

HARC Online Workshops > Vulnerability > Introductory comments from one moderator

Post Title: Introductory comments from one moderator

Posted by: *Lee Cooper* at 8:34 PM 4/19/2002

On behalf of myself and my co-moderator, Anne Jensen, thank you for your interest in contributing to this on-line discussion. I got on the forum to post some introductory comments prior to it starting on Monday, and found that people have already started in, so you have made our job easier. Many of the themes that we are working with, including vulnerability and human impacts, are quite intrinsically linked, so it may not be immediately necessary to get distinct introductory comments started for each theme. Maybe in a more general sense, though, ecological vulnerability and how different people view the consequences of environmental change are key points that are handy to start with.

Vulnerability is a key system characteristics that we think must be important in the Arctic. From a physical standpoint, biological recovery to disturbance and biogeochemical cycles in general are slow at high latitudes. Shoreline erosion, permafrost decay, and the retreat of seasonal sea ice are likely to have significant impacts on biological and human communities. What kinds of research will assist Arctic coastal communities in adjusting to these likely changes? Are these research topics going to be simultaneously attractive to both outside scientists and local residents? Local residents are likely to be more practical in their needs. They might like to use the results of scientific research to adjust hunting strategies or to plan community growth so that new buildings are constructed at optimal locations, away from particularly dynamic shorelines or permafrost. Scientists are often funded however to look at bigger scales, such as what are the second order feedbacks of shoreline erosion or how runoff might change water column chemistry. How can we align these different needs in a mutually beneficial way?

Post Title: Re: Introductory comments from one moderator (Lee Cooper)

Posted by: *Tom Dunning Newbury* at 7:22 AM 4/23/2002

Lee, I agree with your comment that the retreat of seasonal sea ice is likely to have significant impacts on biological and human communities. The following are two examples of biological effects and one of a human effect.

The ice in the Northwest Passage separates the populations of bowheads in the Beaufort/Bering and Baffin/Hudson. A US Navy report predicts that the Northwest Passage will be ice free during summer within about two decades. The loss of ice will allow those two bowhead populations to mix more freely than they have for thousands of years. Secondly, the loss of ice in the Beaufort might mean that killer whales prey more frequently on marine mammals in that sea.

I think that the impact will be greatest on communities that harvest ice-dependent marine mammals such as polar bear. The climate models predict, I think, that ice during summer will eventually cover only the area north of the Canadian arctic archipelago. The loss of that much ice during summer will probably have an enormous impact on polar bear because they depend on ice cover for feeding on seals. The impacts on ice-associated marine mammals (e.g., seals and walrus) and ice-tolerant species (e.g., bowheads) are likely to be less pronounced, I think.)

HARC Online Workshops > Vulnerability > Climate Change vs. Status Quo

Post Title: Climate Change vs. Status Quo

Posted by: *Henry Huntington* at 9:10 PM 4/21/2002

Much planning of coastal facilities, etc., assumes that the historical record of weather and hydrology can be used to establish the likelihood of certain extreme events (floods, storm surges, high winds, temperature extremes, etc.). As climate changes, however, this assumption may not be valid. Furthermore, the conditions for which facilities are designed may not be the conditions the facilities actually face. E.g., erosion rates may increase (or decrease), and so on. Can we use our understanding of climate change to help planners account for a potentially larger envelope of possible conditions (at least, larger than has been assumed), and to help evaluate the adequacy of existing facilities?

(In this context, we should probably take "facilities" broadly, and include various activities in the nearshore that may not include structural facilities . . .)

Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)

Posted by: *Kenneth Johnson* at 5:46 PM 4/22/2002

quote:

Much planning of coastal facilities, etc., assumes that the historical record of weather and hydrology can be used to establish the likelihood of certain extreme events (floods, storm surges, high winds, temperature extremes, etc.). As climate changes, however, this assumption may not be valid.

Factors such as sea level rise and extended periods of open ocean, which may influence the extreme events that communities are subjected to, suggest that climate change will have only negative community impacts. However, relatively little is known about other factors that could potentially counteract sea level rise and extended periods of open ocean.

The dynamics of climate change present an increased need for flexibility in community planning, and any related activities.

Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)

Posted by: *Anne Jensen* at 6:30 PM 4/22/2002

Well, perhaps. That is what Manda Lynch's Climate Impacts Assessment project is trying to do. Models are being developed that can be run with various inputs (including those which are more extreme than historical records) and the output of the models will be presented in a way that will be comprehensible and useful to local decision makers.

However, there are a lot of institutional and bureaucratic factors against such use. The National Weather Service has a policy of not forecasting outside of their own historical data, which was part of the reason that the August 2000 storm in Barrow was forecast to be much less severe (particularly in wind speed) than it was. That forecast probably led the captain of the North Slope Borough dredge which was working off Barrow to delay trying to run around Point Barrow and shelter in Elson Lagoon until it was too late, the result being the dredge (not the most

seaworthy of craft in working condition) was half-swamped and drove onto the beach in Barrow and was battered there to the point where it was a total loss. It was towed to Seattle but declared too expensive to repair. So much for beach nourishment. I'm sure similar events have occurred elsewhere. The NWS policy still stands.

As far as construction, there are established design standards, most of which are based, as Henry says, on historical data. Engineers and architects design to meet those standards, to provide some protection from professional liability, if nothing else. Exceeding those standards generally costs more, and for most rural communities cost is critical. Not only that, in most cases funding is coming from elsewhere, and those handing it out may see exceeding design standards as a luxury for which they don't want to pay.

Cost enters into a lot of decisions. For example, Barrow, despite major storm surge events in 1957 & 1963, does not participate in the federal Flood Insurance Program. The explanations given are that: 1) the process of getting the mapping is expensive; 2) many houses lie in the area that would be a flood hazard area if it were in fact defined,; and 3) people couldn't sell or get mortgages on those houses if it were defined.

I'm not sure the last is true, since I know of properties in flood hazard areas elsewhere with mortgages on them. What is required to get the mortgage is to carry federal Flood Insurance. That is very low cost, and it's also the only insurance that will pay for flood damage. Homeowner's insurance almost always excludes floods, as many find out to their horror (and financial detriment) after the flood. I would imagine the situation will change as mortgage lenders realize their exposure (as it has elsewhere regarding underground oil tanks, etc.). As it is now, people can't insure against flood loss.

Post Title: Re: Climate Change vs. Status Quo (Kenneth Johnson)

Posted by: *Henry Huntington* at 7:45 PM 4/22/2002

Kenneth is right that we tend to think only about the negative impacts of climate change, ignoring changes that might be beneficial. But, in the case of events like floods and storm surges, the critical factor is not the average but the extreme. Few of us would feel comfortable predicting that future storm surges will be lower than past ones, even if our models suggest that to be the case. Instead, we recognize the limits of our predictive ability, and factor in variability, thus increasing the envelope of possibilities. Then, we use the worst end of the envelope to plan for problems. That said, we typically don't explore innovative ideas for response or seriously consider major changes. Anne's comments about the Barrow storm are a case in point. One area for research might be the way(s) in which new information is used in decision making and planning, and how community planning might be made more flexible (assuming that increased flexibility produces better outcomes). Some comparative studies across the Arctic and perhaps with areas outside the Arctic might be particularly illuminating.

Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)

Posted by: *manleyw* at 9:45 PM 4/22/2002

The comments here certainly relate to the hazards of coastal erosion in high latitude settings. Rates higher than 5 m per year have been documented for some Arctic sites, and coastline erosion is the greatest environmental concern for many Arctic communities. We can address these concerns by modeling environmental impact into the future based on relatively long-term historic measurements. But there is some evidence that erosion is *accelerating*, influenced by

unprecedented Arctic warming, increased thaw depths, and diminished summer sea ice (with increased fetch and wave energy).

For example, studies by Jerry Brown and Steve Solomon suggest increased erosion rates over the last decade or so along the Beaufort Sea coast. Analysis of time-series aerial photography provides a way of directly measuring recent change. But more needs to be done, with finer temporal resolution, to test for accelerating impacts, and to unravel the importance of high-magnitude, low-frequency events (tied to possible changes in storm frequency). For input to both assessment and modeling, it seems important to document not only change, but rates of change.

Thus, inline with the other comments here, and for other environmental "vulnerabilities" such as flooding, it seems possible that the boundary conditions for processes and impacts are evolving, and this dynamic needs to be a part of hazard assessment and policy.

Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)

Posted by: *Lee Cooper* at 9:50 PM 4/22/2002

There was an interesting paper in Nature earlier this year that estimated the frequency of "100 yr." floods under a quadrupled CO2 atmosphere. A lot of rivers in the Arctic were used in the model development because they aren't as significantly dammed as rivers at lower latitudes, although there is a degree of comparison with lower latitudes rivers.

Bottom line is that more CO2 will lead to more floods.

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Increasing risk of great floods in a changing climate

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Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)

Posted by: *Manda Lynch* at 10:45 PM 4/22/2002

quote:

One area for research might be the way(s) in which new information is used in decision making and planning, and how community planning might be made more flexible (assuming that increased flexibility produces better outcomes).

Henry - I think you have hit the nail on the head. As Anne says, our project will attempt to provide some form of guidance as to the changing likelihood of the Barrow community being exposed to extreme events - and as Bill says, I think we can be pretty confident about erosion

rates, if not flooding events. This part of the research we physical scientists feel most comfortable about, of course! However, I think that the more crucial issue will be for us to explore ways in which the community might develop and incrementally apply some "no regrets" policies that are cost-effective and attractive.

Post Title: Re: Climate Change vs. Status Quo (manleyw)

Posted by: *Jim Jordan* at 3:27 AM 4/23/2002

Determining rates of change is a critical need for community planning as well as for estimating the broader geographic and geologic impacts of coastal responses to climate change. It is also apparent that some communities are being adversely affected by unspectacular rates of change, especially where residential and commercial infrastructure exist marginal to the active shorezone (barrier islands for example) and influence permafrost behavior regardless of climatic boundary conditions.

Mobility has historically been the adaptive strategy to climatic and coastal landscape change, for which there is plenty of evidence archaeologically and geomorphically, especially in the southern Chukchi Sea. Here is where the historic perspective is valuable and I believe essential for informing discussions about mitigation measures and community planning. While our confidence in making predictions about extreme events is limited by the spatial and temporal resolution of our instrumental observations, we can see physical evidence of the dynamics of many coastal systems at centennial or millennial scales (e.g. substantial reorganizations of coastal sedimentation reflected in erosion-progradation patterns and eolian dynamics). The point about our need for finer resolution observations is a good one, but I think its also instructive to view the arctic coastal system as a fundamentally unstable one over time, and as a system which at least locally records decent evidence of human and landscape responses to environmental change.

Post Title: Re: Climate Change vs. Status Quo (Jim Jordan)

Posted by: *Tom Dunning Newbury* at 7:26 AM 4/23/2002

Jim mentions that mobility has historically been the adaptive strategy to coastal landscape change. Sacrificial beaches are a more recent method of combating coastal erosion. The sacrificial beaches are designed to absorb the erosion and to be replaceable. Two examples are Barrow, where the sacrificial beach is in the surf zone, and the man-made Northstar Island, which I think was built with a subsurface sacrificial berm.

Post Title: Re: Climate Change vs. Status Quo (Manda Lynch)

Posted by: *solomon* at 12:13 PM 4/23/2002

I would like to second Manda's comments as well as others. While the science is the interesting part to many of us, the socio-economic and socio-political aspects are where the rubber hits the decision-making road and this is the hardest part. Making choices about relocation in the north of Canada is even more difficult than in the south because of the history of some well-publicized communities. There are also lots of emotional as well as practical issues involved, running the gamut from what to do about cemeteries to access to fishing and hunting areas. In some cases relocation versus protection becomes a basis for developing negotiating positions which involve other issues and this is equally true in the Canadian north or in coastal communities in the South Pacific Island countries. So the scientist has to be seen as a truly "honest-broker" in the debates about the potential impacts of climate change (or natural processes) and to be clear

about uncertainty. The only way I see this happening is become more engaged with the local population and to have them become an integral part of study. This is not normally the way that I have worked in the past, but I been moving in the direction over the past several years and I think it is certainly the way to move from advice to implementation of adaptation strategies. I am still in the process of trying to develop a good way of illustrating scientific uncertainty while not diluting the original conclusions too much. This is especially difficult when making predictions about the impacts of rare or extreme events. Given the number of people who play lotteries, I think the general population is naive about statistics, although that is the game we play when discussing return periods, etc. There must be a literature on the communication of risk, but I have not delved into it - has anybody any good suggestions for summaries?

Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)

Posted by: *Lisa Doner* at 3:55 PM 4/23/2002

Most of the responses to Henry Huntington's original query have focused on the historical record and it's applicability. But the question also implied that the historical record might provide insufficient data for planning. Much of the premise behind paleoclimate (prehistoric) research is that the range of climate variability occurring today can only be assessed by knowing the longer record. There is increasing evidence that climatic cycles occur at about 40, 80, 400, 800, and 2500 year intervals and that the historical record is too short to cover the range of variability within most of these lower frequency climate modes. There is a lot of ongoing research into the longer record of high frequency events, like hurricanes, storm surges, and landslides, and their links to synoptic climate features like El Nino or the North Atlantic Oscillation. This focus on Holocene-scale, very high-resolution records is in it's infancy, but these results should be reaching publication stage within the next year or so. Hopefully, when the prehistoric climate record is displayed as a series of human-scale catastrophic events, the data will have greater filtration into the meteorological community than most paleoclimate work.

Post Title: Re: Climate Change vs. Status Quo (solomon)

Posted by: *Julie Sprott* at 4:45 PM 4/23/2002

In response to the question raised by Solomon about risk perception/communication literature, there exists a mass of writing, particularly for communicating risks posed by environmental hazards. I haven't checked on the topic specific to environmental change scenarios (and would think the best place to start that search would be in the topic of "uncertainty" and decision-making with a book like MacCrimmon, K.R., and Wehrung, D.A.'s 1986 work, "Taking Risks: The management of uncertainty," Free Press). Peter Sandman is considered a guru in communicating risk. His writing is particularly readable, for example, in "Responding to community outrage: Strategies for effecting risk communication," Fairfax, VA: American Hygiene Association, 1993. Slovic (Peter, 1993) presents a wonderful discussion in the article "Perceived risk, trust, and democracy" in the journal, Risk Analysis, vol. 13 (6), 675-682. Suggest also Rafensperger, C. (1998) "Toward just and competent decisions," Human Ecology Review, vol. 5(1), 63-64 and other papers in that volume as well as Fischhoff, B. (1995), "Risk perception and communication unplugged: Twenty years of process" in Risk Analysis, vol. 15(2), 137-145. A heady book on risk assessment that includes incorporation of community values is Cothorn, C.R. (ed.). Handbook for environmental decision-making (1996; Boca Raton, CRC Press, Inc.).

