energy efficiency in Canada's transportation sector. While air transport remains necessary for long-distance and international travel, its environmental impact is substantial, and technological advancements are not yet sufficient to make it a sustainable alternative. Road transport, although flexible and convenient, continues to rely heavily on fossil fuels and contributes to traffic congestion and pollution. As Canada looks to build a more sustainable future, investing in rail infrastructure, particularly in electrification and hydrogen technologies, is the most effective way to reduce emissions and meet the country's environmental goals.



# Economic Efficiency: The Cost Advantage of Rail Over Air and Road

The economic efficiency of transportation is a critical factor in determining the long-term viability of any transport mode. Rail, air, and road transport each offer different economic advantages, but the overall cost-effectiveness of rail transport makes it the superior option, particularly for freight and long-distance travel. This section will analyze the economic advantages of rail transport over air and road, integrating insights from the research papers provided, as well as findings from the report previously submitted on rural transportation challenges.

- **Rail Transport: Maximizing Economic Efficiency**

Rail transport has long been considered one of the most cost-effective ways to move goods and people over long distances. Railways are inherently designed to carry large volumes of freight and passengers, which allows them to operate at lower costs per unit compared to air and road transport. The capital investment required for rail infrastructure, although substantial, offers significant returns in terms of long-term savings, lower operational costs, and reduced environmental impact.

**Lower Operational Costs:** Rail transport benefits from economies of scale, especially in freight transportation. A single freight train can carry the equivalent of hundreds of trucks, allowing for significant cost savings in terms of fuel, labor, and vehicle maintenance. Additionally, rail systems are more energy-efficient than both air and road transport. Trains consume less fuel per ton of freight or passenger per kilometer, making them a more sustainable and cost-effective option for large-scale transport.

Electrification and hydrogen technologies further enhance the economic efficiency of rail. Electrified rail lines, which rely on electric power rather than diesel, not only reduce emissions but also lower operational costs by reducing fuel expenses. Hydrogen-powered trains, still in their early stages, hold promise for offering similar economic benefits, particularly in regions where electrification infrastructure is not feasible. The move toward cleaner energy sources in rail transport makes it a more attractive option for governments and businesses seeking long-term cost savings and environmental sustainability.

**Infrastructure Investment and Maintenance:** While the upfront costs of building and maintaining rail infrastructure can be significant, rail systems have a longer lifespan compared to road and air infrastructure. Well-maintained rail lines can last for decades with minimal repairs, whereas roadways and airports require frequent and costly maintenance due to wear and tear from heavy traffic. The investment in rail infrastructure, therefore, provides long-term value, reducing the need for frequent, expensive repairs.

The findings from the report previously submitted highlight the particular importance of rail investment in rural and underserved areas, where road maintenance costs are high due to harsh



environmental conditions and low population density. Poor road conditions in these areas lead to increased transportation costs for local businesses, especially in agriculture and resource industries. By investing in rail infrastructure, governments can reduce these costs and provide a more stable and cost-effective transportation solution for rural communities, stimulating local economic growth.

- **Air Transport: High Costs and Limited Capacity**

Air transport plays a vital role in connecting remote regions and facilitating international trade, but its economic efficiency is limited compared to rail. Air travel is expensive, both for passengers and freight, due to the high operational costs associated with fuel consumption, aircraft maintenance, and airport infrastructure. These costs are further exacerbated by the environmental impact of aviation, as airlines face increasing pressure to reduce their carbon footprint through costly technological innovations.

**Fuel and Maintenance Costs:** Aircraft are fuel-intensive, with fuel costs accounting for a significant portion of airline operating expenses. While air transport is faster than rail for long distances, the higher costs associated with fuel consumption and aircraft maintenance make it less economically viable for bulk freight transportation and domestic travel. Additionally, the maintenance of airports and air traffic control systems adds to the overall cost of air transport, limiting its scalability and accessibility, particularly in rural and underserved regions.

