OFFICE OF THE PARLIAMENTARY BUDGET OFFICER
BUREAU DU DIRECTEUR PARLEMENTAIRE DU BUDGET

First Nations School Infrastructure Funding Requirements: British Columbia

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Key Points of this Note:

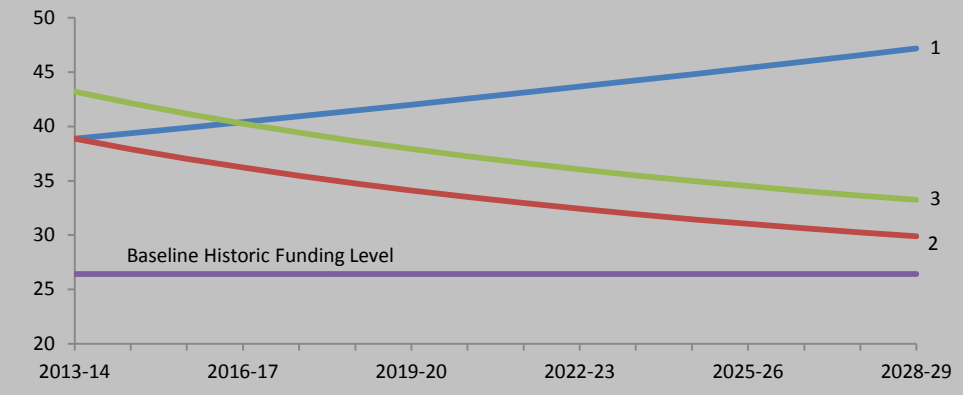
- The mandate of the Parliamentary Budget Officer (PBO) is to provide independent analysis to Parliament on the state of the nation's finances, the government's estimates and trends in the Canadian economy and, upon request from a committee or parliamentarian, to estimate the financial expenditure of any proposal for matters over which Parliament has jurisdiction.

- This report responds to a request of the member for Nanaimo-Cowichan to follow-up on a 2009 PBO report, using new data to estimate the costs of First Nations K-12 educational infrastructure in British Columbia. This report uses information from Aboriginal Affairs and Northern Development Canada and a survey conducted by the First Nations Education Steering Committee and the PBO.

- Baseline federal funding for First Nations school infrastructure in British Columbia is $26 million. The PBO estimates that sustaining the current footprint of First Nations school infrastructure in British Columbia would require $39 million in 2013-14.

- The future funding requirement is anticipated to increase in real terms at the annual rate of student population growth, reaching $47 million by 2028-29 (line 1). Should school capacity utilization (*i.e.* floor space per student) converge to rates comparable to schools operated under the B.C. Ministry of Education, the funding requirement *could* decline to $30 million by 2028-29 (line 2). However, this requires a change in approach to management and funding. Estimated investments of $4 million per year would reduce the average age of First Nations schools to ages comparable to B.C. Ministry of Education schools by 2028-29 (line 3).

First Nations School Infrastructure Funding Requirements in British Columbia



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* The author thanks Jessica Strauss, officials from the First Nations Educational Steering Committee, Aboriginal Affairs and Northern Development Canada and Statistics Canada for their contributions. This paper builds on the earlier work undertaken by Ram Mathilakath and Ashutosh Rajekar and the author wishes to acknowledge their contribution. Any errors or omissions are the responsibility of the author. Contact Trevor Shaw (e-mail: trevor.shaw@parl.gc.ca) for further information.

1 Introduction

The mandate of the Parliamentary Budget Officer (PBO) is to provide independent analysis to Parliament on the state of the nation's finances, the government's estimates and trends in the Canadian economy and, upon request from a committee or parliamentarian, to estimate the financial expenditure of any proposal for matters over which Parliament has jurisdiction.[1]

This report responds to a request of the Member for Nanaimo-Cowichan to follow-up on a 2009 PBO report, using new data sources to estimate the costs of First Nations kindergarten to grade 12 (K-12) educational infrastructure in British Columbia. To develop an estimate, the PBO utilized data from Aboriginal Affairs and Northern Development Canada (AANDC) and conducted a survey of First Nations school administrators in British Columbia.[2]

First Nations generally own and operate school infrastructure on reserve.[3] However, pursuant to the *Indian Act*, the responsibility for funding First Nations schools is that of the Crown, specifically the Minister of Aboriginal Affairs and Northern Development (the Minister).[4] These costs may cover educational infrastructure, facilities' operations and maintenance (O&M), school administration and the provision of education services for K-12 students.[5]

This report examines K-12 educational infrastructure requirements in British Columbia and provides an estimate of the federal government's current and future funding requirements.

[1] http://laws-lois.justice.gc.ca/PDF/P-1.pdf. Accessed July 2013.
[2] This study examines school infrastructure on B.C. reserves exclusively. Findings cannot reliably be extrapolated to other regions.
[3] Indian and Northern Affairs Canada, *Education Facilities Progress Report April 2006-January 2010*. February 2010.
[4] http://laws-lois.justice.gc.ca/PDF/I-5.pdf. Accessed July 2013.
[5] ibid.

2 Background

Federal funding for First Nations school infrastructure is provided as part of AANDC's $7.9 billion spending plan in 2013-14.[6]

There is no specific parliamentary appropriation to fund school infrastructure on First Nations reserves. Rather, monies for First Nations school infrastructure are provided by Parliament through AANDC's $6.3 billion grants and contributions vote (a decomposition of the infrastructure portion of AANDC past and planned grants and contributions allocation is provided in Annex A, Figure A-1).

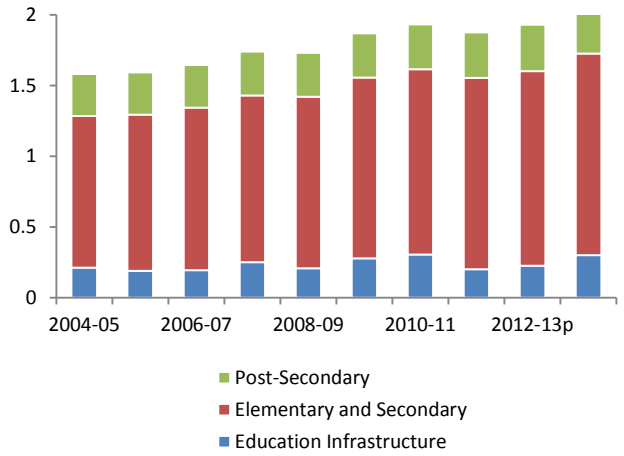
First Nations education spending is planned at $2.1 billion in 2013-14.[7] Roughly $300 million is earmarked for school infrastructure (or 15 per cent of planned education spending). Historically, 13 per cent of federal First Nations education funding is allocated to educational infrastructure and the remaining 87 per cent is allocated to support elementary, secondary and post-secondary education programs and services (Figure 2-1).[8,9]

[6] Main Estimates 2013-14. http://www.tbs-sct.gc.ca/est-pre/20132014/me-bpd/me-bpd-eng.pdf. Accessed July 2013.
[7] Main Estimates 2013-14, Aboriginal Affairs Report on Plans and Priorities 2013-14 and PBO calculation. http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AI/STAGING/texte-text/ai_arp_fin_2013-2014_april2013_1363097691734_eng.pdf. Accessed July 2013.
[8] First Nations education infrastructure funding is historically more volatile, year-over-year, than funding for First Nations elementary, secondary and post-secondary education services (Annex A, Figure A-2). The coefficient of variation for school infrastructure funding (0.17) is higher than that of elementary and secondary (0.08) and post-secondary education (0.03) services.
[9] Aboriginal Affairs and Northern Development Canada and PBO calculation.

Figure 2-1

Federal First Nations Education Funding, Canada

billions of dollars, nominal



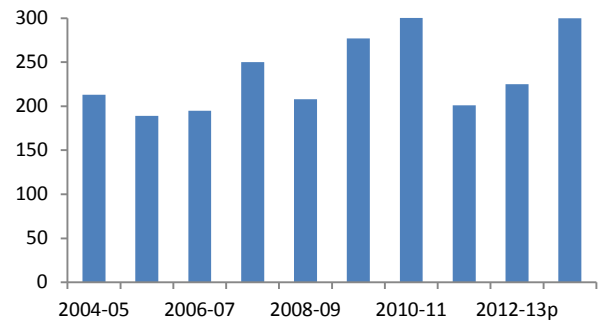
'p' indicates plans

Source: Aboriginal Affairs and Northern Development Canada

Figure 2-2

First Nations School Infrastructure Funding, Canada

millions of dollars, real



'p' indicates plans

Source: Aboriginal Affairs and Northern Development Canada

AANDC provides funding for the provision of education services to First Nations students living on reserve, in addition to funding school infrastructure.

