

Public Infrastructure Technical Work Group – Policy Options

The purpose of the Public Infrastructure Technical Work Group (PI TWG) is to provide policy options for “*adapting infrastructure to a changing climate*” for the Adaptation Advisory Group (AAG).

Definitions:

Public Infrastructure is assets owned by local, state and federal governments that are critical for delivering goods and services to communities.

Climate change is a significant shift in the variability of average or extremes climatic conditions for a specific location and over a period of time.

Policy Options:

The policies below assume that the Governor’s Climate Change Subcabinet recommends that the State of Alaska invest in research programs to create better climatic models for predicting future climate for Alaska’s highly variable climate from region to region. Data from these climatic models are needed for implementing some of the policies.

POLICIES	PROGRAMS	TASKS
<p>1. Create a Public Infrastructure Commission on Climate Change (PICCC) to develop, implement and administer technical programs on collecting data to formulate criteria for adapting public infrastructure to a changing climate.</p> <p>The PICCC would consist of state and local government officials and representatives from the University of Alaska, engineering profession and other interested stakeholders. Also, the PICCC would advise the Adaptation Advisory Group on the current and future effects of climate change on public infrastructure and the strategies and approaches for state agencies and local governments to adapt public infrastructure to a changing climate.</p>		
	<p>1. Establish a statewide baseline inventory of public infrastructure to evaluate climate change impacts on infrastructure.</p>	<p>A. Inventory existing public infrastructure in Alaska and document its existing conditions.</p> <p>(ISER-UAA developed a preliminary and limited database of existing public infrastructure that was created to project the added cost (above normal wear and tear) from the effects of climate change on infrastructure at risk. See Larson, P.H., et al. (2008)</p> <p>B. Estimate the remaining useful life of the existing public infrastructure.</p>

		<p>C. Estimate the present value replacement costs of the existing public infrastructure.</p> <p>D. Inventory the physical and environmental conditions (permafrost, river and coastal shorelines, etc.) that exist at the locations of the existing public infrastructure.</p>
	<p>2. Create a statewide observation network to monitor and update the infrastructure database.</p>	<p>A. Develop the observation network in conjunction with developing the public infrastructure database.</p>
	<p>3. Conduct a statewide assessment and analysis on the vulnerabilities of public infrastructure to the impacts of climate change.</p>	<p>A. Conduct vulnerability assessments and evaluate the associated risks on the current climate impacts to existing public infrastructure.</p> <p>B. Based on the assessments and new climate projections, analyze for future vulnerabilities based on risk levels.</p>
	<p>4. Institute an adaptive climate change model for public infrastructure to develop and recommend strategies and approaches to identify short and long-term sustainable solutions to changing climate.</p>	<p>A. Develop the adaptive model using results of the public infrastructure database and the vulnerability analysis.</p> <p>B. Develop and recommend strategies and approaches to identify short and long-term sustainable solutions to climate change.</p> <p>C. Begin a process based on the modeling results to review and modify engineering design standards, building codes, and operation and maintenance practices to adapt for future climate changes.</p>

2. Create a statewide planning initiative for state agencies and local governments to collaborate and develop adaptation action plans for addressing climate change impacts to public infrastructure.

	1. Develop a public infrastructure planning network between state agencies and local governments.	A. Disseminate and monitor data outputs from the adaptive model via the network for developing adaptation action plans.
3. Establish a statewide capital funding program to fund sustainable solutions that will adapt public infrastructure currently at risk and future public infrastructure to a changing climate.		
	1. Enact a law to create and authorize the state funding program.	A. Identify federal and state funding sources and request funding. B. Establish policies and procedures of the program.

Comments

Specific infrastructure vulnerabilities to assess:

Airports and Landing Strips - Evaluate and address the impacts on airports and landing strips related to thawing permafrost, coastal and river erosion and flooding, including the need to relocate, re-align or repair airstrips.