The report previously submitted underscores the challenges of air transport in rural areas. Many remote communities in Canada, particularly in the northern regions, rely on air travel due to the lack of road and rail infrastructure. However, the high cost of air travel makes it unaffordable for many residents, limiting their access to essential services such as healthcare and education. The report emphasizes the need for more cost-effective transportation solutions, suggesting that rail could play a critical role in providing affordable and reliable transport in these underserved areas.

- **Road Transport: Flexibility with High Long-Term Costs**

Road transport is the most flexible mode of transportation, offering door-to-door delivery for passengers and freight. However, the long-term economic costs of road transport are significant, particularly when factoring in maintenance, fuel consumption, and environmental degradation. While road transport is ideal for short distances and last-mile delivery, it becomes increasingly inefficient over long distances, where rail transport excels.

**Fuel Consumption and Congestion:** Road transport, particularly for freight, relies heavily on trucks, which consume large amounts of diesel fuel. This makes road transport highly susceptible to fluctuations in fuel prices, which can significantly impact operational costs. In urban areas, traffic congestion adds to the inefficiency of road transport, increasing travel times and fuel consumption. Trucks, although flexible, are not designed to carry large volumes of goods efficiently over long distances, making them less cost-effective compared to rail. Challenges related to road transport in rural areas, as mentioned in the report previously submitted, highlight the inefficiencies of relying on road systems for long-distance travel and freight movement. Poor road conditions and long travel distances make road transport



inefficient and costly. For industries such as agriculture, which are heavily dependent on road transport, these inefficiencies result in higher transportation costs and reduced profitability. The report advocates for increased investment in rail infrastructure as a more sustainable and cost-effective alternative to road transport in these regions.

**Infrastructure Maintenance:** The maintenance of road infrastructure is a significant economic burden, particularly in regions with harsh weather conditions, such as Canada's northern territories. Roads require frequent repairs due to damage from heavy vehicles, extreme temperatures, and other environmental factors. This constant need for maintenance drives up the long-term costs of road transport, making it less economically viable than rail, which requires less frequent and less expensive repairs.

- **Comparative Analysis: Rail's Economic Superiority**

When comparing the economic efficiency of rail, air, and road transport, it is clear that rail offers the most cost-effective solution, particularly for long-distance travel and bulk freight transportation. Rail's ability to carry large volumes of goods and passengers at lower operational costs, combined with its energy efficiency and reduced need for maintenance, makes it the superior choice for long-term economic growth.

**Cost per Ton-Mile and Passenger-Kilometer:** Rail transport consistently offers the lowest cost per ton-mile and passenger-kilometer compared to air and road transport. Trains can move large quantities of goods and people more efficiently, reducing fuel consumption and labor costs. In contrast, air transport, while faster, is limited by its high fuel consumption and capacity constraints, making it more expensive for bulk transport. Road transport, although flexible, becomes inefficient over long distances due to higher fuel costs and the need for frequent vehicle maintenance.

**Long-Term Economic Benefits:** Investing in rail infrastructure provides long-term economic benefits by reducing transportation costs, increasing efficiency, and stimulating local economies. Rail transport supports industries such as manufacturing, agriculture, and mining by providing reliable and cost-effective access to domestic and international markets. Additionally, rail systems can be integrated with renewable energy sources, further reducing operational costs and enhancing sustainability.

In rural areas, where road transport is often too costly and inefficient, expanding rail networks can reduce transportation costs, improve access to markets, and support economic development in underserved communities.

## **Conclusion**

Rail transport offers clear economic advantages over air and road, especially for long-distance travel and bulk freight. Its cost-effectiveness, lower fuel consumption, reduced maintenance, and scalability make it the best choice for Canada's future transportation strategy. While air is vital for international travel, it's costly and limited, and road transport is flexible but burdened by high fuel and maintenance expenses. Prioritizing rail infrastructure, particularly in rural areas, can reduce costs, stimulate economic growth, and support sustainable development.



# Equity and Accessibility: Rail as the Most Inclusive Mode of Transport

Equity and accessibility are central to creating transportation systems that support all members of society, particularly in rural and underserved areas where access to essential services, jobs, and social inclusion is often limited. In Canada, rural communities face unique challenges due to geographic isolation, low population density, and underdeveloped infrastructure. Among the available modes of transportation—rail, air, and road—rail transport offers the most equitable and accessible solution, particularly for connecting underserved areas to essential services and economic opportunities.