Funding per student varies somewhat across jurisdictions, as federal education funding is determined through funding agreements between the Government of Canada and First Nations. Agreement signatories may include a provincial ministry of education and/or another party (i.e. the First Nations Education Steering Committee in British Columbia).[10]

Historic and planned First Nations school infrastructure spending is illustrated at the national level in Figure 2-2.

AANDC Capital Planning Approach

First Nations school infrastructure funding is planned and allocated through the AANDC Capital Facilities and Maintenance Program (CFM), the Government of Canada's primary channel to provide for educational and other community infrastructure on reserve.

AANDC capital planning decisions rely upon the Integrated Capital Monitoring System (ICMS), a database of AANDC-funded capital assets (*e.g.* schools, roads and water & waste infrastructure). Capital funding requirements for school assets are identified through triennial building inspections or periodic requests of First Nations officials.

Within the CFM program, education capital allocation decisions are considered concurrent with other infrastructure requirements on reserve. AANDC uses its *National Priority Funding Evaluation and Measurement Matrix* to prioritize funding

[10] http://www.aadnc-aandc.gc.ca/eng/1308840098023/1308840148639. Accessed July 2013.

allocations to various infrastructure needs as follows: [11,12,13]

1. Protection of health and safety and assets (assets require upgrading or replacement to meet appropriate standards);

2. Health and safety improvements (upgrades of existing assets, new construction/acquisition projects to mitigate an identified significant risk to health and safety);

3. Recapitalization/major maintenance (extend the service life of a facility or asset, or maintain the original service level of the asset); and,

4. Growth (anticipated community growth requiring new housing, roads, schools, community buildings, etc.).

The allocation of project funding is determined by AANDC regional officials or investment boards, which may include First Nations representatives.[14] Under this framework, AANDC projects capital requirements and expenditures forward three years.

AANDC documentation indicates that the CFM program is under "considerable pressure" and that "many worthwhile projects are deferred due to the need to fund projects with more immediate health and safety impacts."[15] Consequently, funding pressures result in "premature rust-out of assets, often due to a lack of regular maintenance and limited local capacity to operate; and infrastructure funding diverted to cover price and volume increases in social and education costs."[16]

3 PBO Capital Budgeting

The PBO developed a capital budgeting framework to estimate the funding required to sustain British Columbia's First Nations education infrastructure in 2013-14. The basic capital budgeting framework utilizes a similar accounting-based estimation approach as was used in the PBO's 2009 report on First Nations school infrastructure.

Two principal data sources were used:

(i) AANDC's Integrated Capital Management System (ICMS).[17]

(ii) A survey of school administrators, conducted by the First Nations Education Steering Committee (FNESC) and the PBO.[18,19]

As was the case in the 2009 PBO report, AANDC ICMS data is used to account for the value and characteristics of existing assets (fiscal years 2000-01 through 2011-12).

[11] The AANDC *Summative Evaluation of the Capital Facilities and Maintenance Program* identifies water and wastewater projects as the top priority of the CFM program. The report states that "focus on water and wastewater priorities, […] coupled with limited available funding, has constrained the CFM Program's ability to address other First Nation infrastructure-related needs in a thorough manner." http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/aev_pubs_ev_cfm_1324061605553_eng.pdf. Accessed July 2013.
[12] http://www.aadnc-aandc.gc.ca/eng/1100100016395/1100100016396. Accessed July 2013.
[13] See Annex B for an illustrative depiction of the AANDC *Matrix*.
[14] Indian Affairs and Northern Development, *Education Facilities*. http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/edufacil_1100100010851_eng.pdf. Accessed July 2013.

[15] http://www.aadnc-aandc.gc.ca/eng/1100100016395/1100100016396. Accessed July 2013.
[16] ibid.
[17] https://www.aadnc-aandc.gc.ca/eng/1100100010573/1100100010574. Accessed July 2013.
[18] http://www.fnesc.ca/who-we-are. Accessed July 2013.
[19] FNESC was a signatory of the 2006 tripartite Education Jurisdiction Framework Agreement between Canada, British Columbia and FNESC. http://www.aadnc-aandc.gc.ca/eng/1327671439967/1327674065864. Accessed July 2013.

In light of the prior PBO report, certain gaps within the ICMS database and pursuant to the member's request initiating this study, the PBO and FNESC conducted a survey of on-reserve schools in B.C. in order to build a more complete inventory for First Nations schools.[20,21] The PBO used survey data to verify the quality of ICMS data, benchmark school capital use, and enhance the depth, breadth and accuracy of data used in the budgeting model.

In conducting the survey, FNESC contacted 135 band-operated school officials in B.C. (including nursery schools and adult education centres to ensure comprehensiveness), receiving 70 survey responses (a 52 per cent response rate). Together with the ICMS, the PBO assembled data for 86 distinct K-12 schools on-reserve in B.C.

The PBO estimated the stock of existing infrastructure investment and modeled the funding required to sustain the assets according to the financial model summarized in Figure 3-1.

Capital expenditure requirements can take various forms: new school construction, or expansion, replacement, renovation, and re-capitalization of existing facilities.

Figure 3-1

PBO Basic Capital Budgeting Framework

PBO Capital Budgeting Framework			
Major Inputs	**Minor Inputs**		
Asset Replacement Value	Area	Unit Cost	
	Major recapitalization values	Inspection dates	Geographic location
	AANDC Asset Replacement Values	FNESC Asset Replacement Values	
Estimated Remaining Life	Year of construction	Known capital deficiencies	Months in operation
	Design Life	Maintenance Adequacy	Building Materials
	AANDC Inspector comments	Building Condition	School officials' comments
Recapitalization Expense	AANDC Recapitalization Funding	PBO-FNESC Recapitalization Funding	
Operating & Maintenance	AANDC Operating & Maintenance Funding	PBO-FNESC Operating & Maintenance Funding	

Source: PBO

[20] http://www.pbo-dpb.gc.ca/files/files/Publications/Response_from_M_Wernick.pdf. Accessed July 2013.
[21] http://www.pbo-dpb.gc.ca/files/files/Publications/Reply_to_M_Wernick.pdf. Accessed July 2013.

Asset Replacement Value

On-reserve school assets in British Columbia are not reflected in the financial statements of AANDC, and are not consistently detailed in the financial statements of B.C. First Nations. So an estimation approach is required to identify the value of existing assets using data from AANDC ICMS data and the FNESC-PBO survey of school administrators.

Asset Replacement Values (ARV) are estimated within AANDC's ICMS database according to the formulation in Figure 3-2.[22]

Figure 3-2

AANDC Asset Replacement Value Formulation

$$Asset\ Replacement\ Value_i = Area_i * Unit\ Cost_i * Geographical\ Adjustment_i$$

Source: Aboriginal Affairs and Northern Development

Area represents the size of each school asset, measured in m^2.[23] Unit Cost reflects the per m^2 unit cost to replace the asset and a Geographical Adjustment accounts for proximity to a city centre (or remoteness). The Geographical Adjustment is the product of an AANDC-determined City Index, an Adjusted City Centre Index and a Geographical Zone Index.[24]

The PBO performed basic tests of reasonableness on ARV data. The first test normalizes ICMS ARV data on a per unit basis (ARV per m^2). The PBO examined the internal dispersion of the data, using as model inputs all observations within a range of +/- 1.7 standard deviations of the sample mean (103 observations total).

Additionally, the PBO normalized ARV on a per unit basis (ARV per m^2) for FNESC-PBO survey data. Observations that did not meet the first test of reasonableness (ICMS data) were tested to fall within 1.7 standard deviations of the FNESC-PBO survey ARV per m^2 sample mean. Thirteen observations met this secondary test, bringing the useable sample of data to 116 school structures, comprising 86 schools.[25]

To further ensure the accuracy of the PBO model, ICMS-sourced ARV data were tested for their predictive power in estimating the actual costs incurred to replace school assets. AANDC provided data on the actual construction costs of recent new school constructions or major school expansions on-reserve in B.C.

