



Catalog of Adaptation Actions and Policy Options
Other Economic Activities (EA) Technical Working Group (TWG)
DRAFT: October 5, 2008

POTENTIAL CRITERIA FOR RATING OPTIONS

1. *Significance*: Describes the importance of the option to the state's economy. How critical is it to the overall health of the state's economy that this option be implemented? How important is it to other intangible issues such as social justice, the viability of small or rural communities, historical ways of life, biodiversity, etc.?
2. *Benefits and effectiveness*: Compares vulnerability of not carrying out the option to vulnerability if the option is implemented. This difference in vulnerability can be thought of as the primary benefit of the adaptation option. In addition, ancillary or co-benefits should be considered if the potential state action provides benefits to other sectors or for other policy objectives. This criterion also evaluates whether a policy provides benefits in only the short-term or over the longer term as well. This criterion also includes the concept of flexibility: will the proposed state action be adjusted in response to changing conditions or will it be effective under different plausible climate scenarios? (e.g., no regrets if the option is implemented and changes don't occur or occur differently than anticipated)
3. *Costs*: Addresses whether an option is relatively expensive or inexpensive. Typically, cost includes the initial costs of implementing a potential state action. However, costs over time, such as operation and maintenance, administration and staffing, expected frequency of reconstruction can also be considered, as should non-economic and non-quantifiable costs. For example, costs such as a reduction in viable habitat for significant species, loss of coastal wetlands, or an increased impact on human health should be considered along with more traditional costs.
4. *Feasibility*: Addresses whether the state can realistically implement the proposed action. Is it within state authority or is it more appropriately the role of the federal government, localities, businesses, etc? Do the necessary legal, administrative, financial, technical, and other resources exist, and are they available for use on this proposed state action? Will the action take a great deal of time to be implemented, or can it be quickly implemented?

5. *Timing of Impact*: Assesses whether the action is needed in response to likely immediate impacts (e.g., thawing ice and permafrost) vs longer term impacts (e.g., colonization of invasive species). Options that respond to impacts already occurring or projected to occur in the near future may merit greater consideration than those that address longer-term impacts.

6. *Adaptive capacity*: Describes the ability of a human or natural system to cope with the consequences of climate change. Some systems can accommodate changes in climate without significant intervention while other systems cannot. For example, most hard infrastructure, such as roads, bridges, coastal buildings, etc. cannot alter their alignment, elevation, or structural foundation to accommodate coastal erosion or increased flood risk. On the other hand, farmers have historically responded to natural climate change by changing farming practices, crops planted, etc. Consequently, adaptive capacity may be lower for hard infrastructure than for agriculture.

Please rank the following options across all categories as high, medium, or low based on consideration of the above criteria. Please do not rank more than 7 as “high.” Add notes for explanation where necessary.

Option No.	Adaptation Action/Policy Option (includes regulatory and management options)	Notes	Priority for Analysis
EA-1: Oil and Gas			
1.1	Expand research on ice road and pad construction techniques and in-season monitoring to maximize seasonal use and minimize impacts.	- For example, this research could focus on insulating ice pads for extended use	
1.2	Develop long range infrastructure development and maintenance plan	- Roads, man-made shorelines, and other infrastructure maintenance needs may increase.	

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1.3	Model coastal vulnerability to establish criteria for pipeline coastal transition set-backs and burial depths and develop shoreline change adaptation public policy, guidance for preventive and mitigative measures, and knowledge of who pays for what	<ul style="list-style-type: none"> - Currently there are funding streams to respond to spills/hazmat releases due to coastal erosion, but unless there is an “imminent threat” these funding mechanisms cannot be tapped. - This section should explore options to change such policies at the fed/state level to expend funds for more preventive measures. 	
1.4	Explore use of modeling to project new species ranges and consider stresses on species; confirm with on-the-ground knowledge	- May be option for Natural Resources TWG	
1.5	Use R&D funds to model sea ice and develop new techniques to clean up spills in icy waters	- The state should leverage already existing efforts in this area	
1.6	Consider how potential rise or decline of oil and gas operation and maintenance may affect state revenues	<ul style="list-style-type: none"> - How does cost of operating pipeline affect revenue to state? AK pays 25% of cost of operating pipeline through tariffs. - Within this option, consider management of potential disruptions to oil and gas exploration and examine policies to continue oil and gas flows 	
1.7	Expand research on climate change impacts on permafrost engineering design.	- For example, research and consider use of thermosyphons or other technologies to maintain permafrost	
1.8	Prioritize coastal remediation in places that pose the greatest threat to humans.		