This section will explore how rail transport outperforms air and road in promoting accessibility and equity, with a focus on rural and underserved regions. Insights from previous research and the findings from the report previously submitted will be integrated to demonstrate the critical role of rail in ensuring transportation equity.

- **Challenges in Rural and Underserved Areas**

Rural and underserved areas across Canada face a set of transportation challenges that significantly impact their residents. The lack of accessible and affordable transportation in these regions limits access to employment, healthcare, education, and social services. Key barriers identified in rural areas include geographic isolation, economic constraints, and limited public transportation infrastructure. These challenges disproportionately affect vulnerable populations, including the elderly, low-income families, and Indigenous communities.

**Geographic and Environmental Barriers:** Many rural communities are spread across vast distances, with rough terrain and harsh weather conditions that complicate the construction and maintenance of transportation infrastructure. In regions like Northern Ontario and the Yukon, poor road conditions and limited public transit options mean that residents face long travel times to access basic services. Winter weather further exacerbates these challenges, often rendering roads impassable for extended periods. Rail, however, offers a more reliable solution, with the ability to operate in harsh climates and over long distances without the need for extensive road maintenance.

**Economic Constraints:** The economic viability of transportation projects in rural areas is hindered by low population density and limited economic activity. These areas often struggle to attract investment for infrastructure development, as the cost per capita of building and maintaining roads and transit systems is higher than in urban centers. As a result, rural residents often rely on outdated or inadequate transportation options. The report previously submitted highlighted the cycle of underdevelopment in these areas, where poor transportation options limit economic growth, which in turn hinders further infrastructure development.

**Vulnerable Populations:** Vulnerable populations, such as the elderly, individuals with disabilities, and low-income families, are particularly disadvantaged by the lack of



transportation infrastructure in rural areas. Without access to reliable public transport, these groups face social isolation and are often unable to access essential services like healthcare, education, and employment. Indigenous communities, especially those located in remote northern regions, face significant transportation barriers, which exacerbate existing inequities in terms of access to services and economic opportunities.

- **Rail Transport: Addressing Accessibility in Rural Areas**

Rail transport has a unique capacity to address the accessibility challenges faced by rural and underserved communities. Railways can connect distant regions, providing reliable and affordable transportation that is less vulnerable to the environmental and logistical challenges that affect road and air transport. For rural areas, rail offers a lifeline to essential services, economic markets, and opportunities for social inclusion.

**Connecting Isolated Communities:** One of the greatest advantages of rail transport is its ability to connect isolated and remote communities to larger urban centers. For many rural residents, traveling by road is impractical due to poor infrastructure, and air travel is prohibitively expensive. Rail, however, provides a cost-effective alternative, allowing residents of underserved areas to access healthcare, education, and employment opportunities that would otherwise be out of reach.

Rail lines can be extended into remote regions, providing consistent and reliable service even in challenging terrains and climates. In Northern Canada, for example, rail can offer a viable year-round alternative to winter ice roads, which are becoming increasingly unreliable due to climate change. In the past, communities like Moosonee in Northern Ontario, which is accessible only by train or air, have benefited from rail connectivity that provides consistent access to the rest of the province.

**Affordable Public Transport:** Rail transport can also serve as a more affordable mode of transportation for low-income and vulnerable populations. Public rail systems in rural areas can offer subsidized fares or discounted tickets, ensuring that transportation remains accessible to all residents, regardless of income level. In contrast, air travel is often too expensive for low-income families, and road transport requires access to a personal vehicle, which is not feasible for many rural residents. By expanding rural rail networks and investing in affordable public rail services, governments can ensure that transportation equity is achieved in underserved areas. The report previously submitted emphasized that rural communities often lack reliable public transportation, which disproportionately affects vulnerable populations. Rail systems can help fill this gap by providing affordable, reliable, and accessible transportation that meets the needs of all residents, particularly those who cannot afford private vehicles or air travel.