Ex-post construction costs were contrast with the pre-construction ICMS ARV on a per m^2 basis. On average, ICMS data understated actual construction cost by 18 per cent on a unit cost basis (ARV per m^2).

This underestimate of per unit costs may result from model bias or another factor not captured in ARV estimation such as gradually increasing building code standards over time. Empirical studies suggest that for residential construction, increasing building code standards (*e.g.* seismic upgrading, fire codes) tend to increase residential construction costs by an average of 5 per cent.[26] The PBO acknowledges that building code standard increases are but one potential

[22] Aboriginal Affairs and Northern Development Canada's Integrated Capital Monitoring System

[23] AANDC and FNESC-PBO survey data provide an average school structure size of 970 m^2. Some schools may be comprised of more than one structure.

[24] Further detail can be found in the AANDC *Band Classification Manual*. http://publications.gc.ca/collections/Collection/R22-1-2000E.pdf. Accessed July 2013.

[25] A school may be comprised of several distinct structures (*i.e.* a steel & concrete school structure, supplemented with one or more portable classrooms).

[26] Listokin, D. and D.B. Hattis. *Building Codes and Housing*. Cityscape, Vol. 8, no. 1, 2005, p 21-67.

explanation as to why the actual unit costs to replace a structure tend to exceed AANDC ex-ante estimates.

In this report, the PBO adjusts AANDC ICMS ARV input values upward by 18 per cent. All historic values are adjusted into 2013 constant dollars.[27]

The PBO estimates that the existing stock of band-operated schools in B.C. has a total replacement value of $460 million, measured in 2013 constant dollars.

Estimated Remaining Life

The service life of an asset represents the estimated productive life of that asset at the time of its acquisition. Estimated service life varies by structure, influenced primarily by the materials used in construction.[28]

The PBO estimates service life by the materials used in constructing each building's frame:

- Concrete/steel frame – 40 years
- Wood frame – 35 years
- Portables – 25 years

Inputs to the PBO's estimation of service life were taken from the FNESC-PBO survey and the AANDC ICMS database. For schools with unspecified construction, a 40 year service life was assumed, consistent with the general approach of the organizations outlined in Box 3-3.

Box 3-3

School Asset Service Life References

Service lives of assets are estimated based on survey data and industry practice from the following references:

- Statistics Canada[29,30]
- British Columbia First Nations Bands' Audited Financial Statements[31,32]
- British Columbia School District Audited Financial Statements[33]
- Canada Mortgage and Housing Corporation[34]

Generally, it is expected that remaining service life of each asset declines linearly over time, with adjustments made for physical condition (Figure 3-4).

Figure 3-4

Estimated Remaining Life Formulation

$$Estimated\ Remaining\ Life_i^* = Estimated\ Service\ Life_i - Age_i$$

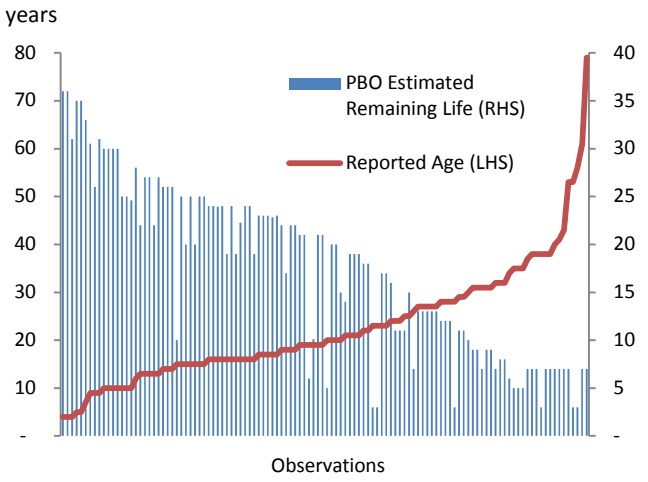
*Subject to adjustment for physical condition
Source: PBO

[27] Inflation indexing uses the PBO's measure of annualized Consumer Price Index.
[28] See Annex A, Figure A-3 for a detailed breakdown of school construction type.
[29] http://www.statcan.gc.ca/pub/11-621-m/11-621-m2009081-eng.pdf. Accessed July 2013.
[30] http://www23.statcan.gc.ca/imdb-bmdi/document/2820_D1_T9_V1_B.pdf. Accessed July 2013.
[31] http://www.nisgaalisims.ca/files/nlg/Audit.pdf. Accessed July 2013.
[32] http://www.namgis.bc.ca/Governance/Audited%20Financial%20Statements/Audited%20Financials%202012%20(1).pdf. Accessed July 2013.
[33] http://sd50.bc.ca/wp-content/uploads/2012/11/Financial-Statements-2011-2012.pdf. Accessed July 2013.
[34] Canada Mortgage and Housing Corporation. Service Life of Multi-Unit Residential Building Elements and Equipment – Final Report. May 2000.

The PBO adjusted the estimated remaining life of each structure to account for variations in building condition. Several factors may affect a structure's present condition and actual service life, including building design, materials quality and composition, weather exposure, quality of maintenance and occupancy characteristics.[35]

Figure 3-5

Estimated Remaining Life and Reported Building Age



*In some cases, schools comprised of more than one structure may have reported a single structure age. The reported age was applied to both structures.

Sources: Aboriginal Affairs and Northern Development ICMS and FNESC-PBO Survey

The PBO approximated building condition in a composite index, using qualitative and quantitative inspection data from the ICMS database and the FNESC-PBO survey.[36]

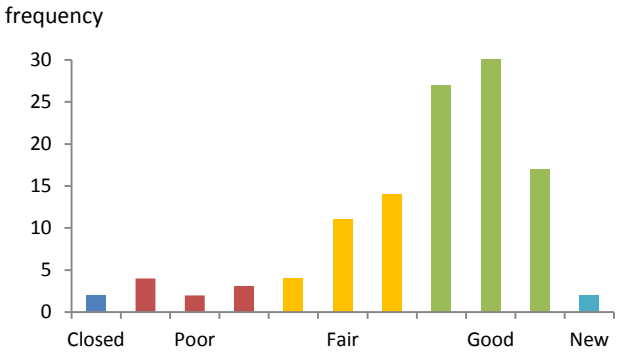
The estimated lives of structures projected to have 5 years or less remaining have been adjusted to reflect physical condition:

- Structures rated "fair" or better are assumed to have 7 years remaining service life.
- Structures rated "poor" or worse are assumed to have 3 years remaining service life.

Of the 116 school structures located in B.C., 76 (or 66 per cent) received a condition index rating of 'good' or better, while 12 structures (or 10 per cent) are considered to be in 'poor' condition or worse.[37]

Figure 3-6

Band Operated School Condition



Sources: Aboriginal Affairs and Northern Development Canada; First Nations Educational Steering Committee and PBO

The AANDC *Summative Evaluation of the Capital Facilities and Maintenance Program* identifies concern on the part of AANDC and First Nations officials that school O&M funding levels are insufficient, particularly in rural and remote communities.[38] School condition is observed to vary

[35] Canada Mortgage and Housing Corporation. Service Life of Multi-Unit Residential Building Elements and Equipment – Final Report. May 2000. https://www03.cmhc-schl.gc.ca/catalog/productDetail.cfm?cat=123&itm=54&lang=en&fr=1372863156860. Accessed July 2013.

[36] The PBO used three equally weighted inputs – each rated 0 (lowest) to 10 (highest) – to form a composite index: the AANDC ICMS General Condition Rating, the FNESC-PBO Survey condition rating and the FNESC-PBO Survey maintenance rating.

[37] The condition index reported is a composite developed by the PBO using data from the AANDC ICMS and the FNESC-PBO survey of school administrators.

[38] The AANDC *Summative Evaluation of the Capital Facilities and Maintenance Program* attributes the outcome to a funding formula that may not reflect the costs borne by rural and remote communities.

somewhat with geographic location. However, differences between municipally influenced and remote regions are not statistically significant with 90 per cent confidence.