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EA-2: Mining			
2.1	Examine and research cost-effective techniques for construction, operation, and reclamation that will be responsive and useful in changed environmental conditions	<ul style="list-style-type: none"> - Consider longer growing season to establish revegetation to stabilize reclaimed areas. - Operators and regulators will need to consider future environmental conditions. - The State’s Large Mine Permitting Team (LMPT) under ADNR direction should work with mine operators. - This option includes both available techniques and potential development of new techniques - Applicable to other aspects of construction in Alaska. - Encourage research for design and application of new liner materials and other technologies - Consider costs and types of energy for mining in remote areas (state energy plan consideration). 	
2.2	Conduct education for operators on new methods identified from research	<ul style="list-style-type: none"> - ADNR place mine permitting staff and LMPT should be involved in facilitating these training opportunities. 	
2.3	Research cost effective methods to monitor changes and develop flexible strategies to address the conditions reasonably expected to occur with climate change	<ul style="list-style-type: none"> - ADNR and LMPT should work with miners on best, cost effective methods to monitor changes and develop flexible strategies to address the conditions reasonably expected to occur with climate change - Provide sufficient/increased trained technical staff (e.g., ADNR) to monitor active placer and large hardrock mines and reclamation and closure progress 	

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2.4	Encourage research and engineering applications for tailings storage in Arctic/Subarctic climates at UAF school of Mines & Engineering	- Opportunity for cooperative efforts by industry, government and university to address these challenges	
2.5	Review current regulations and compliance criteria for managing tailing dams and disposal sites and determine if changes are necessary	<ul style="list-style-type: none"> - LMPT and industry could review. - Each project will have unique challenges based on the site conditions - Regulations should address compliance criteria, but not how to comply; cooperative efforts between mine operators and LMPT regulators should be encouraged to find cost effective solutions. - Compliance criteria could include monitoring of permafrost or related ground conditions at specific sites 	
2.6	Examine opportunities for mining in newly exposed areas		
2.7	Develop long range infrastructure development and maintenance plan for mining	- Consider river barging as an access option for increased mining infrastructure development	
2.8	Develop economic analysis of potential rise or decline of mining and impact on state revenues		
2.9	Consider changes in baseline conditions that may result from climate change and how this will affect standards that are floating based on that baseline.	<ul style="list-style-type: none"> - Baseline conditions may change over the life of a project, which should be taken into account as the project is monitored - Consider sedimentation and other environmental conditions 	
EA-3: Ocean Transportation			
3.1	Increase Coast Guard search and rescue, navigation safety, inspection and prevention, enforcement and icebreaking capabilities in the Arctic		
3.2	Plan, finance, and build basic shipping infrastructure, including port planning and design, to support increased shipping, fishing, mining, offshore drilling, tourism	<ul style="list-style-type: none"> - The opening of new sea routes may create new options for port sites - This could also be an option for the Public Infrastructure TWG to consider 	

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3.3	Develop an understanding of inventories of fish stocks that may be related to shipping changes and implement reliable regulations and limitations on harvests as needed	<ul style="list-style-type: none"> - Establishing inventories of stocks and fluxes of resources may be an option for Natural Resources TWG - Consider changes to invasive species as well 	
3.4	Monitor impacts of shipping on environment, hunting, fishing and communities	<ul style="list-style-type: none"> - This could include impacts of increased invasive species 	
3.5	Ensure oil spill response and clean up capabilities	<ul style="list-style-type: none"> - Is this covered under existing regulation (non-tank vessel plans)? - This option could potentially be combined with recommendations from the Oil and Gas TWG. 	
3.6	Develop economic analysis of potential rise or decline of shipping and impact on state revenues		
EA-4: Rural Non-Road Transportation			
4.1	Consider issues of traditional transportation between villages (e.g., more drowning, losing machines)		
4.2	Consider expansion of river barging due to expanded open season		
4.3	Consider expanded use of rural air strips		
EA-5: Other Economic Sectors			
5.1	Establish federal “all perils” insurance guarantee program		
5.2	Reward climate protection at residential and commercial properties		
5.3	Encourage private insurers, as investors, and the state pension funds to consider climate impact prevention in the prudent investment of portfolios and to invest in climate science as a ‘present value of avoided costs’ strategy		
5.4	Explore potential of insurance industry to contribute to funding as beneficiaries of reduced risk		
5.5	Identify incentives for private investment in creating ‘climate safe’ development		
5.6	Anticipate and address increased insurance costs		