**Providing Access to Jobs and Services:** Rail transport also plays a critical role in providing access to employment opportunities and essential services in rural areas. Reliable transportation is key to economic mobility, as it allows individuals to travel to job centers, schools, and healthcare facilities. For many rural residents, the absence of public transportation severely limits their ability to participate in the labor market or access social services. Rail, with its capacity to move



large numbers of people efficiently, can help bridge this gap by providing regular service to urban centers and major job markets.

The economic impact of improved transportation on rural communities cannot be overstated. By connecting residents to larger cities, rail transport can stimulate local economies by making it easier for businesses to transport goods and for workers to access jobs. In addition, the development of rail infrastructure in rural areas can create new employment opportunities in the construction, maintenance, and operation of the rail network itself.

- **Rail vs. Road and Air Transport in Underserved Areas**

When comparing the accessibility provided by rail, road, and air transport, it becomes clear that rail offers the most equitable and sustainable solution for rural and underserved areas. Road and air transport, while important, fall short in terms of affordability, reliability, and accessibility for vulnerable populations.

**Road Transport: Limited Accessibility for Vulnerable Populations:** Road transport is the most widely used form of transportation in rural areas, but it presents significant challenges for low-income residents and those without access to personal vehicles. In many rural communities, public bus services are either limited or non-existent, leaving residents dependent on cars to travel long distances. For those without access to a vehicle, this lack of public transportation results in social isolation and limited economic mobility. Additionally, road maintenance in rural areas is expensive and difficult to sustain, particularly in regions with harsh climates that require frequent repairs.

In the report previously submitted, the reliance on road transport in rural areas was identified as a key barrier to transportation equity. Without sufficient public transportation options, many residents are forced to rely on costly and inefficient private transport, further exacerbating income inequality and limiting access to services.

**Air Transport: High Costs and Limited Reach:** Air transport is vital for connecting remote regions, particularly in Canada's northern territories, but it is not a viable solution for the majority of rural residents. Air travel is prohibitively expensive for low-income families and often does not offer frequent enough service to be a reliable mode of transportation for accessing everyday services. Moreover, air infrastructure, such as airports and air traffic control systems, requires substantial investment and is not practical for many rural areas with smaller populations.

The report previously submitted highlighted the prohibitive costs of air travel in rural communities, noting that many residents cannot afford regular flights to access healthcare or employment opportunities. Rail, by contrast, provides a more affordable and consistent service, particularly when public rail systems are subsidized to ensure accessibility for all income levels.

- **Policy Recommendations for Improving Rural Rail Accessibility**

To address the transportation inequities faced by rural and underserved communities, there is a need for targeted policies and investments that prioritize the expansion of rail networks and the



development of affordable public rail services. Governments at all levels must work together to ensure that rural residents have access to reliable, affordable, and efficient transportation that meets their needs.

**Investment in Rail Infrastructure:** The expansion of rail infrastructure into rural and remote regions is critical to improving accessibility and equity in transportation. This includes the construction of new rail lines to connect underserved areas with larger urban centers, as well as the modernization of existing rail networks to ensure they are equipped with the latest technologies, such as electrification and hydrogen-powered trains. Governments should prioritize investments in rail infrastructure, particularly in areas where road maintenance and air travel are not feasible options.

**Subsidized Public Rail Services:** To ensure that rail transport remains affordable and accessible for all residents, governments should implement subsidized public rail services in rural areas. Subsidies can help reduce ticket prices for low-income families, seniors, and individuals with disabilities, ensuring that transportation is available to all, regardless of economic status. These subsidies can be funded through public-private partnerships or government grants, with a focus on making rail transport a viable alternative to more costly and less reliable modes of transportation.

**Integration with Other Transport Modes:** To maximize the impact of rail transport, it should be integrated with other transportation modes, such as bus services and ride-sharing programs. This multimodal approach ensures that residents in even the most remote areas can access rail networks, providing first- and last-mile connectivity for those who live far from train stations. Local governments can collaborate with private companies to develop integrated transport systems that meet the unique needs of rural communities.