Buildings - Evaluate the existing damage and loss to public buildings due to shoreline erosion, less shorefast ice, melting permafrost, storms, realignment of rivers and flooding and identify the need to relocate buildings (e.g. Koyukuk) and plan for future siting. Evaluate wild fire risk to buildings due to increased wild fire intensity and frequency and increased threat from diseased/dead trees (e.g. Caribou Hills fire in 2007).

Coastal and River Shorelines - Evaluate the vulnerability of existing and future unprotected reaches of shoreline with respect to existing infrastructure. Determine need for and type of shoreline protection appropriate to these reaches.

Fuel Delivery and Storage, Fuel and Utility Pipelines – Evaluate the impacts of coastal inundation and coastal and river erosion on buried or above-ground utility and oil pipelines. Evaluate the impacts of sea thawing permafrost on existing buried or above-ground pipelines. Evaluate the impacts of thawing permafrost and erosion on shoreline and river-side fuel delivery, storage, and piping.

Harbors - Evaluate the impacts of increased siltation in harbors stemming from glacier melt and flooding events.

Highways, Roads, Bridges and Sidewalks (HRBS) - Evaluate and address damage to HRBS from thawing permafrost and temperature changes. (Building on permafrost in the first place changes the temperature profile of the permafrost. This effect needs to be netted out from the temperature effects related to greenhouse gas-induced climate change.) Evaluate and address damage to and loss of HRBS from coastal and river erosion. Evaluate and address buckling and submersion of boardwalks in village communities. Evaluate and address damage to HRBS from glacier melting, flooding, avalanches, and debris flows.

Landfills - Evaluate the current and future flooding and erosion impacts to dumps and landfills caused by storm surges for communities most vulnerable along shorelines of rivers and seas.

Navigational Hazards - Identify and evaluate risk from new navigational hazards due to inundated underwater structures.

Water, Sewer and Storm Water Systems - Evaluate the current and future flooding and erosion impacts from climate change (thawing permafrost and flooding and erosion from storm surges) on water and sewer facilities for communities most vulnerable along shorelines of rivers and seas. Investigate the contamination impacts from flooding on surface water and well water sources for drinking water and sewage lagoons. Evaluate the public health impacts due to contamination of public drinking water and surface water from climate change related storm surge, coastal inundation or erosion on dumps, landfills and sewage lagoons. (*Relevant to Health & Culture TWG*).

Specific engineering and structural codes or standards to potentially modify:

Airports and Landing Strips - Develop new standards for developing airport and landing strips in light of climate change impacts. Develop a comprehensive airstrip maintenance plan to address issues associate with climate impacts (thawing permafrost, ice, heavy precipitation, flooding, vegetative growth, etc...). Re-evaluate current icing and ice control methods due to more ice from longer seasonal transition periods. Evaluate and address dangerous flying conditions associated with icing, coastal fog, and non-traditional storms.

Buildings - Establish a mechanism to evaluate and recommend new design standards for structures (and placement of mechanical and electrical equipment) that may be vulnerable to climate change related hazards.

Coastal and River Shorelines - Evaluate structural and non-structural options for beach protection (flood walls, dune restoration and creation, and periodic beach nourishment). Evaluate existing shoreline protection structures to determine their effectiveness under varying sea level rise and the need for modification/ replacement/ abandonment. Review available federal, state, and local shoreline protection programs and recommend how each could be modified to address future changes in seas level rise with respect to infrastructure and other land assets.

Design Standards for Floods - Incorporate projected climate change considerations into the design storm event, and the design criteria applicable to vulnerable infrastructure. Revise design standards to address lower probability events (e.g. some cities are protecting to the 500 year event rather than the 100 year event because of the increased vulnerability). Evaluate the need to raise or redevelop structures to a defined elevation above the base flood elevation. Such action would need to be based on compliance with climate change-proofed comprehensive standards/codes; base flood elevation refers to the 100-yr flood incorporating sea level rise considerations.

Dikes, Levees, Seawalls and Similar Structures - Evaluate the effectiveness of hard structural options such as dikes, levees, floodwalls, saltwater intrusion barriers and install these options based upon effectiveness and feasibility.

