

## CREATING CLIMATE RESILIENT RESOURCE ROADS: ADAPTING TO CLIMATE CHANGE

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### Introduction

The planning, construction and maintenance of resource roads are required in support of various industrial and resource management activities and are often the primary access for remote communities and public recreational experiences. Given the significance of resource roads, efforts are required to understand the implications of climate change in order to adapt roads and infrastructure to the potential impacts of these forecasted changes.

This is the first Info Note in a series of five focused on the key issues of creating climate resilient resource roads.

### Needs and challenges

Climate change is anticipated to have important impacts on the forest sector in Canada principally as a result of forecasted changes in temperature and precipitation patterns. The degree of projected change varies considerably, but a few common changes include:

- Earlier onset of spring conditions
- More frequent mid-winter thaws
- Increase of high-intensity, short duration rainfall events

The changing precipitation patterns and temperature regimes associated with climate change are expected to impact resource roads in ways that will affect the performance of the infrastructure. Increased flooding, landslides and erosion can adversely impact the function or service life of roads and infrastructure while more frequent mid-winter thaws and rain-on-snow events, for example, will have a broader impact on operational planning and required road construction standards. Resource road managers need to understand climate change conditions and implications to resource road infrastructure in their region. Then will they be able to determine adaptation methods to create climate change resilient resource roads.

### Understanding adaptation

Adaptation refers to any action that reduces the negative impacts and the vulnerability of resource roads and infrastructure to climate change. Adaptation includes any administrative, policy, standards, planning, design, maintenance or construction activity that is implemented to address projected changes in the climate.

Implementing adaptation practices does not necessarily require significant changes to resource road management practices. There are many current practices that ensure resource roads function to required service levels that may be considered as climate change adaptation practices. For example, effective erosion control and slope stabilization practices are already common best management practices.

However, there are adaptation practices that will require more significant changes to current approaches under certain climate forecasts. Milder winters and increased rain-on-snow events are expected in some regions of Canada which could reduce the use of winter-only roads, and will require significant adaptations in road construction and maintenance techniques to allow continued road use.

## Understanding resiliency

Through the implementation of climate change adaptation practices, a resilient resource road infrastructure and network system can be created. In this case, resiliency refers to the capacity of the roads to withstand disruption and disturbances, and to adapt to changing conditions over time.

A key element to consider for resource road resiliency is that the intent is not to create infrastructure that is resistant to all hazards. Rather, it is to create an infrastructure with the capacity to respond and adapt to climate change events while reducing the severity of damage.

## Adaptation strategies

The approaches for adaptation can be broadly categorized into proactive and reactive adaptation strategies and both may be considered as planned approaches to adaptation. The decision about which adaptation strategy to implement requires that the benefits from the strategy outweigh the potential cost of climate change-induced damages and the costs of implementing the strategy.

Proactive adaptation, also known as anticipatory adaptation, maintains the infrastructure to its designed performance levels before deterioration occurs. This approach may be a challenge to implement as an upfront investment in planning, forecasting and maintenance or construction is required.

Proactive adaptation requires that current operational practices be carefully analyzed and assessed for their effectiveness under a changing climate.

Reactive adaptation, also known as event-based adaptation or a “wait and see” approach, wherein management responses occur after the structure has been damaged or destroyed, or its performance degraded. The risk inherent with this approach is that the performance levels of the road are permitted to decrease, possibly below operational and safety thresholds for a period of time.

A reactive adaptation approach can be costly as the need for maintenance interventions are unplanned and, therefore, can have a significant negative effect on budgeting. It is critical that the infrastructure is rebuilt to a higher performance standard following any damage that is incurred. Building to a higher standard will help ensure that improved resiliency is achieved for future events.

## Summary

This Info Note is part of a series of short reports focused on the key issues of creating climate resilient resource roads. The series includes the following reports:

1. Adapting to climate change
2. Planning and construction
3. Water management
4. Water crossings
5. Road maintenance

For further information, please consult the following publication, Partington, M. Bradley, A.H., Durand-Jezequel, M., Forrester, A. (2017). *Adapting Resource Road Infrastructure to Climate Change* (Technical Report 61). Pointe-Claire, Quebec: FPInnovations.