Minor Recapitalization and Operating & Maintenance Expense

Minor recapitalization expenditure, also known as capital renewal, represents the costs to replace buildings' subsystems (e.g. heating/cooling systems, roofs, fire safety systems).

Recapitalization differs from depreciation, which is a non-cash charge used for accounting purposes to represent the annual economic cost of a long-lived asset spread over its entire service life.

Recapitalization also differs from operations and maintenance (O&M). While recapitalization expenditures go toward replacing subsystems in school buildings, O&M funds the ongoing upkeep of the structure and systems. Recapitalization and O&M are somewhat interrelated, as when subsystems become inefficient to operate and maintain it may become economical to recapitalize with newer, more efficient subsystems.

AANDC provides First Nations schools with recapitalization and O&M funding on an annual cash basis. Based on data obtained from the ICMS and survey of school administrators, annual recapitalization and O&M expenses are each estimated at approximately 2.9 per cent of asset replacement value. High-low scenario analysis examining the sensitivity of results to recapitalization and O&M expenditure rates are provided near the end of this report, in Figure 5-2.[39]

2013-14 Funding Requirement

The PBO estimates the funding required for B.C. First Nations school infrastructure at $39 million in 2013-14. This estimate was calculated according to the basic model set out in Figure 3-7 and the preceding text.

This estimate follows the similar formulation used in the PBO's 2009 report, but is enriched by data obtained in the FNESC-PBO survey of school administrators.

Figure 3-7

PBO Capital Budgeting Formulation

Major Inputs

Line	Item	Formula
(1)	*Asset Replacement Value*$_i$	Figure 3-2
(2)	*Estimated Remaining Life*$_i$	Figure 3-5
(3)	*Minor Recapitalization Expense per unit of ARV*$_i$	2.9%
(4)	*O&M Expense per unit of ARV*$_i$	2.9%

Calculations

Line	Item	Formula
(5)	*Major Recapitalization Expense*$_i$	(1) ÷ (2)
(6)	*Minor Recapitalization Expense*$_i$	(1) x (3)
(7)	*Operating & Maintenance Expense*$_i$	(1) x (4)
(8)	*Annual Funding Requirement*$_i$	(5) + (6) + (7)

Source: Aboriginal Affairs and Northern Development

http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/aev_pubs_ev_cfm_1324061605553_eng.pdf. Accessed July 2013.

[39] The observed sample dispersion of O&M funding (standard deviation of 0.67 per cent) is greater than that of recapitalization funding (standard deviation of 0.35 per cent).

4 Future Infrastructure Funding Requirement Scenarios

The PBO's $39 million funding estimate for 2013-14 is based on the value and condition of the existing footprint of schools.

To provide an estimate of anticipated future funding requirements, the PBO was required to build upon the accounting-based capital budgeting approach, to incorporate demographic and operational considerations to the school capital budgeting model. Demographic and operational considerations are detailed below, and the corresponding funding impacts of each are presented in a series of illustrative projection scenarios.

Demographics

The need for future investment in educational infrastructure is closely linked to population demographics. Increasing (decreasing) school-age populations should directly correspond to increases (decreases) in the amount of school space required in a region, all else equal.

School-age populations can be estimated by examining projected total population as well as the age composition of the population in question. For example, areas with low total population growth but an increasingly young population may have greater school space requirements than areas comprised of a rapidly growing but ageing population.

The age structure within the school-age population can also influence school infrastructure requirements, as primary schools and kindergartens require less classroom space per student than secondary schools.[40,41]

Forward-looking school enrollment is estimated using Statistics Canada micro-simulation population projections for North American Indians living on-reserve in British Columbia.[42,43] In Canada, approximately 90 per cent of individuals living on-reserve are Registered Indians.[44] For the purposes of this analysis, the PBO assumes Statistics Canada's population projections for British Columbia are reflective of demographic trends on First Nations reserves in British Columbia.[45,46]

Statistics Canada demographic simulations project a 2.4 per cent annual rate of growth in populations living on-reserve in British Columbia, from 2006 through 2031 (Figure 4-1).[47,48] This rate of population growth would exceed the national population growth rate on-reserves (2.0 per cent) and the total population growth rate in British Columbia (approximately 1.4 per cent).[49]

It is anticipated that the population composition on reserves could change in the coming decades.

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[40] Aboriginal Affairs and Northern Development Canada. *School Space Accommodation Standards*. November 2011. http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/ih-ci-pol-sass1_1328212463840_eng.pdf. Accessed July 2013.

[41] British Columbia Ministry of Education. *Area Standards*. 2012. http://www.bced.gov.bc.ca/capitalplanning/resources/areastandards.pdf Accessed July 2013.

[42] http://www.statcan.gc.ca/pub/91-552-x/2011001/ana-eng.htm. Accessed July 2013.

[43] Forward-looking population data are scenario-based projections generated by Statistics Canada and are not forecasts.

[44] Statistics Canada, *Registered Indian Demography – Population, Household and Family Projections*, 2007, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/rgd_1100100016839_eng.pdf. Accessed July 2013.

[45] http://www.statcan.gc.ca/pub/91-552-x/2011001/ana-eng.htm. Accessed July 2013.

[46] http://www.aadnc-aandc.gc.ca/eng/1100100016838/1100100016855. Accessed July 2013.

[47] Population growth projections on reserves reflect persons identifying themselves as North American Indian, as defined by the 2006 Census. Registered Indians comprise 90 per cent of on-reserve populations in Canada, so demographic projections for persons of North American Indian identity are assumed to be reflective of overall trends in First Nations populations on-reserve.

[48] Statistics Canada. Population Projections by Aboriginal Identity in Canada, 2006-2031. Catalogue no. 91-552-X. Scenario 1 - unchanged fertility rates and no intergenerational ethnic mobility.

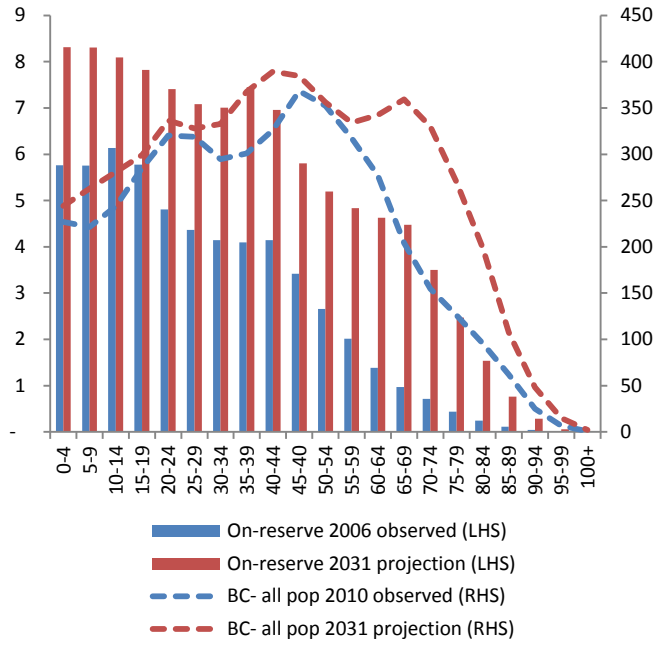
[49] http://www5.statcan.gc.ca/cansim/a26. Accessed July 2013.

Anticipated declining fertility rates and increases in life expectancy may lead to an ageing population on First Nations reserves.[50] To illustrate, the number of persons aged 65 or older is projected to increase nearly five-fold from 2006 to 2031, a cumulative increase of 6 per cent per year.[51] Comparatively, school-aged populations on B.C. reserves are expected to increase by 37 per cent between 2006 and 2031 (or 1.3 per cent per year).

Figure 4-1

Statistics Canada, projection with PBO adjustment to British Columbia

thousands of persons (LHS & RHS)



Source: Statistics Canada, Scenario 1; PBO Calculations

Province wide, the total population aged 65 or older in B.C. is projected to increase at a rate of 3.5 per cent between 2010 and 2031. School-aged populations are anticipated to grow at an annual rate of 1.4 per cent.[52,53]

Thirty-four per cent of students living on reserve in B.C. attend a band-operated school. This share is the lowest of any jurisdiction in Canada (Figure 4-2).[54,55] This report assumes that the share of students living on reserve, attending school on reserve remains constant through 2031.