**Community Engagement in Transportation Planning:** Engaging rural communities in the planning and development of transportation infrastructure is essential to ensure that the solutions implemented reflect the needs of local residents. Public consultations, town halls, and surveys can help gather input from community members, allowing policymakers to tailor transportation solutions to the specific challenges of each region. By involving communities in the decision-making process, governments can build support for rail projects and ensure that transportation systems are designed with accessibility and equity in mind.

## **Conclusion**

Rail transport offers the most inclusive and equitable solution for rural and underserved areas in Canada. By connecting isolated communities, providing affordable transit, and improving access to services, rail can significantly improve rural lives. Unlike costly and limited road and air transport, rail is a sustainable and cost-effective option that bridges the urban-rural gap. Targeted investments in rail infrastructure and services are essential to ensure all Canadians have access to opportunities and services, regardless of location.



## Policy Implications: Reviving Passenger Rail and its Broader Impact

The re-establishment of passenger rail services between Calgary and Edmonton, Alberta—discontinued 38 years ago—has become a focal point in discussions about sustainable and equitable transportation in Canada. The absence of this vital service has limited transportation options for many residents, particularly those without access to private vehicles, and has strained road infrastructure between the two cities. Meanwhile, comparisons can be drawn with Montana in the United States, where efforts to improve rail services for both rural and tribal communities offer insights into the broader implications of passenger rail services on social inclusion, environmental sustainability, and economic growth.

This section will explore the policy implications of reviving the Calgary-Edmonton passenger rail line, contrasting the situation with Montana and its tribal communities, and analyzing how such a move could align with broader transportation goals in Canada.

- **The End of Passenger Rail Between Calgary and Edmonton**

Passenger rail services between Calgary and Edmonton, two of Alberta's most populous cities, were discontinued in 1985. The service, operated by Via Rail, was deemed financially unsustainable due to low ridership and competition from road and air transport. Since the cessation of this service, residents have relied heavily on personal vehicles and buses to travel between the cities, a shift that has strained the highway infrastructure and contributed to increased emissions and congestion along the primary route, Highway 2.

The lack of rail connectivity between Calgary and Edmonton represents a significant gap in Alberta's transportation network, particularly in light of the economic, environmental, and social benefits that rail transport can offer. Reintroducing passenger rail between these cities would not only provide an environmentally sustainable alternative to car and bus travel but would also enhance accessibility for vulnerable populations, including seniors, students, and low-income residents who may not have access to private vehicles.

**Current Road and Air Reliance:** Highway 2, the primary road connecting Calgary and Edmonton, is heavily trafficked and often congested, especially during peak travel times. The reliance on road transport has led to increased emissions and contributed to Alberta's carbon footprint. Furthermore, frequent long-distance driving between the cities results in higher risks of accidents, vehicle wear and tear, and additional costs for drivers.

Air transport, while faster, is not an affordable option for many residents. The relatively short distance between the two cities makes air travel less practical and environmentally friendly, especially when alternatives like rail could offer a more efficient and lower-emission solution. Moreover, air travel primarily caters to business travelers and those who can afford the higher costs, leaving a gap for other passengers who would benefit from affordable public transportation.



- **Comparing Calgary-Edmonton to Montana's Rail Services**

The situation in Alberta can be compared to Montana, where the state's rural and tribal communities have been pushing for improved rail services to address transportation inequities. Montana is a predominantly rural state, with many of its tribal communities located in remote areas where access to public transportation is limited. In response to these challenges, there have been efforts to restore and enhance rail services, particularly to serve underserved and marginalized populations.

**Tribal Communities in Montana:** Montana's tribal communities, including the Blackfeet Nation, the Crow, and the Northern Cheyenne, have historically faced significant transportation challenges. These communities are often geographically isolated, making access to healthcare, education, and employment difficult. The restoration of passenger rail services, particularly through the Empire Builder route, has been seen as a potential solution to improve connectivity for these communities, enabling them to travel more easily to urban centers such as Great Falls, Billings, and Missoula.

