

**Catalog of Vulnerabilities, Impacts, Opportunities and Adaptation Options  
Other Economic Activities (EA) Technical Working Group (TWG)  
Draft #2**

~~Red text~~ are deletions

Highlighted text are additions

Green text are comments, notes or questions

ISSUE	Vulnerabilities, Impacts, Opportunities	Option No.	Adaptation Action/ Policy Option	Notes
<b>Oil and Gas</b>		<b>EA-1</b>		
<b>Onshore</b>	Reduced ice road, tundra travel, ice platform opportunities	<b>1.1</b>	Expand research on construction techniques and in-season monitoring.	
<b>Onshore</b>	Possible extensive onshore development associated with worldwide energy and resource demands. Need for supporting infrastructure	<b>1.2</b>	Develop long range infrastructure development plan	
<b>Onshore</b>	Affect on coastal communities caused by flooding	<b>1.3</b>	Need sea level rise - adaptation public policy, guidance for preventive and mitigative measures, knowledge of who pays for what	
<b>Onshore</b>	Reduced efficiency of gas compression			<i>increased horsepower requirements and fuel consumption</i>
<b>Onshore</b>	Animal behavior and distribution changes			

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Onshore	<del>Migration of contaminants from flooding of gravel pads</del>			<i>Would seem to be an issue mostly in areas of warm permafrost where there is little O&amp;G activity</i>
Onshore	Increase in gravel required for new pads to contain seasonal thaw depth			
Onshore	Advancing limits of vegetation, increased logging			
Onshore	Conditions more favorable to agriculture, biofuel industry			
Onshore	Fishing industry changes in arctic regions			
Onshore	Flooding and shore erosion, North Slope oil field facilities			
Onshore	Changing river hydraulics, flooding deposition as glaciers melt			
Offshore	Possible extensive offshore development			
Offshore	Animal behavior changes			
Offshore	Increased oil spill risk from increased activity			<i>Risk to individual activities should go down with less ice</i>
Pipeline	Sea level rise and coastal erosion impacts			

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<b>Pipeline</b>	Thawing permafrost affects buried or above-ground pipelines			<i>Possible increased pipeline tariff affection state revenues; Possible increased pipeline maintenance; Increased risk of landslides, liquefaction, etc; Possible cooling of crude oil temperatures caused by ground water flow</i>
<b>Existing Infrastructure</b>	Coastal infrastructure, old wells and waste pits submerged and breached			
<b>Existing Infrastructure</b>	Uncertainty in engineering design criteria (heating/cooling indices, soil bearing capacities, precipitation, wave intensity, river flows, etc.)	<b>1.4</b>	Monitor climate trends and downscale models to establish engineering environmental design criteria.	<i>This option applies to most sectors</i>
<b>Existing Infrastructure</b>	Regulatory changes (cap and trade, endangered species, etc.)			
<b>Mining</b>		<b>EA-2</b>		
<b>Placer mining erosion</b>	Longer operating season for placer mines	<b>2.1</b>	Research opportunities for best reclamation practices for changing site conditions	<i>Increase in placer mining activity would increase revenue to the state</i>

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<b>Placer mining erosion</b>	Potential for increased thawing of permafrost	<b>2.2</b>	Regulations for managing placer mining	<i>Regulations protecting the environment should continue to be based on sound science; Regulations should address compliance criteria, but not how to comply</i>
<b>Placer mining erosion</b>		<b>2.3</b>	Monitoring of active placer mines and reclamation progress by ADNR should be staffed sufficiently for the increase in activity.	<i>Placer miners will need to address the changing conditions to remain in compliance</i>
<b>Tailings dams and disposal sites</b>	Reduced freezeback for tailings dams and modifications to disposal sites	<b>2.4</b>	Encourage research and engineering applications for tailings storage in Arctic/Subarctic climates at UAF school of Mines & Engineering	
<b>Tailings dams and disposal sites</b>	Tailings disposal, design and planning can be optimized to provide insulating layer(s) (tailings or other materials) to minimize potential seepage	<b>2.5</b>	Monitoring of active mine operations, mine reclamation and closure progress by ADNR should be staffed sufficiently	

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<b>Tailings dams and disposal sites</b>	Seasonal aspects of TSF construction planning can be optimized by applicants	2.6	Regulations and compliance criteria for managing tailing dams and disposal sites	<i>Current regulations protecting land and waters should not be lessened. Each project will have unique challenges based on the site conditions; Regulations should address compliance criteria, but not how to comply; Compliance criteria could include monitoring of permafrost or related ground conditions at specific sites</i>
<b>Tailings dams and disposal sites</b>	Encourage research for design and application of new liner materials			
<b>Access to exploration</b>	Glacier melting exposes new areas to exploration			