Post Title: Re: Climate Change vs. Status Quo (Manda Lynch)
Posted by: *Julie Sprott* at 4:53 PM 4/23/2002

I'd like to ask Manda Lynch from a few responses back to explain more fully what is meant by "exploring ways in which the community might develop and incrementally apply some 'no regrets' policies. . ." I'm unclear what the "no regrets policies" mean and would appreciate an elaboration. I suspect there is an interesting context of meaning that goes along with that phrase, Manda.

Post Title: Re: Climate Change vs. Status Quo (solomon)
Posted by: *Henry Huntington* at 7:12 PM 4/23/2002

This is an excellent point about working with communities and trying to achieve "honest broker" status. It is often easy to create problems by mixing scientific understanding with advice. E.g., "The beach is eroding so you should move" vs. "The beach is eroding and if nothing is done the water's edge will be where the middle of town is now." In the former, we assume that one response is preferable and that we can identify it. In the second, we simply state our understanding of the problem. Communicating the uncertainty of that understanding (e.g., "the water's edge may be here or it may be over there") makes things a bit more complicated, but the basic idea is the same: we can communicate our findings, but shouldn't mix the findings with the response. The community in question can work with us to see if the findings are based on sound premises (collaborative research), and then they can review the options. The researchers can help in this step, too (though it may be different researchers!), by analyzing the options and how they might feed back to the original problem, or by assessing cost effectiveness, or in other ways. This step includes acknowledging the emotional issues that Solomon mentions, realizing that a "purely rational" approach (if such a thing were possible) isn't necessarily appropriate.

Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)
Posted by: *Kenneth Johnson* at 7:27 PM 4/23/2002

QUOTE "The beach is eroding so you should move" vs. "The beach is eroding and if nothing is done the water's edge will be where the middle of town is now."

The first statement is a definitive engineering approach, which would also have a dollar value attached. Engineers come by this approach honestly, as a result of their training. Unfortunately, this type of statement would not be well received by a community.

The second statement is what I would call more of a scientific approach to the problem. I personally define the scientific approach as having a beginning but not necessarily an end, versus the engineering approach which has a definite starting point and a definite ending point. The engineering approach usually has a life cycle cost attached to it as well.

Post Title: Re: Climate Change vs. Status Quo (Henry Huntington)
Posted by: *Larry Hamilton* at 8:29 PM 4/23/2002

Discussion of climatic change in the North American or Russian Arctic commonly deals with warming scenarios (or associated storminess, sea level, erosion, ice conditions etc.). A different vulnerability might exist in the European Arctic/NE Atlantic region: weakened thermohaline circulation and hence cooling. Paleo records suggest this is one of the "modes of variability" in

the global climate system, with potential to have very large human impacts. Perhaps so large that it is hard to imagine research, but that does not mean we are wise to ignore them.

To what extent are we focusing on smaller, more linear climatic shifts because they are easier to study? How could/should research on human dimensions of large-scale nonlinear shifts be advanced?

Post Title: Re: Climate Change vs. Status Quo (Tom Dunning Newbury)
Posted by: *Anne Jensen* at 8:32 PM 4/23/2002

Tom's point about moving being the classic response to coastal erosion was a good one. This is not only true of Arctic residents; similar patterns can be seen on the New Jersey shore, for example. A fair number of structures a few blocks away from the current beach/boardwalk were originally located on the former beach, and moved to avoid erosion.

Now, of course, Ocean City has got the Army Corps pumping sand onto the beach, where it lasts about through the first big storm. The waves are otherwise under the boardwalk at high tide (spoils the sunbathing a bit). None the less, people there seem intent on continuing, and no one asks what happened to streets which are on old maps between today's beachfront street and the ocean. In fact, most people seem oblivious to the fact that there ever were such streets. Of course, the costs are enormous, and hard to justify even for communities which have lots of high value real estate along the shore, and where the economy is dependent on having a beach for tourists to lie on. For smaller communities in the Arctic, it will probably not be realistic to expect to get the funds to cover the continuing costs. It is the nature of the continuing costs where the Army Corps seems to fall a little short on communicating things to communities, whether in New Jersey and Alaska.

Post Title: Re: Climate Change vs. Status Quo (Larry Hamilton)
Posted by: *Henry Huntington* at 10:25 PM 4/23/2002

The question of large-scale, non-linear shifts seems like one place to use paleo-environmental and archeological records to see what kinds of shifts occurred and what happened to people in the neighborhood. One approach would be to use evidence of past conditions to construct a possible future climate scenario, and examine what the impacts might be. Another would be to look at successful and unsuccessful attempts to adapt to new conditions (e.g., Inuit vs. Norse in Greenland, as Anne Jensen mentioned elsewhere) to try to find social and environmental factors influencing success.

Post Title: Re: Climate Change vs. Status Quo (Lisa Doner)
Posted by: *Anne Jensen* at 11:50 PM 4/23/2002

Lisa has a very good point that paleoclimatic work is needed even to look at the range of what has happened. I think she's also right in the idea that it may be easier to get people to take the possibility seriously that current conditions are not a stable system if they can see graphic proof that things were very different once. For example, residents of a sand spit looking into a trench where there was a very distinct level of cobbles up to the size of a human head and realizing that what they thought of a big storms were nothing compared to events that could create that layer (and that their houses wouldn't do all that well in such an event, either) and that such events had happened, right there.

HARC Online Workshops > Vulnerability > Nearshore Biology

Post Title: Nearshore Biology

Posted by: *Henry Huntington* at 7:56 PM 4/22/2002

The nearshore zone is both biologically productive and critical to human users since it is accessible by small boats or via sea ice. In terms of human vulnerability, it seems that changes in productivity and/or distribution of animals are critical, as are changes in access (e.g., reduction in extent or stability or duration of shorefast ice). One way to approach this would be to make use of the great variability of the Arctic, to select a few years when conditions were vastly different, and see what the human response was. Clearly, this doesn't tell you much about long-term changes, which will have more extensive repercussions for biota than interannual variability, but it's a starting point to identify the strategies people use to adapt to changing conditions. The historical and archeological records can give examples of more severe, longer-lasting changes and the human responses, successful or otherwise. The degree of vulnerability likely varies greatly from place to place, based on local conditions both natural and social.

Post Title: Re: Nearshore Biology (Henry Huntington)

Posted by: *Tom Dunning Newbury* at 7:24 AM 4/23/2002

Henry, you commented on possible changes in productivity. The loss of ice will probably increase the productivity of offshore waters, but their productivity is very low compare to the coastal waters. The waters right next to the coast are almost two orders of magnitude more productive than offshore waters--probably because of the relatively high nutrients and temperature of coastal water. The reason that this might be important is that the coastal waters are almost always ice free during summer. I think that the retreat of the Arctic ice further offshore with climate warming is not likely to increase the productivity.