In 2021, the Big Sky Passenger Rail Authority was established to explore the restoration of rail services across Montana's southern corridor. This initiative, driven by local governments and tribal leaders, aims to provide equitable access to transportation, reduce reliance on personal vehicles, and promote economic development in rural and tribal areas. The restoration of rail services is also seen as a way to reduce the environmental impact of road transport, a critical concern for communities that are deeply connected to the land.

**Policy Lessons for Alberta:** The policy efforts in Montana offer valuable lessons for Alberta, where the reintroduction of passenger rail services between Calgary and Edmonton could have similarly positive effects. In Montana, rail services are viewed not only as a means of transportation but as a tool for fostering social inclusion, environmental sustainability, and economic growth in underserved regions. This perspective could be applied to Alberta, where rural and Indigenous communities between Calgary and Edmonton could benefit from improved rail connectivity.

By examining the push for rail services in Montana, Alberta can explore similar models of collaboration between provincial governments, Indigenous groups, and local communities to advocate for transportation equity. The potential for rail services to promote economic development, particularly in industries such as tourism and local businesses, aligns with Alberta's broader goals of diversification and sustainable growth.

- **Environmental and Economic Implications**

Reintroducing passenger rail services between Calgary and Edmonton has clear environmental and economic implications that align with Canada's commitment to reducing greenhouse gas emissions and promoting sustainable transportation solutions.

**Environmental Benefits:** Rail transport is widely recognized as one of the most environmentally friendly modes of transportation, particularly when compared to cars and airplanes. Electrified rail systems, in particular, offer significant reductions in greenhouse gas emissions, as they can



be powered by renewable energy sources such as hydroelectricity. For a province like Alberta, which is transitioning towards greener energy, the adoption of electric trains would be a forward-looking solution that complements existing efforts to reduce carbon emissions. Reintroducing rail between Calgary and Edmonton would also help alleviate road congestion along Highway 2, reducing the number of vehicles on the road and lowering the province's overall carbon footprint. In Montana, advocates for restoring passenger rail have similarly highlighted the environmental benefits of reducing car dependency, particularly in rural areas where driving long distances is often the only viable option. By shifting more travelers to rail, both Alberta and Montana can make meaningful progress toward achieving their environmental goals.

**Economic Growth and Job Creation:** Restoring passenger rail services in Alberta could stimulate economic growth by creating jobs in construction, rail operations, and maintenance. The development of rail infrastructure would require significant investment, which in turn would generate employment opportunities in both urban and rural areas. Additionally, improved rail connectivity could promote tourism between Calgary and Edmonton, as well as support the movement of workers and goods between the cities.

In Montana, efforts to restore rail services have been tied to economic revitalization, particularly in rural and tribal communities. Improved rail connectivity can attract visitors to cultural and historical sites, boost local businesses, and provide residents with greater access to employment opportunities in neighboring towns and cities. Similar economic benefits could be realized in Alberta, where the Calgary-Edmonton corridor is a key economic hub for the province.

- **Transportation Equity and Social Inclusion**

Reestablishing passenger rail services between Calgary and Edmonton would also have important social and equity-related benefits, particularly for those who currently face barriers to accessing affordable transportation. In Montana, tribal communities have been at the forefront of advocacy efforts for improved rail services, recognizing that transportation is a critical factor in achieving social inclusion and economic mobility.

**Improved Access for Vulnerable Populations:** In Alberta, vulnerable populations—including low-income families, seniors, and people with disabilities—are often disproportionately affected by the lack of accessible transportation options. The reliance on cars and buses means that those without private vehicles or those who cannot afford frequent bus tickets are left with few alternatives for traveling between Calgary and Edmonton. By reintroducing rail services, the government can provide an affordable and accessible mode of transportation that meets the needs of all residents, regardless of income or mobility.

In Montana, the restoration of rail services is seen as a means of addressing similar transportation inequities, particularly in rural and tribal communities. Improved rail connectivity can help reduce social isolation, provide access to essential services such as healthcare and education, and promote economic mobility by connecting residents to job opportunities in



urban centers. Alberta could similarly benefit from a more inclusive transportation system that addresses the needs of underserved populations.