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5.7	Consider future income for selling carbon credits and offsets	Recommend to Mitigation Advisory Group	
5.8	Assess permit needs for safe drinking water and sanitation in villages		
5.9	Consider prescribed fire as an approach for wildfire control	Could be an option for the Natural Resources TWG to consider	
5.10	Explore, install, permit new wind, geothermal, solar, and other renewable energy projects	Recommend to Mitigation Advisory Group	
5.11	Explore possibilities for new hydroelectricity sources	Recommend to Mitigation Advisory Group	
5.12	Consider how climate change will impact the application of federal laws on specific economic development efforts	E.g. Endangered Species Act	
5.13	Develop economic analysis of potential rise or decline of commercial fishing		
5.14	Develop long range infrastructure development and maintenance plan for commercial fishing		
EA-6: Tourism and Recreation			
6.1	Develop economic analysis of potential rise or decline of tourism and impact on state revenues		
6.2	Consider allowing use of higher elevation lands for skiing based on changes to snow		
6.3	Study cost of snow production		
6.4	Explore alternative winter tourism options, considering the benefits of warmer, but sub-freezing temperatures, for selected locations		
6.5	Address road, airport, bridge maintenance and other public infrastructure needs to support tourism		
6.6	Consider extension of services and marketing for a longer summer season		
6.7	Consider need to change or develop permit and changed itinerary requirements due to changing climate conditions		
6.8	Address tourist issues from wildfire smoke and increased risks of drowning		
6.9	Locate/re-locate visitor centers		
6.10	Expand cruise tourism infrastructure into Arctic Ocean		

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6.11	Develop long range infrastructure development and maintenance plan for tourism and recreation		
EA-7: Boundaries and Ownership			
7.1	Advocate for Law of Sea Convention Treaty provisions	- The Law of the Sea Convention provides nations a basis to extend their sea floor resource rights beyond the foot of the continental slope if they meet certain geological criteria backed up by scientific data. The U.S. has not yet ratified this treaty.	
7.2	Conduct field research re: boundaries and use of Outer Continental Shelf		
7.3	Improve mapping and surveying to accurately and efficiently establish boundaries, address boundary disputes as needed and aid charting for safe navigation		
7.4	Establish new boundaries to manage river erosion and property impacts		
7.5	Reinstate a fully effective Alaska Coastal Zone Management program to reduce unwise investments along the coast	Possible linkage to EA-1.3	
7.6	Review the state policy on boundary change, with a focus on fixed versus migratory boundaries		
7.7	Participate in international forums dealing with Arctic issues (e.g. resource management, boundaries, shipping, etc.) to better inform U.S. delegations on the desires/needs/interests of the State and its native populations		
EA-8: Energy Demand			
8.1	Examine options for alternative energy sources (e.g., wind)	- May be option for Mitigation Advisory Group	
EA-9: Evolving Alaska's Jobs and Economy			
9.1	Conduct long and short term jobs analysis to identify which sectors/occupations will be positively/negatively impacted, with an eye towards job creation opportunities at all levels, including community		

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9.2	Re-tool education and job training programs for new workforce to take advantage of green economy growth		
9.3	Make Alaska a world leader in the climate adaptation field: engineering and design services, climate-sensitive infrastructure systems, etc.		
9.4	Promote activities that will promote climate change adaptation and the responsible use of state resources through education and outreach	- State's ability to conduct adaptive activities will be dependent on continued responsible use of state's resources, including training additional resources - these capabilities may be promoted through universities	
EA-10: Information Collection and Dissemination			
10.1	Invest in monitoring and data dissemination programs to enhance information available for safe and efficient resource development		
10.2	Allocate a portion of major public works investments toward monitoring, data dissemination, and analysis of climate and other environmental data		
10.3	Continue to refine the "Cost of Climate Change" study recently completed by the UAA Institute for Social and Economic Research		
10.4	Identify climate trends and downscale models leading to establishing environmental information, analysis tools, and design criteria for use in adapting to climate change.	- This option could include updating the environmental atlas of AK with chapter on adapting to climate change.	
10.5	Provide resources for good Digital Elevation Model (DEM) and GIS data, and current and high resolution imagery to establish a more robust information infrastructure to plan and adapt	- Link to UAF and their imagery data. - Need as close to real time as possible need permafrost, temp, sea level trends - This is an overarching option that applies to many sectors	