Post Title: Re: Nearshore Biology (Tom Dunning Newbury)

Posted by: *Lisa Doner* at 4:13 PM 4/23/2002

Tom, the point you raise about the sea-ice brings up another issue. Near-shore communities go "extinct" all the time due to catastrophic events like hurricanes, sand-burial, etc. and are subsequently re-colonized. But the rate of recolonization, and the composition of the new community, are highly dependent on the size and distance of the nearshore site from the pool of organisms available for relocation. In more temperate latitudes, estuaries are the breeding grounds for many of these kinds of new colonizers. Could sea-ice communities be serving a similar purpose in the Arctic? If so, then the retreat of sea-ice will increase the recovery time for these mini-extinction events.

Post Title: Re: Nearshore Biology (donerl)

Posted by: *Lee Cooper* at 5:39 PM 4/23/2002

One of the differences with non-Arctic systems with respect to local extinction/recolonization events is that in much of the near-shore Arctic, sea ice gouging of the bottom is the source of the local extinction events. I think with sea ice retreat, we may see the development of much more widely distributed, longed-lived, stable, near-shore benthic ecological communities. We know from the "Boulder Patch" kelp communities in the Beaufort Sea that are in deep enough

water to escape sea ice disturbance, and from similarly rich communities on ice-free portions of the Barents Sea (e.g. Kola Peninsula) that there is the potential for complex and rich benthic floral and faunal communities in the Arctic, and those communities are limited today by the lack of suitable strata and sea ice gouging. Many benthic invertebrates of course have pelagic larval stages, so with a few exceptions of obligate sea ice-associated organisms, I don't think the retreat of sea ice is going to lead to problems of increased times for ecological recovery.

Post Title: Re: Nearshore Biology (donerl)
Posted by: *Tunderwo* at 6:07 PM 4/23/2002

My view may be somewhat provincial having only worked in the nearshore of the Beaufort Sea of Alaska, but we are not necessarily talking about one community in regards to fish, but a blend of marine, amphidromous, and migratory species. The fish species and others are mobile and move into the nearshore when it becomes available to take advantage of its richness. Dolly Varden char, for example, radiate out from their overwintering streams to feed in the nearshore zone. From a particular river some fish travel little and some far. Recolonization in localized area are less of a problem than region wide effects that you might see from say an oil spill spread by the along shore winds or currents. The nearshore "brackish water" band remains unquantified, but is highly vulnerable to human impacts. Changes in habitat from human activities in the Arctic nearshore have been documented (American Fisheries Society Symposium 11), but an argument regarding the biological significance remains open to debate. One of the burning questions that remains is can we link changes in habitat (temperature) to population level effects (e.g., habitat to animal condition to reproductive success).

Post Title: Re: Nearshore Biology (Tunderwo)
Posted by: *Henry Huntington* at 7:02 PM 4/23/2002

Good point about linking habitat changes with population changes. This seems to me a crucial question in terms of human impacts: the extent to which human-mediated changes to the nearshore environment affect biota on scales larger than the local. It is also a critical question in terms of the impacts of regional and global change (anthropogenic or otherwise) on the biota that people use. One way to think about these questions is:

1. What are the larger-scale impacts of local human-caused changes in the nearshore environment?
2. What are the localized impacts to humans of regional- and global-scale environmental change?

For (1), we'd like to know just how significant human activities in the Arctic are in terms of the Arctic system. For (2), we'd like to know how large-scale, general changes (climate, water circulation, etc.) affect biota and the ability of people to use them.

Studying these questions is another matter!

Post Title: Re: Nearshore Biology (Tom Dunning Newbury)
Posted by: *maslanik* at 8:00 PM 4/23/2002

Regarding the near-shore zone being ice free during summer (along the Beaufort coast), there seem to be periods of maybe 2 to 3 years' duration when relatively little open water is present

even in late summer for substantial portions of the coastline. I'm curious whether such relatively short-lived fluctuations in near-shore ice cover might have any significant effect on biological conditions?

Post Title: Re: Nearshore Biology (maslanik)

Posted by: *Tunderwo* at 11:32 PM 4/23/2002

Some evidence does suggest annual fluctuation in water temperature (associated with ice pack) affect animal condition. A study on Dolly Varden length-weight data from 1988 to 1991 examined fish condition in nearshore waters of the Arctic National Wildlife Refuge (American Fisheries Society Symposium 19:295-309). Condition among the four years studied was significantly different and the authors point out that the condition appear to be associated with water temperature though valid criticism is that water temperature was not included in the analysis. The year with the lowest fish condition 1991 was one where heavy ice remained along the coast throughout the summer. No direct mechanism was established.

Post Title: Re: Nearshore Biology (Tunderwo)

Posted by: *solomon* at 1:10 AM 4/24/2002

I have been involved in a nearshore water level and temperature monitoring program in the Beaufort Sea which included ANWR, Ivvavik Park and the Mackenzie Delta area. We are just beginning the 3rd year of the collaboration which includes US Fish and Wildlife, Parks Canada, the Canadian Dept of Fisheries and Oceans and the Geological Survey of Canada. Nearshore temperatures are closely linked to upwelling and downwelling events caused by storms during the open water season. The changes are dramatic (5-10 degrees C), occur within a matter of hours and often affect 100s of km of coastline virtually simultaneously. I have wondered, as a non-biologist, what effects these events may be having on fish stocks.

Post Title: Re: Nearshore Biology (Henry Huntington)

Posted by: *maschner* at 4:13 PM 4/24/2002

One massive fluctuation in near shore and perhaps off shore productivity is now becoming recognized for the north Pacific. Sometime around AD 1150 is a shift from cod and sea mammal subsistence regimes to one based on salmon. This is seen in southeast Alaska, Kodiak, and the Alaska Peninsula and eastern Aleutians. There are several oral histories that include a complete collapse of the north Pacific ecosystem sometime in the recent past, and archaeological data from across the region is beginning to point toward this AD 1150 date. It appears that for about 250 years there were few cod, few or no sea lions, and weak numbers of everything else. Salmon, on the other hand, begin to peak about this time (Finney et al. in Nature) and that becomes the focus of harvesting efforts in most areas. Human populations peak at this time (AD 1150), followed by declines for the next few hundred years in all areas. The marine ecosystem, and the human population within it, does not begin to recover until AD 1400, when we again see growth until European contact.

Post Title: Re: Nearshore Biology (maschner)

Posted by: *Lilian Alessa* at 6:39 PM 4/24/2002

The nearshore is one of the most fecund venues to study the complexities of human feedbacks into an arctic hotspot type. Yes, it is productive and it is also a very important interface between terrestrial and oceanic transfers.

For example, Dan W mentioned silt loads (from terrestrial processes). These have strong effects on macroalgal recruitment (esp. the Phaeophyceae) which "engineer" the intertidal and subtidal community structures BUT our political and scientific conversations still revolve around addressing single species rather than whole systems. This is one interesting point: the culture of the scientists and policy-makers themselves.

Humans are usually co-localized with these areas because they're so highly productive. Now, a feedback that exists falls into the waste mgt discussion. The balance between human settlement, waste and outputs relies on management geared toward mitigating disease, moving waste away from communities and industries and maintaining productivity. However, the mitigating tools (in the case we're studying in the Aleutians) include chemicals like Cl.

Chlorine is not inert, it's highly reactive. In southern (tropical) climates it is broken down under UV and high temps. In the arctic, Cl remains bio-reactive and we're finding that it incorporates into living tissues of nearshore benthos (and vertebrates!) at high rates and is metabolically active as chlorinated fatty acid (CFA). These CFAs have effects that include causing "leaky" cell membranes. We're only just embarking on understanding the implications of this to the organism.