As a result, although 12 per cent of Canada's K-12 First Nations students reside in B.C., the province accounts for just 7 per cent of the student population enrolled in school on reserves and 10 per cent of the national portfolio of school assets.[56,57] Band-operated schools in British Columbia tend to be smaller in size than in other regions of the country.[58]

[50] Aboriginal Affairs and Northern Development Canada, Registered Indian Population, Household and Family Projections, 2009-2034. http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AI/STAGING/texte-text/ai_rs_st_pubs_regPop-famProj_1336066512934_eng.pdf. Accessed July 2013.

[51] PBO Calculation; Statistics Canada.

[52] ibid.

[53] Assumes trends in Canadian age distributions for persons of North American Indian identity living on-reserve are reflective of populations on-reserve in British Columbia.

[54] http://www.aadnc-aandc.gc.ca/eng/1100100033676/1100100033677. Accessed July 2013.

[55] http://www.aadnc-aandc.gc.ca/eng/1349140116208/1349140158945. Accessed July 2013.

[56] Aboriginal Affairs and Northern Development Canada and PBO calculation. http://www.aadnc-aandc.gc.ca/eng/1100100033676/1100100033677. Accessed July 2013.

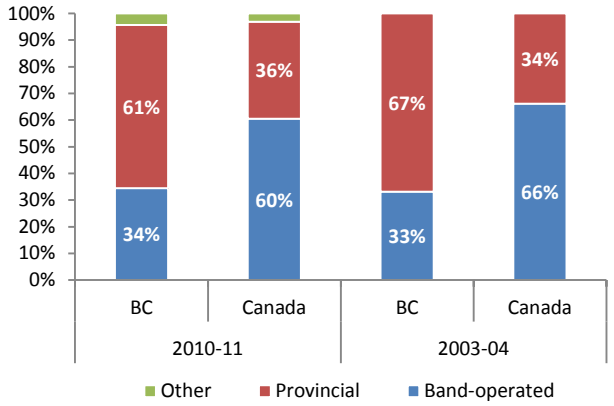
[57] http://www.aadnc-aandc.gc.ca/eng/1349140116208/1349140158945. Accessed July 2013.

[58] Aboriginal Affairs and Northern Development Canada's Integrated Capital Monitoring Database.

Figure 4-2

K-12 Enrollment by School Type, Persons Living On-Reserve

per cent of students



Source: Aboriginal Affairs and Northern Development

Scenario I: Status Quo Capital Budgeting

The PBO's first forward-looking funding scenario incorporates a 15-year demographic projection (2013-14 to 2028-29) into the estimate of B.C. First Nations school infrastructure funding requirements.

School infrastructure quality is assumed to remain unchanged into future years under this scenario. Hence, the average age and quality of school capital would be maintained at levels observed in 2012-13, and any new construction would meet but not exceed a cumulative annual growth rate of 1.3 per cent on reserve (the anticipated rate of school-age population growth on reserves in B.C.). Federal funding would replace assets going out of service each year and provide for minor capital investment and O&M to sustain the present quantity and quality of school facilities.

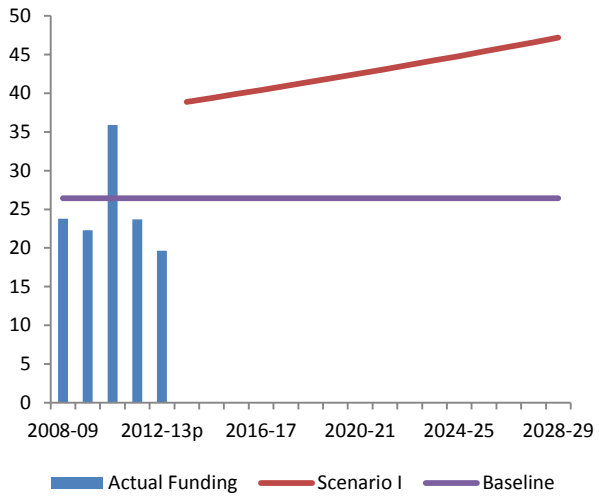
Under this scenario, the PBO estimates that the $39 million required to sustain B.C. school infrastructure on reserve in 2013-14 would grow to $47 million by 2028-29. Student population growth (1.3 per cent per year) is the sole driver of growth in the funding requirement in this scenario, as figures are presented in real terms. Figure 5-1 illustrates the 15-year funding requirement profile.

For context, AANDC has provided First Nations schools with $26 million per year since 2008-09.[59] Historic average funding levels are indicated as a baseline in Figure 4-3 (all figures presented in 2013 constant dollars).

Figure 4-3

Scenario I: Status quo

millions of dollars, real



'p' indicates plans

Sources: Statistics Canada, Scenario 1; PBO Calculations

[59] Aboriginal Affairs and Northern Development Canada and PBO calculations.

Capacity Utilization

The PBO funding requirement estimate for school infrastructure can more accurately capture the impact of demographic trends when the relationship between student population and school space is defined.

AANDC specifies this relationship in its *School Space Accommodation Standards*, a document that provides AANDC's standards for floor space to be allocated for a given student population and grade level.

Generally, as a student population increases in numbers and grade level, a school facility will require larger floor space.[60] School capacity is a function of school size and the *Standards,* calculated according to the equation in Figure 4-4.

Figure 4-4

School Capacity

$$School\ Capacity_i = School\ Area_i \div Area\ Required\ Per\ Student$$

*Subject to adjustment for physical condition
Source: PBO

Capacity utilization measures whether actual student populations are at, below, or in excess of a school's capacity. The PBO estimated school capacity for each school on-reserve in B.C. according to the equation in Figure 4-5.

Figure 4-5

Capacity Utilization

$$Capacity\ Utilization_i = Student\ Population_i \div School\ Capacity_i$$

*Subject to adjustment for physical condition
Source: PBO

A school with a student population equal to school capacity is considered to be allocating school capital at the levels specified in the AANDC *School Space Accommodation Standards.*

A school with a student population exceeding capacity would be deemed overcapacity relative to the standards and may require additional capital should the trend hold into the future. A school with a student population projected below capacity may indicate a requirement for a reduction in school capacity in future years.

The PBO obtained student populations for each school through the FNESC-PBO survey of school administrators. In 2012-13, schools on reserve in B.C. utilize 57 per cent of capacity, on average (+/- 7 per cent with 95 per cent confidence).[61,62]

Utilization rates are not uniform across schools (Figure 4-6). In the FNESC-PBO survey of school administrators, while many schools report underutilized capacity, the utilization rate is observed at 133 per cent in one case (33 per cent overcapacity). The lowest reported utilization rate is 7 per cent (or 93 per cent below capacity).[63]

[60] Detailed school space requirements are available in Appendix E of the AANDC 2011 School Space Accommodation Standards. http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/ih-ci-pol-sass1_1328212463840_eng.pdf. Accessed July 2013.

[61] First Nations Education Steering Committee – PBO Survey of B.C. School Administrators, 2013.

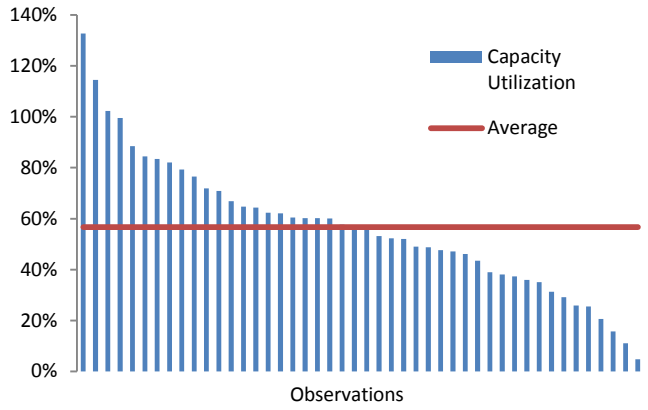
[62] The median capacity utilization rate is also 57 per cent.

[63] ibid.

Figure 4-6

Band-operated school capacities, British Columbia

per cent of school capacity utilized



Sources: First Nations Educational Steering Committee – PBO Survey; PBO Calculations

Capacity utilization may vary year-to-year. Schools are fixed assets, and absent expansion or renovation, school capacity is expected to remain fairly constant over time. Student populations, however, may fluctuate from one year to the next due to a variety of factors. Effective school capital planning requires an appropriate balance of the risk of undercapitalization (resulting in overcrowded schools) and overcapitalization (resulting in capital expenditure per student exceeding desired levels).