Fuel Delivery and Storage, Utility and Fuel Pipelines - Develop new standards for the future development of shoreline and river-side fuel delivery, storage, and pipeline facilities (*Also relevant to Health & Culture TWG*). Develop appropriate standards for the future development of buried and above-ground utility and oil pipelines taking into account sea level rise, coastal and river erosion, and thawing permafrost.

Harbors - Develop measures to minimize the impacts of siltation in harbors stemming from glacier melt and flooding events.

Highways, Roads, Bridges, Sidewalks - Strengthen design codes for bridges, roads, and highways, to account for climate impacts.

Landfills - Develop new standards for the future development of landfills that will address impacts associate with climate change such as sea level rise, thawing permafrost, and more intense storms.

Navigational Hazards - Develop operational protocols that specify disclosure requirements for this coastal hazard. Develop retreat strategies for the management of existing structures or conditions that may become submerged hazards to navigation or public health (e.g. effluent outfalls, water intakes, septic fields, rock walls, docks, and piers).

New Transportation Modes - Develop new modes of transportation that can travel across the altered rural landscape. Develop nautical vessels capable of navigating rivers during times of low water flow and flooding events. Provide rural public transportation across new and existing rural transportation routes to more efficiently move people and freight across the altered rural landscape. (*Relevant to EA TWG*).

Piers and Wharves - Review construction standards for piers and wharfs for wave strength. Increase construction protocols/conventions for piers and wharves for wave strength. Sea ice will impact offshore resource development and marine supply to coastal villages. This is of special importance for the Bering, Chukchi and Southern Beaufort Seas. Create new standards for floating piers to accommodate both lower water flow and flooding events. Create new standards for floating piers to accommodate both higher water levels and flooding events. (both statements okay?)

Water, Sewer and Storm Water Systems - Develop new standards for designing water and sewer systems that will address future conditions caused by climate change. Evaluate and improve capacity of storm water infrastructure in areas subject to increasing high intensity rainfall events.

Integrate climate change considerations into planning for emergencies, new public infrastructure, community land use and facilities. Use zoning, setbacks and other land management tools to prevent location of new public infrastructure and critical facilities in high hazard areas.

Specific tasks could include:

Emergency and Disaster Planning - Community emergency and disaster plans, including designating emergency evacuation routes, must incorporate climate change hazards and vulnerabilities. Require municipalities to have written and operational disaster response plans that are updated at least every 5 years, and that include consideration of likely changes in the frequency and intensity of extreme events due to climate change. Re-evaluate evacuation routes in light of climate change and modify as necessary. Synchronize future design with emergency planning and evacuation infrastructure requirements.

Community Planning - Integrate climate change considerations into community comprehensive, land use and facility planning. Consider developing a prototype Community Adaptation Plan for community use to ensure climate change considerations and related hazards and vulnerabilities are considered. Do not site public infrastructure and critical facilities in high risk areas identified in the vulnerability analysis. Provide funding and enforce requirement for municipal governments to enact comprehensive plans. Include an evaluation of the significance of threatened historical structures and develop plans for their relocation and/or protection. Use LEED standards for new building construction to reduce heat generation. Develop new, or expand current storm water management facilities and systems to address increased precipitation and possible flooding.

Community Development Setbacks and Related Tools - Community and state planning should include and enforce setback ordinances/no-development zones for high hazard areas. Investigate potential and limitations of shoreline erosion buffers, eminent domain, vesting, grandfathering, purchase of development rights, and amortizing strategies to limit development in high hazard areas.

Transportation Planning - Ensure climate change is considered as part of update and review of Alaska's State Transportation Plan and regional plans (e.g. Southeast Alaska Transportation Plan Update). Review Department of Transportation's Future Corridors Initiatives to insure it appropriately addresses climate change. Require/Enable Metropolitan Planning Organizations to take climate into account. (Anchorage MATS

<http://www.muni.org/transplan/amats.cfm> Fairbanks Metropolitan Area Transportation System (FMATS)

<http://www.dot.state.ak.us/nreg/planning/fmats/index.shtml>

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