

Chignecto Isthmus to cost \$190-300+-Million

A transportation study has recommended three options to help preserve the flow of goods and services across the Chignecto Isthmus between New Brunswick and Nova Scotia. The cost of each option ranges from about \$190 million to more than \$300 million

The options outlined in the study are: raising the existing dikes; building new dikes and raising the existing dikes and installing steel sheet pile walls at select locations. About \$35 billion in trade is conducted via the Chignecto Isthmus each year.

"We now have three well-considered options for protecting the critical transportation infrastructure on the Chignecto Isthmus, as well as agricultural land and, most importantly, local communities," said Nova Scotia Public Works Minister Kim Masland. "This study will help guide

our decisions."

"Work on the Chignecto Isthmus Climate Change Adaptation Engineering and Feasibility Study started in 2018, and collaboration between New Brunswick, Nova Scotia and the federal government was key to ensuring this vital economic link between both provinces remains protected," said New Brunswick Transportation and Infrastructure Minister Jill Green. "Not only will this ensure the continuation of the trade corridor, but it should provide additional protection for residents in Sackville and surrounding areas."

The two provinces will decide on a course of action after discussing these options with the federal government. The cost of each option ranges from about \$190 million to more than \$300 million.

Situated in the Upper Bay of Fundy, in eastern Canada, the Chignecto Isthmus refers to the narrow strip of land that physically connects the Maritime Provinces of New Brunswick and Nova Scotia. This land bridge is approximately 21 kilometres (km) wide and separates the waters of the Bay of Fundy from those of the Northumberland Strait (Figure ES.1). The Isthmus landscape contains private lands including numerous land trusts, conservation organizations, and Rights Holders, agriculture, and forestry. The Chignecto Isthmus also houses critical transportation and utility infrastructure and serves as a major conduit and trade corridor. The estimated value of goods and services through the corridor, inclusive of revenues generated by in-corridor economic activity, is approximately \$35 billion per annum.

Throughout the Isthmus and Trade Corridor area, protection from the high energy and tides of the Bay of Fundy is primarily provided by historic earthen dykes originally constructed in the 1600s to assist in the development of farmland. The combination of effects by climate change, such as sea-level-rise and increased severity of weather events, with land subsidence have left the Chignecto Isthmus particularly vulnerable, given the area is only slightly above sea level. Presently, the historic earthen dykes along with their re-habilitation conducted in the 1950s protect the coastline: without the current protection provided by the existing earthen dykes, much of the Isthmus would be inundated by today's sea levels resulting in significant negative socio-economic impacts locally, regionally and even nationally. Induced Sea Level Rise (SLR) and coastal subsidence is forecasted to threaten a large portion of the coastal infrastructure in Atlantic Canada before the year 2100. The current Chignecto Isthmus dykes are at risk along with the various Trade Corridor infrastructure components they protect such as: TransCanada Highway, CN Rail, 138 kV and 345 kV electrical transmission lines, fibre-optical cables, a wind farm, agricultural cropland activities and various other utilities. While there have been several studies on the impacts of climate change and rising sea levels, up until this Study, there had not been an engineering analysis assessing the feasibility of potential options to provide protection to the existing transportation network and infrastructure.

Key directives specified by the PSC included: • An elevation of required protection from extreme water levels in the estuary at 10.6 m CGVD2013 (11.2 m CGVD1928) was adopted for the purpose of this study. Throughout the report and associated figures, the geodetic reference is inferred to be CGVD2013, unless otherwise stated. Similarly, the design level of protection of a given Option is inferred to be 10.6 m. • The water level in the estuary is the combined result of tide, storm surge and projected SLR. Sackville Amherst Moncton Sussex New Brunswick Nova Scotia PEI Northumberland Strait Bay of Fundy Chignecto Isthmus Chignecto Isthmus Climate Change Adaptation Comprehensive Engineering and Feasibility Study 2 • Hydrological modeling and protection of the Trade Corridor from inland flooding are excluded from the scope of work for this study. • The dyke and aboiteaux concept, in part or in whole, will form part of one, or all solutions. • The study should provide viable and resilient engineered solutions, using a climate change adaptation lens. • Projected costs for the 3 Options identified should be estimated to +/- 25%.

Option A - Raise Existing Dykes: Raise existing dykes, as required, to 10.6 m to protect the Trade Corridor (highways, railway, bridges, etc.). Existing infrastructure

to remain at present elevation. Where required, existing dykes will be connected by new alignments. Water level control structures required downstream of existing bridges. Raise Existing Dyke Cost \$200.2M - Annual Operating Cost - \$7.31M

Options B - Build New Dykes: A new dyke system to be constructed to 10.6 m to protect Trade Corridor (highways, railway, bridges, etc.) on inland (TCH) side of existing alignment, (approximate alignment location to be determined). Existing infrastructure will remain at current elevation. Water level control structures required downstream of existing bridges. Cost: \$189.2M - Annual Operating Cost - \$6.90M

Option C - Raise Existing Dykes + Steel Sheet Pile: Raise existing dykes along existing alignment, as required, to 10.6 m to protect Trade Corridor (highways, railway, bridges, etc.). Install approximately 800 m of Steel Sheet Pile (SSP) walls at selection locations. Where required, existing dykes will be connected by new alignments. Water level control structures required downstream of existing bridges. Raise Existing Dyke + SSP Cost: \$300.8M - Annual Operating Cost - \$10.98M

This analysis employed an amortization period of 30 years and an interest rate of 3.5% to determine a future annual payment stream and adding the annual operating cost yields a total annual cost.

Additional Resources: Chignecto Isthmus Climate Change Adaptation Engineering and Feasibility Study: <https://novascotia.ca/tran/publications/>

Executive summary of the report can be found at: <https://novascotia.ca/tran/publications/>



As shown, Option A (white line) follows the existing dyke alignment and crosses the Tantramar River at the mouth of the Bay of Fundy. Reconnection of the existing dyke alignment occurs east of the Tantramar Marsh and continues to the termination point near Fenton Road. This option would require the construction of a large water control structure.



Option B (white line) would include construction of new dykes on the landward side, generally following the existing dyke alignment. The dyke would start south of Sackville and follow existing dyke alignment up to the mouth of the Tantramar River.

This option would require the construction of a large water control structure and connect to the existing dyke alignment on the east side of the Tantramar marsh before continuing to the termination point near Fenton Road.



As shown above, Option C (white line) provides a similar construction to Option A with the exception of a new SSP wall, approximately 800 m in length, from the new aboiteaux structure through Tantramar Marsh to Aulac River. A new dyke will be constructed to tie into the existing dyke, which continues to the termination point near Fenton Road.

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