Institute of Social and Economic Research
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Web Notes

Replacement Cost for Public Infrastructure in Alaska: An Update

Web Note No. 4. Mark Foster and Scott Goldsmith July 2008

Replacing Alaska's public infrastructure would cost nearly $59 billion, in today's dollars. That includes, as the table shows, the costs of replacing public buildings as well as transportation and utility systems.[1]

This is an update of an estimate ISER made in 2007—which at that time was the first comprehensive estimate of the cost to replace Alaska's public infrastructure.[2] That 2007 estimate was considerably less—about $39.5 billion—but we emphasized at the time that it was preliminary.

It did not take into account that costs to replace infrastructure in remote areas are higher, and it undercounted and undervalued certain types of infrastructure, including power and telephone systems.

This revised estimate is based on an analysis of cost differences across the state, additional data on existing infrastructure, and additional consultation with engineers, architects, and cost estimators.

Knowing the value of Alaska's infrastructure helps give public officials an idea of how much the state should be spending to maintain and replace critical infrastructure. It also provides a basis for estimating how much climate change could add to the future costs of public infrastructure.

Replacement Cost: Alaska Public* Infrastructure (Million 2008 $)

TOTAL INFRASTRUCTURE	**$ 58,879**
PUBLIC BUILDINGS	**$ 12,192**
Schools	$ 5,953
Government Buildings	$ 2,468
Public Hospitals	$ 1,261
Court Facilities	$ 1,056
Health Buildings	$ 868
Law Enforcement	$ 415
Emergency Services	$ 171
PUBLIC UTILITIES	**$ 13,472**
Energy	$ 5,598
Sewer Systems	$ 4,327
Water Systems	$ 1,683
Electric Grid	$ 1,000
Natural Gas	$ 462
Telecommunications[3]	$ 402
TRANSPORTATION	**$ 33,215**
Roads	$ 21,399
Airports	$ 5,793
Ak Railroad	$ 2,625
Bridges	$ 1,898
Harbors	$ 1,500

*Excludes Department of Defense facilities
Source: ISER

[1] It doesn't include costs of replacing federal defense facilities; partly for security reasons, little information is available about those facilities.

[2] See Table 2, *Understanding Alaska* Research Summary No. 8, "How Much Might Climate Change Add to Future Costs for Public Infrastructure?" By Peter Larsen and Scott Goldsmith, June 2007.

[3] Telecommunications here includes telephone lines, but does not include interstate fiber optic facilities nor telecommunications satellites. Many of these facilities are "outside" Alaska.

Public Buildings

We found that the costs to replace public buildings—including schools, clinics, multi-use facilities and hospitals—in remote areas was on the order of twice as much per square foot as in Anchorage.[4] The higher cost per square foot for rural buildings was due to a combination of:

- Higher input costs, especially freight costs (barge and air); limited supply of specialty labor (mechanical, electrical); challenging foundation conditions—including ice-rich frozen ground; weather delays; remote logistics; and the high cost of fuel.
- Smaller scale. Smaller buildings and smaller projects typically cost relatively more, because they have to carry more fixed costs per square foot, including costs of mobilization, equipment, project management, and administrative functions.

We consolidated public buildings into three main categories: general government buildings, schools, and hospitals/clinics. We analyzed the cost per square foot to replace those basic types of buildings in urban and remote rural locations based on Denali Commission Benchmark Cost Studies (2008), R.S. Means Square Foot Costs (2008), and consultations with Estimations, Inc. (2007, 2008) on typical sizes and costs of those types of buildings in Alaska.

In addition, we estimated the total square footage in each of the main categories, based on our public infrastructure database. In the general government buildings category, we estimated square footage based on stratifying our sample into Anchorage, suburban, and rural communities, then estimating square footage within each category, and multiplying that by the number of communities in each category.

For schools, we used the Alaska Department of Education and Early Development's K-12 Schools Database for an estimate of square footage by community. For hospitals and clinics, we estimated square footage based on the Denali Commission's project database, data from the Railbelt end-use energy survey, and interviews with facility managers.

Overall, we estimate that the replacement cost for *public buildings* in Alaska is on the order of $12.2 billion, in 2008 dollars.

Public Utilities[5]

As we highlighted when we published our initial estimate, we knew that our public infrastructure database undercounted and undervalued certain sectors, including the power and telecommunications sectors. To better estimate the quantity and book value of existing infrastructure for this update, we reviewed the annual reports and public filings of public utilities (gas, electric, water/sewer, and telecommunications) at the Regulatory Commission of Alaska and the Federal Energy Regulatory Commission. We also reviewed Alaska Energy Authority reports and Securities and Exchange Commission disclosures of public telecommunications utilities. We then applied current reconnaissance level replacement cost estimates by region to the quantities (miles of lines, installed kW, switching, data centers) for an initial replacement cost estimate. As a crosscheck, we estimated replacement costs based on escalating the book value to current 2008 dollars. using utility sector specific cost indices.[6]

[4] MAFA Analysis of Denali Commission Benchmark Cost Studies and Benchmark Cost Models for Teacher Housing, Clinics and Multi-Use facilities and consultations with Estimations, Inc. on cost of schools and public buildings across urban and rural Alaska

[5] Please note that "public utilities" include the for-profit, municipal, and cooperative utilities providing *service to the public.*

[6] Sources of utility cost data included: Handy-Whitman, Engineering News Record, R.S. Means, Energy Information Administration, Federal Communications Commission and telecommunications industry reports.

We found the preliminary estimates of rural water/sewer utilities were in close agreement with the new estimates. But we found that the preliminary public infrastructure database significantly undercounted and undervalued existing energy infrastructure, including natural gas utility plants, hydroelectric projects, fossil fuel combustion turbines (natural gas, HAGO, naphtha), coal-fired power plants, diesel power plants, bulk fuel storage facilities, electric transmission and distribution systems, and telecommunications infrastructure of public utilities in Alaska.

Our revised estimate of the replacement cost for *public utilities* in Alaska is on the order of $13.5 billion, in 2008 dollars.

Transportation Infrastructure

Based on a quick review of the data sources (including the Alaska Department of Transportation and Public Facilities and the Alaska Railroad) we used to make our preliminary estimate of replacement costs for transportation infrastructure—airports, bridges, harbors, railroads, and roads—we saw no need to update our preliminary estimates beyond a simple adjustment to take into account capital cost escalation between 2006 and 2008.

We estimate that the future replacement cost for *public transportation* infrastructure in Alaska is on the order of $33.2 billion, in 2008 dollars.

Work in Progress

We are continuing to improve the public infrastructure database as new information becomes available, and we welcome suggestions for enhancements. Sector-level summary spreadsheets are available from the authors. You can get in touch with ISER by calling 907-786-7710 or e-mailing to ayiser@uaa.alaska.edu.