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<b>Mining access</b>	Reduced season for ice roads	<b>2.7</b>	Ensure adequate level of trained technical staff is in place to monitor increase in activities.	<i>Impacts could lead to increase in mineral exploration activities with longer season, which could lead to more discoveries and overall mining activity – and increased revenues from mining</i>
<b>Mining access</b>	Longer barging season on rivers			
<b>Mining access</b>	Longer “summer” construction season			
<b>Mining access</b>	Reduced season for overland access on frozen ground conditions			
<b>Ocean Transportation</b>		<b>EA-3</b>		
<b>Increased shipping opportunities and needs</b>	Open shipping lanes due to less Arctic ice	<b>3.1</b>	Increase Coast Guard, rescue, navigation and information assistance	
	Longer winter summer access to north seas	<b>3.2</b>	Finance and build basic shipping infrastructure	
		<b>3.3</b>	Monitor impacts of shipping on environment, hunting, fishing and communities	
		<b>3.4</b>	Ensure oil spill response and clean up capabilities	<i>Is this covered under existing regulation (non-tank vessel plans)?</i>
		<b>3.5</b>	Examine need for new standards and regulations	

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<b>Ocean Recreation</b>	Increased cruise and recreational traffic			
<b>Rural Non-Road Ground Transportation</b>		<b>EA-4</b>		
<b>Ice Road Impacts</b>	Reduction in season length			
<b>Other Business Impacts and Opportunities</b>		<b>EA-5</b>		
<b>Other Business Impacts (e.g., Insurance)</b>	Individual and government insurance impacts	<b>5.1</b>	Federal "all perils" insurance guarantee program	
		<b>5.2</b>	Reward climate protection at residential and commercial properties	
		<b>5.3</b>	Encourage private insurers, as investors, and the state pension funds to consider climate impact prevention in the prudent investment of portfolios.	
		<b>5.4</b>	Explore potential of insurance industry to contribute to funding as beneficiaries of reduced risk	
		<b>5.5</b>	Create incentives for private investment in creating 'climate safe' development	
		<b>5.6</b>	Anticipate and address increased insurance costs	
		<b>5.7</b>	Encourage private insurers to invest in climate science as a 'present value of avoided future costs' strategy.	
		<b>5.8</b>	Consider future income for selling carbon credits and offsets	
	Wild land fire increase			<i>Need for more fire fighting, increased health hazard from smoke</i>

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<b>Energy Supply Impacts</b>	Increased demand for new and diversified energy sources	<b>5.9</b>	Explore, install, permit new wind, geothermal, solar, and other renewable energy projects	
<b>Regulatory Changes</b>	Increased need for related permitting, siting, regulatory changes	<b>5.10</b>	Address increased staffing and data needs in regulatory agencies	
	Increased energy costs from regulatory changes (carbon tax or similar)	<b>5.11</b>	Assess permit needs for safe drinking water and sanitation in villages	
<b>Tourism and Recreation</b>		<b>EA-6</b>		
		<b>6.1</b>	Develop economic analysis of potential decline of tourism and impact on state revenues.	
<b>Downhill Skiing</b>	Less snow, less cold weather	<b>6.2</b>	Consider use of higher elevation lands for skiing	
		<b>6.3</b>	Study increased cost of snow production	
<b>Other winter tourism</b>	More comfortable temperatures for some locations	<b>6.4</b>	Study likely impacts on winter tourism	
		<b>6.5</b>	Consider benefits of warmer, but sub-freezing temperatures, for selected locations	
		<b>6.6</b>	Explore alternative winter tourism options	
		<b>6.7</b>	Address road, airport, bridge maintenance needs to support tourism	
<b>Summer and shoulder seasons</b>	Damaged roads, diseased or dying forests, smoke	<b>6.8</b>	Market longer summer season, deal with damages and health	
		<b>6.9</b>	Extend services for longer season	
		<b>6.10</b>	Permit and other changed itinerary requirements	
		<b>6.11</b>	Address tourist health issues from smoke	
		<b>6.12</b>	Locate/re-locate visitor centers	



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		<b>6.13</b>	Expansion of cruise tourism into Arctic Ocean	
<b>Boundaries and Ownership</b>		<b>EA-7</b>		
<b>Outer Continental Shelf</b>	Arctic countries surveying and "laying claim" to Arctic Ocean submerged lands	<b>7.1</b>	Advocate for Law of Sea Convention Treating provisions	
		<b>7.2</b>	Conduct field research re: Outer Continental Shelf	
<b>Boundary Adjustments</b>	Coastline changes and property ownership – e.g., state/federal changes	<b>7.3</b>	Establish new boundary dispute protocols as needed	
	River erosion and property impacts	<b>7.4</b>	Establish new boundaries	
	Changes in ownership of submerged lands			
<b>Energy Demand</b>		<b>EA-8</b>		
<b>Costs to Businesses</b>		<b>8.1</b>	Reductions in winter fuel needs	
		<b>8.2</b>	Reductions in peak demand	
		<b>8.3</b>	Increase in summer demand for cooling	
<b>Evolving Alaska's Jobs and Economy</b>		<b>EA-9</b>		
		<b>9.1</b>	Long and short term jobs analysis to identify which sectors/occupations will be positively/negatively impacted, with an eye towards job creation opportunities	
		<b>9.2</b>	Education and job training programs to re-tool workforce to take advantage of green economy growth	
		<b>9.3</b>	Make Alaska a world leader in the climate adaptation field: engineering and design services, climate-sensitive infrastructure systems, etc.	