For comparative purposes, the PBO examined school capacity utilization in B.C. provincial schools to provide capacity utilization scenario sensitivities.

The PBO examined 132 schools from six school districts in British Columbia operating under the administration of the B.C. Ministry of Education.[64]

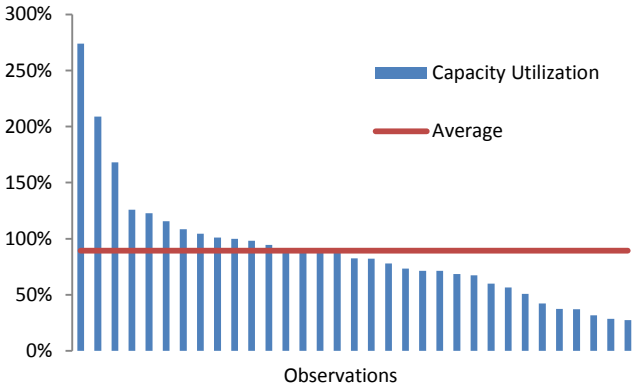
School districts were selected to reflect the geographic profile (municipal-rural blend) observed in the First Nations schools. The broader sample was narrowed to the 33 schools approximately equivalent in size (capacity of less than 200 students) to the sample of First Nations schools under examination (Figure 4-7).

The PBO estimates that schools similar in size and geographic location to schools on reserve, but operated by the B.C. Ministry of Education operate at 89 per cent of capacity.[65,66] The B.C. Ministry of Education reported in 2011 that the average B.C. public school operates at 87 per cent capacity.[67]

Figure 4-7

B.C. Ministry of Education school capacities, PBO sample

per cent of school capacity utilized



Sources: First Nations Educational Steering Committee – PBO Survey; PBO Calculations

[64] School districts examined: Kootenay Lake (School District No. 8), Sunshine Coast (46), Nanaimo-Ladysmith (68), Comox Valley (71), Coast Mountains (82) and Nechako Lakes (91).

[65] PBO Calculation; School District No. 8, Kootenay Lake 2012-13 Capital Plan; Coast Mountains Board of Education School District 82, Facilities Plan 2011-12; School District No. 71 (Comox Valley) Long Range Facilities Plan 2012; School District 91 Nechako Lakes Strategic Facilities Plan 2008; Nanaimo-Ladysmith School District 68 Five Year Capital Plan 2012-13; British Columbia School District No. 46 (Sunshine Coast), School District Facilities Plan, 2010.

[66] The median capacity utilization rate is 83 per cent.

[67] British Columbia Ministry of Education, *Summary of Key Information* 2010-11. http://www.bced.gov.bc.ca/reporting/docs/SoK_2011.pdf. Accessed July 2013.

Scenario II: Higher Capacity Utilization

Scenario I determines the funding gap based on the existing footprint of First Nations schools. Within Scenario I, it is implicitly assumed that schools continue to operate at the status quo rate of school capacity utilization (57 per cent).

Scenario II projects the expected funding requirement under an alternative capacity utilization rate – that of schools similar in geographic location and size, but operated by the B.C. Ministry of Education. Generally speaking, a student population will require less school infrastructure (on a school area basis) when schools operate at higher capacity. Increasing school capacity utilization over time (in Scenario II) is expected to reduce the capital funding requirement for B.C. First Nations schools.

In Scenario II, it is assumed that B.C. First Nations school utilization rates converge linearly with the B.C. Ministry of Education utilization rate of 89 per cent in 15 fiscal years (by 2028-29). A 15-year convergence time horizon was chosen based on difference between the dollar-weighted estimated useful life of school assets (38 years) and the average estimated remaining life of school structures (23 years).[68]

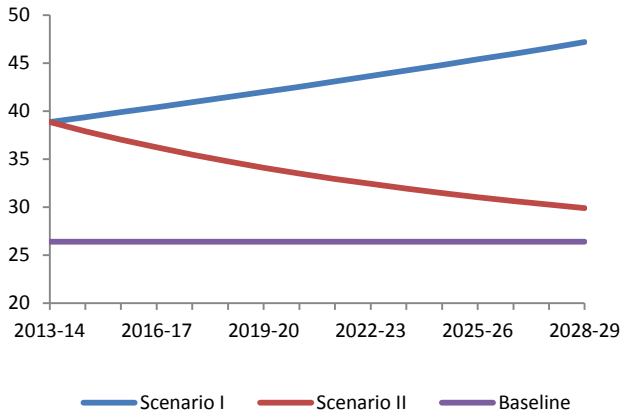
Hence, beginning in 2013-14, school capacity utilization would increase by approximately 2 per cent per year until an 89 per cent utilization rate is reached in 2028-29. Figure 4-8 illustrates the profile of required funding under Scenario II.

The current funding requirement is identical in Scenarios I & II ($39 million in 2013-14). However, increases in First Nations school capacity utilization would reduce the amount of school infrastructure required on reserves over time, decreasing the estimated funding requirement to $30 million by 2028-29.[69] This amount is approximately $4 million higher than the amount provided by AANDC, on average, from 2008-09 to 2011-12, in real terms. Estimates in this scenario are predicated on changes in approach to management and funding.

Figure 4-8

Scenario II: Higher Capacity Utilization

millions of dollars, real



Sources: Statistics Canada, Scenario 1; PBO Calculations

This scenario is illustrative and portrays a smoothed forward-looking funding estimate. The PBO acknowledges that practical consequences could result in an attainable average school capacity utilization rate on reserves above or below the estimated rate presented in Scenario II. Given the fixed nature of capital structure size and fluctuations in school enrolment, capacity utilization may vary year-over-year.

Furthermore, in practice, capital investments are not made incrementally, but occur in blocks or steps. Even if assumptions embedded within Scenario II

[68] PBO estimates using Aboriginal Affairs and Northern Development Canada's Integrated Capital Management System and the PBO-FNESC survey of school administrators.

[69] Capacity utilization at the median rate of 83 per cent rather than 89 per cent would result in an annual funding scenario approximately $2 million higher from 2028-29 forward.

hold, the actual funding requirement may fluctuate above or below the PBO projection depending on the specific capital projects undertaken in each year.

As is the case in Scenario I, projected student population growth on reserves increases the funding required year-over-year. A declining funding requirement, overall, from 2013-14 to 2028-29 results from capacity utilization increasing at a faster rate than population growth.

Scenario III: Higher Capacity Utilization and Capital Renewal

First Nations school infrastructure in B.C. has an average age of 23 years.[70] Comparatively, schools operating under the B.C. Ministry of Education in predominantly rural and remote districts have an average structure age of 18 years. The age difference between band operated schools and comparable schools administered under the B.C. Ministry of Education is statistically significant with 95 per cent confidence.

Scenario III depicts a funding requirement where investments incrementally improve school infrastructure over a 15-year horizon. As in Scenario II, this funding requirement profile is an illustration and in practice, actual cash requirements may fluctuate above or below the generalized case depending on specific capital projects in any given year.

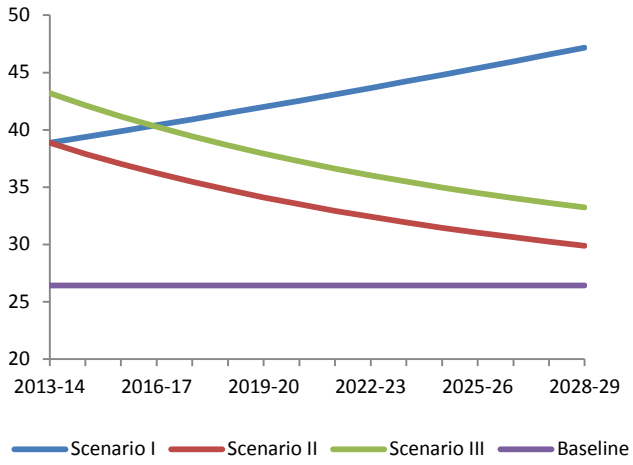
The PBO estimates that an incremental annual investment of roughly $4 million, from 2013-14 until 2028-29, would be required to bring the average age of on-reserve school infrastructure in line with comparable schools administered under the B.C. Ministry of Education (Figure 4-9).