So, here's a system where human co-localization has effected a significant input of a xenobiotic into the nearshore ecosystem. But where is the balance? What standards are inviolable? I.e., in terms of understanding and managing this system it is not enough to know what and where the lateral nutrient, sediment and contaminant transfers are and occur. It is critical to understand where the social individual trade-offs (ITTs) occur as well. Do we not treat waste and risk the proliferation of disease vectors? If people co-localize with productive nearshore areas, does management demand ITTs that are community-wide? If so, can and will these be sustained through cultural norms? What risks have been presented to the communities themselves and how do they understand them? What frameworks are used to place the task of choosing trade-offs in the community's hands? How are these choices balanced with regional and global needs and constraints?

And finally, there's the political side. I've been cautioned that studying CFA loading and the corresponding toxic effects is not a great idea simply because Cl is such a useful and ubiquitous chemical for water and waste treatment. That, in and of itself, is a very interesting issue and a clear case of societal trade-offs and choices that may or may not have been presented to the local scale (the communities).

The social order and the natural order are co-variant, and their interaction is reciprocal.

Post Title: Re: Nearshore Biology (Lilian Alessa)
Posted by: *Anne Jensen* at 8:06 PM 4/24/2002

In the case Lil is working on, rather than ignoring the problem of reactive Cl in the Arctic, might it not be possible to develop Arctic adapted treatment plants, where, say, the treated water could be exposed to massive amounts of UV to break down the Cl prior to release into the environment?

In many places "dilution is the solution to pollution" is the treatment plan. Here in Barrow our utilidor takes the sewage to a lagoon, where it sits, then gets pumped to another lagoon where it

sits another year, and then gets released into the ocean after breakup. Then they close off the second lagoon and the cycle starts again. In a lot of villages, they don't have the holding & diluting steps.

Post Title: Re: Nearshore Biology (Lisa Doner)
Posted by: *Tom Dunning Newbury* at 9:12 PM 4/24/2002

Lisa Doner asked about changes in recolonization rates. In the arctic there are "extinction" events every winter; plankton production drops to a very low level. The epontic organisms in the ice cover are one of the sources of organisms for the spring bloom. Even though the ice cover is expected to retreat far offshore during the summer, the arctic will remain ice covered during the winter. To summarize, the arctic experiences a mini-extinction every year, and I think that the seasonal retreat of the ice cover will not change that pattern.

Post Title: Re: Nearshore Biology (maslanik)
Posted by: *Tom Dunning Newbury* at 9:23 PM 4/24/2002

Maslanik asked if there is a biological consequence of heavy ice years when the ice remains near the coast. Severe ice years certainly have an effect on the bowhead whale migration; the animals remain farther from the coast. Another example was described by Ken Dunton for the Boulder Patch kelp community. He found that during some years there is very little kelp growth, presumably years when there is less light due to heavy summer ice and/or sediment/snow in the winter ice cover.

Post Title: Re: Nearshore Biology (solomon)
Posted by: *Tom Dunning Newbury* at 9:28 PM 4/24/2002

Thunderwo and Solomon describe the influence of changes in water temperature. Water temperature is expected to change slightly with global warming, but I think that the change in temperature per se will be minor compared to changes in the ice cover. A four degree change between, say 4 and 8 degrees, would have a relatively small effect on organisms compared to a change between minus 2 and plus 2--which would eliminate the ice cover.

HARC Online Workshops > Vulnerability > Effects of expedition tourism on coastal archaeological and historic sites

Post Title: Effects of expedition tourism on coastal archaeological and historic sites
Posted by: *Callum Thomson* at 10:06 PM 4/24/2002

To pick up on Anne's comment about future, present and millennia-old vulnerabilities, does anyone have any thoughts on the potential effects on Arctic coastal archaeological and historic sites from increasing tourism traffic, especially expedition cruise ship-loads? I've been a lecturer and shore guide on a few trips between the U.K., Faeroe Islands, Iceland, Greenland and Labrador and always endeavour to get across to passengers and other staff the message of site conservation and protective legislation. However, I wonder how much the tourism industry is doing to increase the cumulative threats to such sites from more recent human settlement, construction, mineral and oil exploration and development, and (in Greenland) farming, as well as natural erosion processes resulting from climate change, weather and sea level change.

Of course, millennia-old and more recent sites have always been subject to modification by later settlement, whalebone, sod and timber recycling, archaeology, and the reconstruction of abandoned sites, but a few cruise ship loads of 100 or more eager tourists, if their activities are not carefully controlled, represent a considerable potential threat to site stability and integrity. Do the benefits of cultural tourism in terms of increased knowledge and passenger spending in otherwise isolated communities outweigh such potential impacts? This raises more social and environmental questions, but I think the answer is yes.

Post Title: Re: Effects of expedition tourism on coastal archaeological and historic sites (Callum Thomson)
Posted by: *Anne Jensen* at 2:57 AM 4/25/2002

I think Callum is right that cultural tourism can be a good thing for remote communities if the tourists are kept from trashing the sites. It may be a good thing for the sites, too, if community members see them as income-producing community resources when kept intact. This can help counterbalance artifact "mining" such as has developed on St. Lawrence Island and to a much more limited extent in other communities with nearby sites. One can't really blame the local residents for selling artifacts that people are willing to pay a lot for, since they may have very limited options for earning cash in any other way, and some cash is essential for life in today's world, even in a remote community. If the intact sites can bring in cash, that is an incentive for the community to protect them.

Post Title: Re: Effects of expedition tourism on coastal archaeological and historic sites (Callum Thomson)
Posted by: *Lee Cooper* at 3:22 AM 4/25/2002

There is obviously some room for concern, although I don't see this as one of the top ten threats in the Arctic. Compared to package-type cruise ships in southeast Alaska or the Caribbean, these are not huge vessels and the impact can be positive in terms of bringing in money into local economies of remote villages. It's not exactly the same problem as was posed, but there has been concern about the impact of Antarctic cruise ship tourists on truly pristine landscapes and biotic resources that have never been impacted by human activities, but the Arctic is much less unaltered by human activity. Even in the Antarctic, I think the threat posed by tourism is

relatively minor, and it does serve to educate the small fraction of the population that can afford to go on these sort of excursions.

HARC Online Workshops > Vulnerability > Some-near-to-closing comments about the Nearshore Initiative

Post Title: Some-near-to-closing comments about the Nearshore Initiative
Posted by: *Lee Cooper* at 9:38 PM 4/24/2002

Although discussion can continue for as long as people would like, it is getting late in the work day here in U.S. Eastern Daylight time, on our last scheduled day for the on-line discussion, so I would like to indicate how pleased I have been with the diversity of fresh ideas that have been contributed over the past 3 days.

This on-line workshop is a direct result of a people talking together by e-mail and in person over the past 18 months about the scientific needs for new research in Arctic coastal zones. We originally started talking within the Russian-American Initiative for Land-Shelf Environments (RAISE) science steering committee, which is focused on global change research that is best approached in the large part of the Arctic dominated by the Russian Arctic. In the past year, though, we have put aside the geographical limits, and are trying to design a new interdisciplinary research program that will focus on the critical unknowns for Arctic environmental change that are best studied at the land-sea margin. Break-out sessions and discussions have been held as part of other meetings in Salt Lake City in November, and this is our second on-line forum mounted with the help of ARCUS. Many detailed discussions were of course undertaken in Seattle in February during the ARCSS "All-Hands" Meeting. We also have a working science plan document available on the RAISE web-site (<http://www.raise.uaf.edu>) that can be downloaded, and is available for comments, as well as contributions of additional text and figures.

