 November 3 working draft - PI TWG Catalog of Policy Options

There are 7 policy options, listed below, in this November 3 version of the catalog.
I believe that each could be preceded by, "It is a policy of the State of Alaska to…"

1. Set a consistent context for adaptation policy setting and analysis by documenting and describing the changes occurring and likely to occur due to climate change in Alaska. *(Relevant to Research Needs Advisory Group.)*
2. Develop an observation network to document the current condition of public infrastructure in Alaska.
3. Systematically assess the level of risk to existing public infrastructure due to climate change conditions and hazards.
4. Coordinate community, transportation and emergency planning to address climate change hazards and vulnerabilities.
5. Establish a decision-making system to determine which infrastructure investments are appropriate, where and why, and how much risk is acceptable to the public.
6. Amend Alaska's educational curricula to include research and development of new standards and codes to site, design and engineer public infrastructure to address climate change conditions and hazards.
7. Maximize the life of and the investment in existing public infrastructure.

There are 14 programs, each nested beneath an overarching policy.

There are many tasks/actions/comments, each representing an implementing idea related to a program.
I added back-in the detail (but with some editing and reorganization) from the October 27 draft catalog so that it is not prematurely lost, per direction from the TWG at our October 31 teleconference meeting. Remember, the programs and tasks/actions/comments will eventually become supporting narrative in a 2-4 page policy option paper that we recommend to the AAG and subcabinet.

POLICY OPTIONS	**PROGRAMS**	**TASKS, ACTIONS and COMMENTS**
1. Set a consistent context for adaptation policy setting and analysis by documenting and describing the changes occurring and likely to occur due to climate change in Alaska. *(Relevant to Research Needs Advisory Group.)*		
	1A. Create clear narrative and visuals that describe and depict the range of impacts that Alaskan regions are currently, and will increasingly experience over time due to climate change.	
	1B. Monitor, map and disseminate climate change data. Develop and maintain a system for comprehensive surveillance, monitoring, documentation, and dissemination of rates and locations of climate change indicators. Data is desired in real time, though quality control needs are recognized.	Desired data includes, but is not limited to, higher temporal and spatial resolution of sea and river ice forecasts to enhance sea and river barge traffic and safety of winter travel in roadless areas, current floodplain maps, and current detailed mapping of the offshore environment. The latter is needed because storm surge models used to predict flooding and wave activity during storms *depend on* detailed measure of water depths and the form of the underwater environment.

2. Develop an observation network to document the current condition of public infrastructure in Alaska.		
	2A. Establish an inventory of potentially impacted infrastructure and maintain this database relative to emerging projected sea level rise findings.	This is a first step in scoping relevance/viability of potential adaptation options. ISER-UAA has a public infrastructure database that was created to assess climate risk. See Larsen et al (2008) and Foster and Goldsmith (2008) for more info.
3. Systematically assess the level of risk to existing public infrastructure due to climate change conditions and hazards.		
	3A. Catalog natural resource hazards, including primary and derivative (secondary) hazards that will be created or amplified by climate change.	This data is needed to conduct a vulnerability analysis and to develop new site, design and engineering standards for public infrastructure. Recognize the high degree of regional variation.
	3B. Conduct a systematic vulnerability analysis of the risks to public infrastructure from the hazards occurring and expected from climate change. Identify facilities at high, medium and low risk.	Identify public and quasi-private systems and facilities at serious risk due to climate change and initiate a system for siting such facilities away from vulnerable areas. This should include critical facilities that may be privately owned, such as power stations, hospitals, etc, as well as important cultural resources such as clan houses and museums. *Specific infrastructure vulnerabilities to assess:* <u>Airports and Landing Strips</u> - 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. <u>Buildings</u> - 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). <u>Coastal and River Shorelines</u> - 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. <u>Fuel Delivery and Storage, Fuel and Utility Pipelines</u> – 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. (R*elevant to Health & Culture TWG.)*
4. Coordinate community, transportation and emergency planning to address climate change hazards and vulnerabilities.		
	4A. Help ensure local government decisions, investments and planning incorporates climate change considerations by sharing hazard and vulnerability data in a timely manner with local governments and leaders in an actionable format.	Set up a process and platform to regularly provide the narrative and visuals on climate change and related natural resource hazards to local leaders and decision-makers in a format that can be used and is actionable. This is needed for everything from informing and guiding local public works and enterprise-funded projects to locating emergency evacuation routes to local community and facility planning and more. Create on-line mapping capability for multiple audiences including local governments (SNAP program at UAF is working on this).
	4B. Efficient and effective community planning will integrate emergency and disaster, land use, transportation and facility planning. Comprehensive community and adaptation planning such as this is needed to ensure	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.