**Indigenous Engagement and Collaboration:** Both Alberta and Montana have significant Indigenous populations who would benefit from improved rail services. In Montana, Indigenous leaders have been active participants in the discussions surrounding the restoration of rail services, recognizing the potential for rail to improve access to services and support cultural preservation through enhanced tourism. Alberta could follow a similar model by engaging Indigenous communities in the planning and implementation of passenger rail services, ensuring that their transportation needs and cultural priorities are incorporated into the project.

Collaborating with Indigenous communities on transportation projects also aligns with Canada's broader goals of reconciliation and Indigenous empowerment. By involving Indigenous leaders in the decision-making process, Alberta can ensure that the restored rail services meet the unique needs of these communities and contribute to long-term social and economic development.

- **Policy Recommendations for Alberta**

To successfully reintroduce passenger rail services between Calgary and Edmonton, Alberta's government will need to develop policies that prioritize sustainable transportation, social inclusion, and collaboration with key stakeholders. Based on the lessons learned from Montana's rail efforts, the following policy recommendations are proposed:

- **Prioritize Rail as a Sustainable Transportation Solution:** Alberta should prioritize the reintroduction of passenger rail services as part of its broader efforts to reduce greenhouse gas emissions and promote sustainable transportation. Electrified rail systems should be considered to ensure long-term environmental benefits.
- **Collaborate with Local and Indigenous Communities:** Engaging with local governments, Indigenous communities, and other stakeholders is essential to ensure that the restored rail services meet the needs of all residents. Collaborative planning can help create a transportation system that promotes equity, inclusion, and economic development.
- **Invest in Rail Infrastructure:** Significant investment in rail infrastructure will be required to reestablish the Calgary-Edmonton rail line. This investment should be viewed not only as a transportation project but as an opportunity to stimulate economic growth, create jobs, and support the province's transition to a greener economy.
- **Ensure Affordable and Accessible Rail Services:**  
To maximize the social impact of the restored rail services, Alberta's government should ensure that ticket prices are affordable for all residents, particularly vulnerable populations such as low-income families, seniors, and individuals with disabilities. Subsidized fare programs or discounted tickets could be implemented to make rail travel an equitable and viable option for those who might otherwise



be excluded. This will help ensure that rail transport serves as an inclusive public service, not just a convenience for those who can afford it.

- **Integrate Rail with Other Modes of Transport:**

To ensure the rail service's effectiveness, it should be integrated with other modes of public transportation. This multimodal approach—linking rail with local bus services, bike-sharing systems, and ride-sharing programs—would make the passenger rail service more accessible and convenient for residents. In rural and Indigenous communities, where access to public transport is particularly limited, first- and last-mile solutions are crucial to connecting people to the main rail network.

## **Conclusion**

Reintroducing passenger rail services between Calgary and Edmonton, Alberta, after 38 years is not just a transportation initiative—it's a critical step toward promoting environmental sustainability, economic development, and social inclusion in the province. The comparison with Montana and its tribal communities shows the potential for passenger rail to address long-standing transportation inequities, particularly in rural and underserved areas. Alberta can learn from Montana's collaborative approach to restoring rail services, engaging local governments, Indigenous communities, and other stakeholders to create a transportation system that meets the diverse needs of its residents.

By prioritizing rail as a sustainable transportation option, investing in modern rail infrastructure, and ensuring that rail services are affordable and accessible to all, Alberta can create a more equitable and environmentally friendly transportation network. The restoration of passenger rail between Calgary and Edmonton would not only benefit commuters but also stimulate economic growth, reduce emissions, and improve access to essential services for vulnerable populations. The lessons from Montana's tribal communities demonstrate that rail services can be a powerful tool for fostering social inclusion and promoting economic mobility, providing a model for Alberta's rail future.



## Conclusion

Throughout this report, we have explored various transportation initiatives and challenges across different regions, examining case studies and policies from Ontario, Montana, and broader rural communities in Canada. Drawing connections between these examples and the reintroduction of passenger rail between Calgary and Edmonton offers a holistic view of how Alberta can learn from both national and international experiences to create a more sustainable, accessible, and equitable transportation system.