I have been encouraged by the many different individuals participating in this forum, and the modest overlap with our previous discussions. It is important to have focused on the human element, which is arguably much more important in coastal zones than elsewhere in Arctic landscapes and seascapes because of the densities of human communities.

I'd like to encourage all those participating in this forum to try and engage in the hard work that is involved in putting together a new science program such as the Nearshore Initiative. The science plan I mention above needs a human dimensions element built into it, and I would welcome all the help we can get.

I am currently in the final stages of preparing a management office proposal to the Arctic System Science Program of the U.S. National Science Foundation for the Nearshore Initiative, which will be combined with our RAISE efforts. This office will be available to help support development and implementation of the program over the next several years, but a key ingredient to success will be the participation of stakeholders, including scientists and local residents.

Post Title: Re: Some-near-to-closing comments about the Nearshore Initiative (Lee Cooper)
Posted by: *Jerry Brown* at 12:22 AM 4/25/2002

Lee: keep us on track. Good luck with the Management Office.

Post Title: Re: Some-near-to-closing comments about the Nearshore Initiative (Lee Cooper)
Posted by: *Tom Dunning Newbury* at 12:38 AM 4/25/2002

This is a small procedural addition to Lee's overall closing comment.

This online workshop seems to have been very successful in term of number of participants and number of entries. However, I do not see a clear order to the entries. The result is like a group of people speaking randomly rather than listening to one another and discussing a subject (creating a "thread"). As a new user, I found it easy to read the previous entries but not to understand the threads. Lee's closing comment indicates that, regardless, he can pull information out of the contributions that he needs for a proposal.

During future ARCUS online workshops, I suggest that some participants should be asked to constantly coordinate and summarize the threads. Such summaries would create clear bottom lines so that new users could either (a) read through prior entries and respond randomly or (b) contribute sequentially to the threads.

Post Title: Re: Some-near-to-closing comments about the Nearshore Initiative (Tom Dunning Newbury)
Posted by: *Anne Jensen* at 1:37 AM 4/25/2002

While I agree Tom's suggestion sounds wonderful, there are some practical issues here. These fora are like informal discussions, and like most discussions I have observed or taken part in, people often do go off on tangents depending on their interests. Certainly, I've seen discussions at least as disjointed during face-to-face meetings for various ARCSS programs. As is the case with any discussion, latecomers are at a bit of a disadvantage.

However, there is a complicating factor here. People may post before they go to work on the East Coast, someone else may respond and the discussion can move quite a way before I check in at 7AM ADT. But I may have a comment on what was said 4 hours earlier and make it. Some else may first have time to participate after they get in from the day's fieldwork at 6PM ADT, eleven hours after that. And people may go on to ten or eleven at night. A coordinator would need to be constantly on duty from about 3 AM to 11PM ADT (or the equivalent in another time zone) and keeping it straight would be a full-time task; they could accomplish little other work during that period, and need to eat in front of the computer, probably. I doubt there are many folks who would be up for that kind of commitment. Of course, if you'd like to volunteer ... :-)

You can subscribe to the various threads and have each new post in the thread e-mailed to you. I find that helps in following.

Post Title: Re: Some-near-to-closing comments about the Nearshore Initiative (Anne Jensen)
Posted by: *Tom Dunning Newbury* at 5:34 PM 4/25/2002

Anne, I agree that it would be an almost continuous job for most of the day, and your suggestion about e-mail messages would have helped me.

What I have in mind is a summary like the one in an e-mail message from Dan Ferguson about Day Two highlights. However, I think that the summary should be posted in the forum website and updated ever couple of hours. The summary could be a listed as a separate "topic" by itself-

-a topic that the coordinator would routinely update (edit) and that could be accessed only by the coordinator. In other words, the coordinator's summary would fill the role of a typical facilitator who continually summarizes the ongoing discussion. If the coordinator wanted to add material to the ongoing discussion, it could be done in the one of the other appropriate "topics".

HARC Online Workshops > Vulnerability > Cultural identification with subsistence practices

Post Title: Cultural identification with subsistence practices
Posted by: *JWiener* at 8:29 PM 4/25/2002

What I do not see on vulnerability or combined vulnerability is a post on the issue of cultural identification with subsistence practices. I suspect this is politically a hot button, since Natives have been attacked everywhere for using new technology when hunting or fishing. But looking past such attitude-based issues, the climate change (and increased rate of change) threats to cultural vitality worry me. The fundamental questions about how central group activity (versus individual activity) is to the culture or spirit of a people, and how important traditional interdependence is to the distinctiveness of a people, may never be answered if these intangible qualities are lost. Various disciplines are now abuzz with versions of "social capital", but those who are holding the most diverse and arguably most interesting forms are being dissolved into the global mainstream (or other sanitary pipe metaphor if you prefer), and I fear the extraordinary learning of the Innu/Inuit/etc peoples and far Northern interior peoples will be lost under pressure of subsistence changes.

HARC Online Workshops > Past Human Responses > Past Human Responses in Situation of Vulnerability

Post Title: Past Human Responses in Situations of Vulnerability
Posted by: *Anne Jensen* at 2:42 PM 4/19/2002

When changes in the nearshore area have exposed vulnerabilities, how have humans responded? Have they tended to persist in old patterns of behavior, changed their behavior to fit the new conditions in an area, or moved to a place where old behaviors could continue to work? While the present and future may hold new types of vulnerabilities (pollution, etc.) others are millennia-old. Threats to infrastructure due to coastal erosion and displacement of subsistence resources due to climate and weather issues have occurred time after time in the Arctic. Examining past responses and their outcomes could be useful in guiding responses to such situations in the future. How can we go about doing this effectively?

Are there factors that seem to influence the likelihood of a successful response? There are examples of both successful and unsuccessful responses to changing conditions (e.g. the Norse and Thule people in West Greenland--one group is extinct; the other number in the tens of thousands and have adapted relatively successfully to a series of challenges of various sorts). What made the difference, and is there anything which can be applied to current and future situations of vulnerability to facilitate useful responses?

Post Title: Re: Past Human Responses in Situations of Vulnerability (Anne Jensen)
Posted by: *szeeman* at 11:35 AM 4/22/2002

This is a cogent point. We need to understand how people perceive the changes around them, what actions they are likely to take, and what spurs them on to take these actions. How people behave in response to changing conditions is outside my field of expertise, however, I do recall a book several years ago addressed similar kinds of issues. It was written by Mickey Glantz at NCAR about the Icelandic cod wars, and titled "Societal Responses to Regional Climate Change: Forecasting by Analogy" (Westview Press, 1988). It is my suspicion that there may be a body of literature out there that could shed some light on the subject.

Post Title: Re: Past Human Responses in Situations of Vulnerability (Anne Jensen)
Posted by: *Henry Huntington* at 11:50 AM 4/22/2002

This seems an area ripe for comparison with areas outside the Arctic as well, particularly in terms of analyzing the modern Arctic (with fixed communities with expensive infrastructure, etc.). The past can help in many respects, but the situation of the Norse colonies in Greenland is not found today--by using the Norse example and some non-Arctic examples that correspond more closely with the modern Arctic in other respects, we might shed more light on what we can expect in the Arctic in the near future.