Under Scenario III, $43 million in funding would be required in 2013-14. Due to capacity utilization increases identical to Scenario II, the requirement would decline until it reached $33 million in 2028-29.

Figure 4-9

Scenario III: Higher Capacity Utilization and Capital Renewal

millions of dollars, real



Sources: Statistics Canada, Scenario 1; PBO Calculations

As in Scenario II, the required funding would steadily increase at the rate of anticipated student population growth once benchmark capacity utilization and structure age is reached in 2028-29.

[70] Aboriginal Affairs and Northern Development Canada's Integrated Capital Monitoring System and First Nations Education Steering Committee - PBO survey.

5 Conclusion

The PBO estimates that the funding requirement for First Nations school infrastructure in British Columbia is $39 million per year in 2013-14.

The future funding requirement is anticipated to increase in real terms at the annual rate of student population growth (1.3 per cent), reaching $47 million in 2028-29.

In a scenario where school capacity utilization (*i.e.* school floor space per student) converges in line with comparable schools administered under the B.C. Ministry of Education, the funding requirement could decline to $30 million by 2028-29.

Additional investments of $4 million per year could reduce the average age of First Nations school infrastructure to that of provincially-administered schools, similar in size and location, by 2028-29. Historically, $26 million in federal funding is provided for First Nations school infrastructure in British Columbia each year.

Figure 5-1

PBO Summary Results

millions of dollars, real

Scenario I: Status quo

Fiscal Year	Low	Medium	High
2013-14	$ 25	$ 39	$ 55
2028-29	$ 30	$ 47	$ 67

Scenario II: Higher capacity utilization

Fiscal Year	Low	Medium	High
2013-14	$ 25	$ 39	$ 55
2028-29	$ 19	$ 30	$ 51

Scenario III: Higher capacity utilization and capital renewal

Fiscal Year	Low	Medium	High
2013-14	$ 28	$ 43	$ 61
2028-29	$ 22	$ 33	$ 55

Source: PBO Calculations

Figure 5-2

Summary Results and Sensitivities, 2013-14 fiscal year

dollars

Scenario analysis was applied to test the sensitivity of results to upward or downward movements in the assumed asset replacement values, recapitalization rates, and O&M rates.

Scenario I: Status quo

2013-14	Low	Medium	High
Asset Replacement	$ 8,948,921	$ 12,149,919	$ 15,350,917
Recapitalization	$ 8,628,466	$ 13,322,077	$ 18,862,568
Operating & Maintenance	$ 7,533,478	$ 13,393,384	$ 20,921,089
Total	**$ 25,110,865**	**$ 38,865,379**	**$ 55,134,575**

Scenario II: Higher capacity utilization

2013-14	Low	Medium	High
Asset Replacement	$ 8,948,921	$ 12,149,919	$ 15,350,917
Recapitalization	$ 8,628,466	$ 13,322,077	$ 18,862,568
Operating & Maintenance	$ 7,533,478	$ 13,393,384	$ 20,921,089
Total	**$ 25,110,865**	**$ 38,865,379**	**$ 55,134,575**

Scenario III: Higher capacity utilization and capital renewal

2013-14	Low	Medium	High
Asset Replacement	$ 12,144,964	$ 16,489,176	$ 20,833,387
Recapitalization	$ 8,628,466	$ 13,322,077	$ 18,862,568
Operating & Maintenance	$ 7,533,478	$ 13,393,384	$ 20,921,089
Total	**$ 28,306,908**	**$ 43,204,636**	**$ 60,617,045**

Low = Medium scenario less one standard deviation for each input (ARV, Recapitalization and O&M).

High = Medium scenario plus one standard deviation for each input (ARV, Recapitalization and O&M).

Source: PBO Calculations

References

Aboriginal Affairs and Northern Development Canada, *2013-14 Financial Overview*, April 2013. http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AI/STAGING/texte-text/ai_arp_fin_2013-2014_april2013_1363097691734_eng.pdf.

Aboriginal Affairs and Northern Development Canada, *Departmental Performance Report, 2011-12*, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AI/STAGING/texte-text/arp_es_1112_dpr_1351883215680_eng.pdf.

Aboriginal Affairs and Northern Development Canada, *Financial Statements for the Year Ended March 31, 2012*, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AI/STAGING/texte-text/ai_financialstatement_2012_1351013101839_eng.pdf

Aboriginal Affairs and Northern Development Canada, *National First Nations Infrastructure Investment Plan*, 2011-12, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/ih_ci_nfniip2011-2012_1326738672128_eng.pdf.

Aboriginal Affairs and Northern Development Canada, *Registered Indian Population, Household and Family Projections, 2009-2034*. http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AI/STAGING/texte-text/ai_rs_st_pubs_regPop-famProj_1336066512934_eng.pdf

Aboriginal Affairs and Northern Development Canada, *Report on Plans and Priorities,* 2013-14, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-AI/STAGING/texte-text/2013-14RPP_pdf_1363177576527_eng.pdf

Aboriginal Affairs and Northern Development Canada, *School Space Accommodation Standards*, November 2011, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/ih-ci-pol-sass1_1328212463840_eng.pdf.

British Columbia Ministry of Education, *Area Standards*, May 2012, http://www.bced.gov.bc.ca/capitalplanning/resources/areastandards.pdf

British Columbia Ministry of Education, *Summary of Key Information,* March 2011, http://www.bced.gov.bc.ca/reporting/docs/SoK_2011.pdf.

British Columbia School District No. 8, Kootenay Lake, *Capital Plan*, 2012-13, http://www.sd8.bc.ca/Finance/20122013_FiveYearCapitalPlan.pdf.

British Columbia School District No. 46 (Sunshine Coast), *School District Facilities Plan*, December 2010, http://www.sd46.bc.ca/files/Bd%20Mtg%20Syn-Reports/District-Facility-Dec5_10.pdf.

British Columbia School District No. 71 (Comox Valley), *Long Range Facilities Plan*, 2012, http://www.sd71.bc.ca/pdfs/properties/SD71%20Comox%20Valley%20Long%20Range%20Facilities%20Plan.pdf.

British Columbia School District 91 Nechako Lakes, *Strategic Facilities Plan,* 2008, http://www.sd91.bc.ca/sites/default/files/files/SD91%20Strategic%20Facilities%20Plan%20LOW2008%20.pdf.

Coast Mountains Board of Education School District 82, *Facilities Plan*, 2011-12, http://cmsd.bc.ca/wp-content/uploads/2012/01/Cascade-Report-CMSD82-Facilities-Plan-2011-2021.pdf.

Canada Mortgage and Housing Corporation, *Capital Replacement Planning*, 2003, http://www.cmhc-schl.gc.ca/en/ab/noho/noho_021.cfm.

Canada Mortgage and Housing Corporation, *Service Life of Multi-Unit Residential Building Elements and Equipment*, May 2000, http://publications.gc.ca/site/eng/93498/publication.html.

Canadian Institute of Chartered Accountants, *20 Questions About Government Financial Reporting*, 2003, http://www.frascanada.ca/standards-for-public-sector-entities/resources/reference-materials/item14605.pdf.

Canadian Institute of Chartered Accountants, *Public Sector Accounting Handbook*, 2013, http://www.cica.ca/applying-the-standards/financial-reporting/accounting-standards-for-public-sector/index.aspx.

Government of Canada, *2013-14 Main Estimates*, March 2013, http://www.tbs-sct.gc.ca/est-pre/20132014/me-bpd/me-bpd-eng.pdf.

Indian Affairs and Northern Development Canada, *Band Classification Manual*, March 2000, http://publications.gc.ca/collections/Collection/R22-1-2000E.pdf.

Indian Affairs and Northern Development Canada, *Education Facilities Progress Report,* February 2010, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/edufacil_1100100010851_eng.pdf.

Indian and Northern Affairs Canada, *Summative Evaluation of the Capital Facilities and Maintenance Program*, February 2010, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/aev_pubs_ev_cfm_1324061605553_eng.pdf.