### **Lessons from Ontario:**

Ontario's ongoing debate between hydrogen-powered and electrified rail systems provides valuable insights for Alberta. Ontario's exploration of these two technologies has demonstrated that both offer significant environmental benefits over traditional road and air transport. However, Alberta must carefully evaluate which option—hydrogen's flexibility and cost-effectiveness or electrification's long-term sustainability—best suits the province's geographic and economic landscape. Both technologies offer the potential to reduce emissions, a crucial step for Alberta as it looks to modernize its transportation network.

### **Montana and Tribal Communities:**

Montana's push to restore rail services for its rural and tribal communities highlights the importance of equity in transportation. Like Montana's tribal regions, Alberta's rural and underserved communities face significant barriers to accessing essential services due to inadequate transportation infrastructure. Montana's efforts to collaborate with local governments and Indigenous groups provide a useful model for Alberta as it seeks to engage its own rural and Indigenous populations in the planning and implementation of new rail services. The reintroduction of passenger rail between Calgary and Edmonton could be a catalyst for social inclusion and economic growth, ensuring that all Albertans benefit from improved connectivity.

### **Comparisons to Broader Rural Initiatives in Canada:**

Rural and underserved areas across Canada have long struggled with transportation inequities. As outlined in the report previously submitted, these challenges are particularly acute in regions with limited public transport options. Alberta's rural communities, much like those in other provinces, stand to benefit immensely from improved rail connectivity, which would provide a reliable, affordable, and environmentally sustainable alternative to private vehicles and expensive air travel. By prioritizing rail as a core component of its transportation strategy, Alberta can address long-standing issues of isolation and economic stagnation in its rural regions.

### **The Calgary-Edmonton Rail as a Catalyst for Broader Change:**

Reintroducing passenger rail between Calgary and Edmonton is not merely about reconnecting two major urban centers; it represents a broader shift towards sustainable transportation in Alberta. Lessons from Ontario's rail technology debate, Montana's focus on transportation equity, and Canada's national efforts to enhance rural connectivity all point to the



transformative potential of rail transport. Alberta has the opportunity to create a transportation network that reduces emissions, promotes economic mobility, and ensures that residents in both urban and rural areas have access to the services and opportunities they need.

**Policy Recommendations and Moving Forward:**

- **Adopt Sustainable Rail Technologies:** Alberta should carefully evaluate both hydrogen and electrification options to determine the most suitable technology for its passenger rail services. The province should prioritize long-term environmental sustainability while considering the immediate feasibility of implementing these systems.
- **Engage Rural and Indigenous Communities:** Just as Montana has engaged its tribal communities, Alberta must collaborate with local and Indigenous populations to ensure that the new rail service benefits all residents, particularly those in rural and underserved areas.
- **Focus on Affordability and Accessibility:** To promote social equity, the reintroduced rail service must be affordable and accessible to all Albertans. The government should consider fare subsidies for low-income populations and ensure that the rail service integrates with other modes of transport, such as buses or ride-sharing services, to provide first- and last-mile connectivity.
- **Commit to Long-Term Investment in Rail Infrastructure:** Significant investment will be required to build the necessary infrastructure to support modern, sustainable rail services. This investment will yield long-term economic benefits by creating jobs, reducing road congestion, and promoting tourism and commerce between Calgary and Edmonton.

**Final Thoughts:** By drawing on lessons from Ontario, Montana, and rural Canada, Alberta can ensure that the reintroduction of passenger rail between Calgary and Edmonton becomes a symbol of progress for the province. This project has the potential to reduce emissions, boost economic growth, and address transportation inequities, particularly in rural and underserved areas. Alberta's government must now take decisive action, implementing policies that prioritize sustainability, accessibility, and collaboration with local stakeholders to create a transportation network that benefits all Albertans.

The decisions Alberta makes today regarding rail technology, infrastructure investment, and social inclusion will shape the province's transportation landscape for decades to come. By reintroducing passenger rail, Alberta can take a bold step toward building a more connected, inclusive, and sustainable future.



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