Post Title: Re: Past Human Responses in Situations of Vulnerability (Henry Huntington)
Posted by: *Anne Jensen* at 12:37 PM 4/22/2002

I was thinking more of the sociocultural factors which may have lead the Norse & Thule people down very different paths in Greenland. Certainly, the two groups had very different backgrounds, but they were both in a relatively new environment with the ability to extract food and shelter from it, yet they adapted (or didn't) in very different ways. Why?

I'm not sure some of the settlements in the Russian Arctic aren't pretty analogous to the Norse in Greenland, except maybe they have less in the way of an ability to rely on the land/ocean. Actually, if you listen to the Elders, they see a somewhat similar situation arising in Alaska "when the oil is gone."

Post Title: Re: Past Human Responses in Situations of Vulnerability (Anne Jensen)

Posted by: *Kenneth Johnson* at 1:23 PM 4/22/2002

The very limited experience in the Canadian arctic over the past 40 years suggests that communities are not willing to move in spite of challenges with current community siting. A classic example is the "old" community of Aklavik, and the "new" community of Inuvik, which was built in the late 1950's. Aklavik is located on low lying land of the MacKenzie Delta, and is subject to significant periodic flooding. The community also has limited area for expansion. The Federal government of the day decided to create a "new" Aklavik in a location with all the appropriate site and infrastructure characteristics. In the end, a significant number of the residents refused to move, which created an obligation for the senior government to maintain the community.

Post Title: Re: Past Human Responses in Situations of Vulnerability (Kenneth Johnson)

Posted by: *Anne Jensen* at 3:00 PM 4/22/2002

Is part of the problem where the new communities are placed? I know there was at least one case in the eastern part of Canada where the new community was established for geopolitical reasons (a need for Canadians to reside on a certain piece of real estate) with no real consideration of the subsistence possibilities for the people who were relocated there.

One difficulty with moves that has been seen in Northwest Alaska is selection of the new site. Engineers want sites that will be relatively inexpensive to use, erosion resistant and so forth. Local residents want sites that have similar access to game. Since they know the area around their village, they want it close by, since that is the country/coast where they can hunt most effectively. Unfortunately, as seems to be the case in Shishmaref, the two sorts of sites may be mutually exclusive or nearly so. The sites the engineers like have poor access to hunting and the ocean; sites favored by the people of Shishmaref, while fairly unaffected by erosion, don't seem to have soil conditions which would make for easy construction.

There seems to have been less difficulty with relocations of some villages threatened by riverine erosion (e.g. Allakaket). Then again, since subsistence is river-based there, they aren't changing subsistence access as much. On the other hand some of these villages seem to have been relocated by the residents several times in oral tradition (due to erosion, changes in hunting/trapping, desire to be near trading posts, etc.) so perhaps there are some cultural factors as well.

Post Title: Re: Past Human Responses in Situations of Vulnerability (Anne Jensen)

Posted by: *Jim Jordan* at 8:23 PM 4/22/2002

Anne brings up a sticky problem with respect to relocation. There is no inexpensive solution to moving a village, but we must realize at the same time that it is even more costly to fight the natural direction of coastal evolution. Shishmaref is a classic example and it could be argued that the most recent installation of a hard "protecting" structure, or a lack of its maintenance,

really accelerated the problem. Folks also lack the mobility that characterized precontact settlement.

But I think that there are historic analogues for understanding human responses to rapid environmental change, both within and without the arctic. We can view this as resiliency to external or environmental forcing. On the western Alaska Peninsula we see rapid sea level change occurring through the middle and late Holocene, in an area characterized by large sedentary coastal villages oriented to marine resources. A brief highstand (eustatic probably augmented by coseismic coastal subsidence) centered about 2500 yr BP resulted in the apparent abandonment of all contemporary villages save one, an amalgamation site that was strategically located to access both the Bering Sea and Pacific Ocean. This was the largest village to that time in the region and was only depopulated after sea level fell, stranding it relative to more advantageous coastal locations.

There is no evidence that the Shishmaref barrier islands were occupied prior to about 1000 BP and no geologic evidence that they were substantively emergent prior to 1500 BP, the point being that these coastal systems have seen rapid occupancy and abandonment in response to the natural dynamics of the system - essentially climatically driven in the Chukchi. As there is little support for relocation of vulnerable communities into amalgamation villages today, we are left with some tough economic and environmental choices. In the case of Shishmaref, the public health consequences of remaining on the smallest most dynamic island of the chain with increasing population, little fresh water, and no sewerage save a dump on the tidal flat, will (or should) soon overshadow any rationale for additional armoring. In this scenario of vulnerability there is no historic analog - the situation would never have developed to this degree. I understand that a new site on the adjacent mainland has been selected, but as Anne suggests, in a less than ideal spot from an engineering perspective. So resilience here may involve the relative preservation of traditional human-landscape ties in the context of a modern economic structure that can support it.

Post Title: Re: Past Human Responses in Situations of Vulnerability (Jim Jordan)

Posted by: *Kenneth Johnson* at 11:00 AM 4/23/2002

The only Canadian example of a community relocation in a current context is the community of Davis Inlet on the east coast, which has a current population of approximately 600 people.

Led by the Mushuau Innu Relocation Corporation (M.I.R.C.), a project developed which is aimed at moving the Innu of Davis Inlet off an island and to the mainland portion of Labrador. The new location is called Sango Bay, or in Innu Eimun it is called Natuashish (pronounced naw-twa-sheesh'). The people of Davis Inlet hope to be established in their new town in 2002 or 2003. The total cost of this relocation will exceed \$100 million (Canadian).

Post Title: Re: Past Human Responses in Situations of Vulnerability (Anne Jensen)

Posted by: *Larry Hamilton* at 11:15 AM 4/23/2002

Discussions about adaptation to changing environmental conditions sometimes contrast the mobility and flexible resource use of older times with the more fixed and rigid systems we have today. Although there is an element of truth here -- modern communities build a lot of infrastructure that is difficult to move, and depend on resources and programs that are controlled far away --I think it also overlooks the evolving character of modern life. Northern

fisheries, in particular, have shown great flexibility in recent decades as they adapt to a rapidly changing ocean. In some places it seems that the fishery adapts faster than either scientific or regulatory knowledge can follow. I suspect there are other examples; my point is that social adaptations of contemporary societies, in situations of vulnerability, provide a worthwhile topic for study as well.

Post Title: Re: Past Human Responses in Situations of Vulnerability (Larry Hamilton)

Posted by: *Henry Huntington* at 11:30 AM 4/23/2002

Social adaptations may include increased local mobility--e.g., motorized travel making it less important to live right next to harvesting locations. Another direction this takes is reduced use of camps if one can get home to the village in the evening. In Elim, Alaska, a better access road to the sea has made it easier to make day trips hunting and fishing, and people thus spend more time in the village in summer than they used to. My point is simply that mobility takes many forms, ranging from nomadism to extensive rapid travel from a fixed location. It might be interesting to look at patterns of movement over time, comparing communities that were located for environmental reasons (access to fish and animals) with those that were located for other reasons (stability, ship access, politics).

Post Title: Re: Past Human Responses in Situations of Vulnerability (Henry Huntington)

Posted by: *Alexey Voinov* at 3:55 PM 4/23/2002

quote:

This seems an area ripe for comparison with areas outside the Arctic as well, particularly in terms of analyzing the modern Arctic (with fixed communities with expensive infrastructure, etc.). The past can help in many respects, but the situation of the Norse colonies in Greenland is not found today--by using the Norse example and some non-Arctic examples that correspond more closely with the modern Arctic in other respects, we might shed more light on what we can expect in the Arctic in the near future.