Listokin, D. and D.B. Hattis. *Building Codes and Housing*. Cityscape, Vol. 8, no. 1, 2005, p 21-67. http://www.jstor.org/discover/10.2307/20868571?uid=32208&uid=3739448&uid=2134&uid=2&uid=70&uid=3737720&uid=3&uid=67&uid=62&uid=32206&sid=21102030141323

Nanaimo-Ladysmith School District 68, *Five Year Capital Plan*, 2012-13, http://www.sd68.bc.ca/Documents/2012-13FiveYearCapitalPlan.pdf.

Parliamentary Budget Officer, *The Funding Requirement for First Nations Schools in Canada,* May 2009, http://www.pbo-dpb.gc.ca/files/files/Publications/INAC_Final_EN.pdf.

Statistics Canada, *Age of Education Infrastructure: Recent Trends*, September 2009, http://www.statcan.gc.ca/pub/11-621-m/11-621-m2009081-eng.pdf.

Statistics Canada, *Age of Public Infrastructure: A Provincial Perspective*, February 2008, http://www.statcan.gc.ca/pub/11-621-m/11-621-m2008067-eng.htm.

Statistics Canada, *Investment Flows and Capital Stocks, 2001*, http://www23.statcan.gc.ca/imdb-bmdi/document/2820_D1_T9_V1_B.pdf.

Statistics Canada, *Population Projections by Aboriginal Identity in Canada*, December 2011, http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=91-552-x&lang=eng.

Statistics Canada, *Registered Indian Demography – Population, Household and Family Projections*, 2007, http://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ/STAGING/texte-text/rgd_1100100016839_eng.pdf.

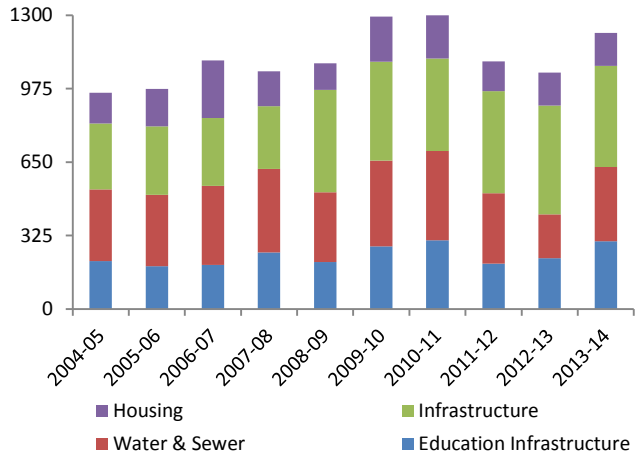
Statistics Canada, *Standard Geographical Classification (SGC)*, November 2011, http://www.statcan.gc.ca/pub/12-571-x/12-571-x2011001-eng.pdf.

Annex A

Figure A-1

First Nations Infrastructure Funding, Canada

millions of dollars, nominal

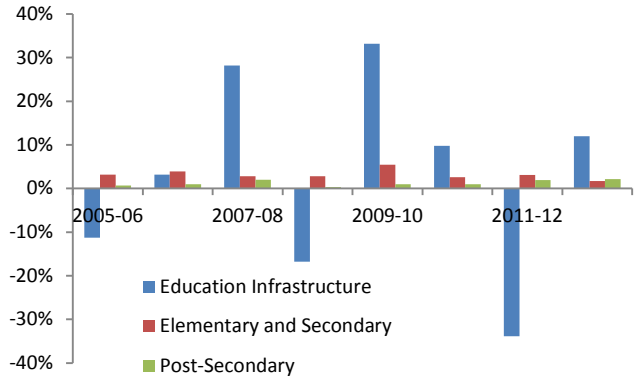


Source: Aboriginal Affairs and Northern Development Canada

Figure A-2

First Nations Education Funding Variability

year-over-year change, per cent



Sources: Aboriginal Affairs and Northern Development ICMS and FNESC-PBO Survey; PBO calculation

Figure A-3

School Infrastructure Construction Type

per cent of sample

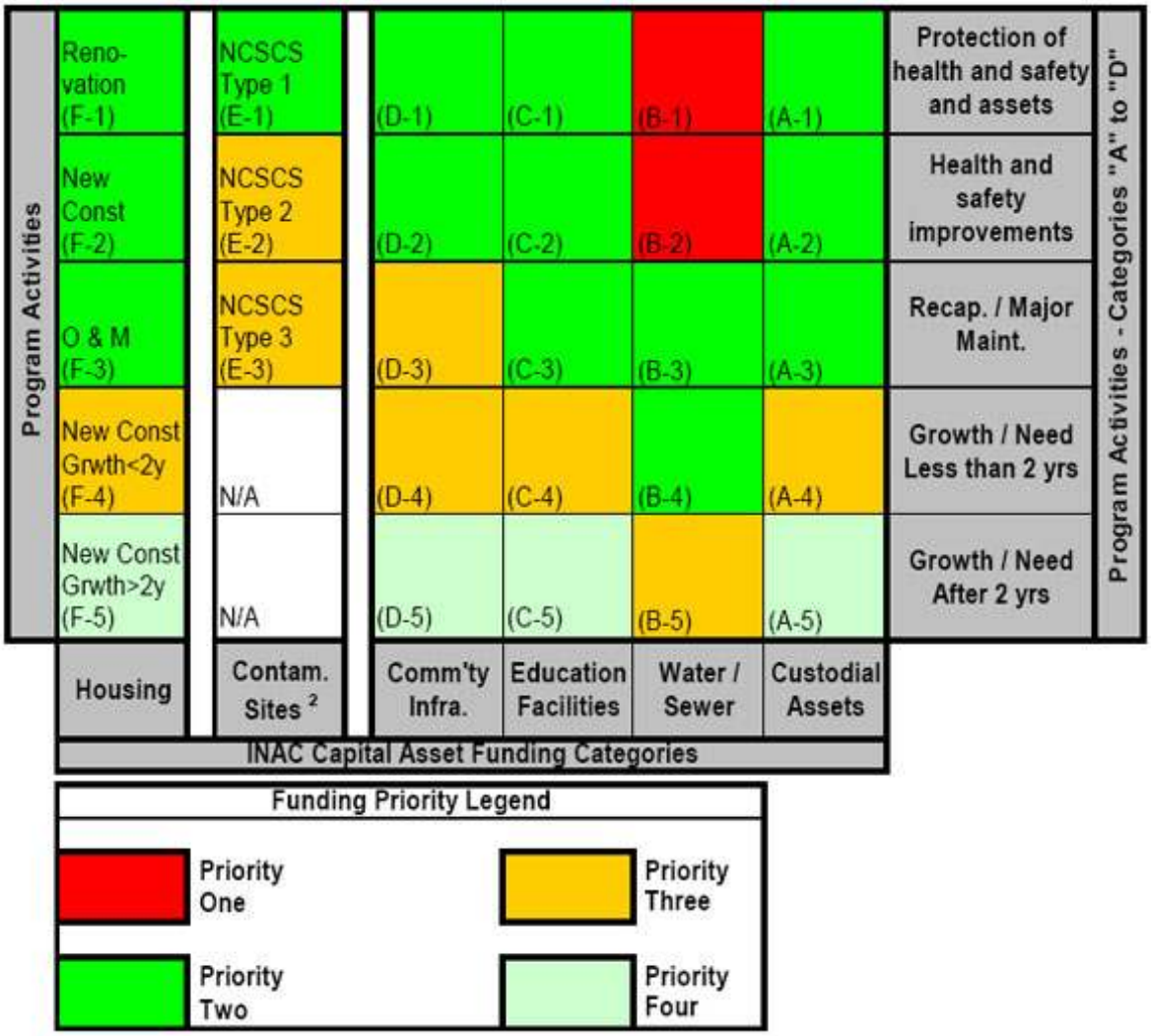
	On-reserve*	Comparable Provincially-administered**
Concrete/steel frame	41%	17%
Wood frame	37%	50%
Portables	22%	33%

*Source: FNESC-PBO survey of school administrators

**Source: Consultations with B.C. school district officials

Annex B

Aboriginal Affairs and Northern Development Canada
National Priority Funding Evaluation and Measurement Matrix



Source: Aboriginal Affairs and Northern Development Canada, *National First Nations Infrastructure Investment Plan*, 2011-12, p. 43