	infrastructure investment and siting efforts do not occur in isolation or without the benefit of updated hazard mapping and vulnerability analysis.	*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
	4C. Identify public infrastructure and related needs due to increased ice free periods in the Arctic Ocean and Beaufort Sea and increased transshipment and commercial use.	Evaluate the potential opportunities, risks, and needs associated with reduced sea ice and new shipping lanes opening up in the Arctic Ocean and Bering Sea. Consider establishing a container port facility in Nome, Barrow or Prudhoe Bay, linked by rail, to the continental interior. Without this, opportunities associated with increased arctic shipping will not be realized by Alaska. Monitor shipping lanes through the Arctic Ocean and Bering Sea for

		ice melt, glacier melt, and related navigation problems. 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. Address national security concerns associated with new shipping lanes in the Arctic Ocean and Bering Sea. (R*elevant to EA TWG.)*
5. Establish a decision-making system to determine which infrastructure investments are appropriate, where and why, and how much risk is acceptable to the public.		
	5A. Develop a rational basis for determining priority public investments to prevent or reduce impacts to public infrastructure from climate change. The state needs a decision-making process and criteria to determine whether public funds should be spent and repairs made to existing public infrastructure, or, if relocation of the infrastructure is more appropriate.	Develop criteria to guide the prioritization of public infrastructure investments in order to prevent or reduce impacts due to climate change. Consider establishing a hierarchy for the types of public infrastructure to protect or relocate first (for example, public drinking water and sanitation).
	5B. Establish a single, cabinet-level, one-step review process to help ensure that public infrastructure investment decisions take climate change into account and are consistent.	Coordinate public infrastructure investment decisions of tribal, local, state and federal governments. (The COE, Denali Commission, ADEC, others are discussing a concept like this now.) Recognize that different strategies and approaches may apply in large municipal, small municipal and rural communities.
6. Amend Alaska's educational curricula to include research and development of new standards and codes to site, design and engineer public infrastructure to address climate change conditions and hazards.		
	6A. Develop university, community college, vocational-technical, and community-based education programs and curriculum on planning, design, engineering, construction and hazard mitigation standards and techniques that address climate change and related hazards.	Modify standards and codes for siting, design, engineering, and operations to prevent or reduce impacts of climate change on public infrastructure. Do the same for maintenance and increase building inspection effectiveness as part of the strengthened codes and practices. Develop probabilistic design tools for public infrastructure systems. *Specific engineering and structural codes or standards to potentially modify:* <u>Airports and Landing Strips</u> - 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. (R*elevant 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.
	6B. Develop a suite of low-technology, soft structural/bio-engineered construction, and best management techniques for Alaska's rural areas to mitigate, prevent and avoid impacts from climate change related hazards.	Evaluate the effectiveness of soft structural options such as dune restoration and creation, wetland restoration, periodic beach nourishment, temporary barriers and other options and implement the best options based upon effectiveness and feasibility. Look to protect natural coastlines, riverfronts, improve drainage, and reduce storm water retention through use of low-technology, soft structural/bio-engineered options such as vegetative solutions; building on skids; better use of natural swales, wetlands and reduced paving; use of soft protection options such as dune restoration and creation, wetland restoration, and periodic beach nourishment, and more. Approaches that reduce required energy and have less technical maintenance requirements are more sustainable.
	6C. Enhance public education programs aimed at informing the public about climate change and coastal hazards.	Create and use standardized community education materials on hazards that addresses the relationship between climate variability and climate change
7. Maximize the life of and the investment in existing public infrastructure.		
	7A. Ensure continued access to and use of existing public infrastructure, as well as providing for its increased resilience, in the face of changing climate conditions.	Implement strict maintenance regulations for existing infrastructure in high hazard/vulnerable zones. Protect threatened infrastructure by mitigation, retrofit, stabilization, preparing emergency plans, and enhancing viability. Invest to protect infrastructure that is at high risk first, then medium and low risk