I wonder if somebody would care to elaborate a little more on this comparison side. I'm somewhat new to the Arctic theme and still not quite sure about what makes the area so special, especially in terms of human dynamics. It seems to me that there are more similarities to other regions than distinctions. Certainly there are the harsh living conditions, but we can find similarly harsh conditions elsewhere. Could someone come up with an example of clearly "Arctic" type of behavior, something that we would not find anywhere else? Both in the past or in the present?

Post Title: Re: Past Human Responses in Situations of Vulnerability (Alexey Voinov)

Posted by: *Henry Huntington* at 5:19 PM 4/23/2002

Actually, I mentioned comparisons outside the Arctic in the expectation that there would be many things in common so that non-Arctic experiences could provide useful information for Arctic communities. In other words, in many respects I think Arctic communities have more in common with modern non-Arctic communities than with prehistoric (or early historic) Arctic communities.

Nonetheless, although there may not be unambiguously "Arctic" behaviors, some characteristics of (some) Arctic communities are rare elsewhere today. These include substantial dependence

on wild animals for food, land use by individuals encompassing thousands and thousands of square miles, cultural preferences for sharing information orally rather than in writing, and so on. To be sure, some of these characteristics apply to indigenous peoples in other parts of the world, but the Arctic is unusual in being largely in the developed world (at least in terms of national boundaries), yet retaining some hunter-gatherer patterns.

Post Title: Re: Past Human Responses in Situations of Vulnerability (Alexey Voinov)
Posted by: *Kenneth Johnson* at 6:49 PM 4/23/2002

The arctic in its simplest terms is a land of extremes: extremes in temperature (+ 30 C to - 40 C is not uncommon); extremes in daylight (0 to 24 hours); extremes in isolation (not so much as it used to be); extremes in cost (airfare from Edmonton to Iqaluit is C\$4,000 - one of an endless list of examples); and to be a less scientific, extremes in natural beauty. Together these extremes create a place where many people develop and maintain a kindred spirit even when they are no longer a resident.

I suspect that the kindred spirit felt by the modern resident has replaced what may have been a spirit in the resident cultures essential to live in the region (particularly the high arctic).

HARC Online Workshops > Past Human Responses > Moving Beyond the Notion of Human Impacts

Post Title: Moving Beyond the Notion of Human Impacts
Posted by: *maschner* at 7:53 AM 4/24/2002

Much of the discussion of the last 20 years has revolved around the means by which humans have impacted northern ecosystems, usually with negative consequences. The July 2000 Science paper by Jackson et al. places this paradigm in the forefront by presenting "before fishing" and "after fishing" models of northern marine systems. But research on the western Alaska Peninsula has shown this to be a flawed approach. For at least 10,000 years, there have been people harvesting the marine ecosystems of the north Pacific and southern Bering Sea, creating nearshore systems where there is no "before fishing" baseline. In fact, I think it quite safe to assume that the near shore ecosystem is organized by the activities of the indigenous residents of the region and has been for thousands of years. Thus, the Aleut and other peoples must be seen as ecosystem engineers who, through harvesting, waste disposal, village formation, coastal alterations, and other activities, created the "natural" ecosystems of recent history. It is certainly possible that many of the "natural" patterns to fish, mammal, and bird distributions that modern biologists are trying to recreate, are specific responses to harvesting, not some nebulous preharvesting naturalness that has not been present since deglaciation. Therefore, we should perhaps step away from the concept of human impacts and put humans back in the middle of our ecosystem models as a critical and necessary element in the structure of overall system.

Post Title: Re: Moving Beyond the Notion of Human Impacts (*maschner*)
Posted by: *Anne Jensen* at 1:05 PM 4/24/2002

Herb has a very good point when it comes to the North American Arctic for sure, and quite possibly the Eurasian Arctic as well. Iceland might be an exception. People seem to have been here and hunting since deglaciation, and the ecosystem developed with humans as an integral part of it. That's the way people here traditionally see themselves, and they are quite correct in doing so. I think that is a more useful approach to that level of human activity. Where "human impacts" in the sense most people use it may come into play are activities which in nature and/or scale are way outside of those which have taken place since "time immemorial" since those are the sorts of things which are well outside of what the ecosystem evolved with. I'm thinking of things like massive industrial sites like Prudhoe Bay or some of the Russian mineral extraction cities, or factory trawlers, etc.

Post Title: Re: Moving Beyond the Notion of Human Impacts (*Anne Jensen*)
Posted by: *Henry Huntington* at 2:36 PM 4/24/2002

I agree with Anne about distinguishing the large-scale recent impacts of industrial and commercial activity, as opposed to the continuous interaction of humans and the environment on local scales (with perhaps regional implications). That said, Anne and Herb are both right to point out the folly of assuming that there exists a state of nature without humans in this region. The "natural" environment found by Europeans on the East Coast of North America was in fact a heavily modified environment that, when the fire setting and other activities of the Native Americans ended, changed drastically. I don't know if a similar conditions exists in the Arctic nearshore, but reducing or ending traditional human activities will surely have some effect. I

wonder if there are some opportunities to study this phenomenon in places where traditional hunting and fishing have been largely curtailed (at least for a while, such as in Arctic Russia)?

HARC Online Workshops > Human Impacts > Waste management practices and impacts

Post Title: Waste management practices and impacts
Posted by: *Kenneth Johnson* at 11:13 PM 4/18/2002

Waste management in the north, whether it be solid waste, or sewage may pose a public health risk to a community. Factors contributing to this risk include the subsistence economy, community proximity to water (ocean or freshwater), poor waste managements practices, and waste management system proximity to the community. The last factor is due to the simple fact that roads or other conveyance systems (pipelines and pump stations) are expensive, and subject to failure due to the harsh climate.

Certainly improvements are being made in the waste management practices to reduce the public health risk, but communities, and senior governments are still making mistakes by not following some key principles in the application of technology in cold regions. These key principles are "northern context", "appropriate technology" and "incremental improvement".

Post Title: Re: Waste management practices and impacts (Kenneth Johnson)
Posted by: *Lee Cooper* at 8:49 PM 4/19/2002

I think these are good points. One of the things that people commonly ask me in the village that I spend the most time in (Diomedes) is what are the health and environmental consequences of a clearly inadequate sewage and garbage disposal system. I tell them that I don't know the answer for sure, although we know that the currents are strong in Bering Strait, and the village is quite small in population. But it bothers me that while we as scientists are tasked to collect environmental data from the ocean (or land) we don't have a ready mechanism or scientific tools within our funded umbrella of responsibilities to always help local communities address problems that are obvious to all.

Post Title: Re: Waste management practices and impacts (Lee Cooper)
Posted by: *Henry Huntington* at 9:14 PM 4/21/2002

A number of federal and state agencies in Alaska (and I presume something similar exists in other countries) are responsible for community infrastructure like water and sewer systems. They collect data on various things, conduct analyses, and so on. Is this data and are these people ever involved in the activities of the "basic" research community? Are there ways to improve communication between the agencies doing the work and the scientists studying the conditions that are relevant to that work? Any examples?

Post Title: Re: Waste management practices and impacts (Henry Huntington)
Posted by: *Kenneth Johnson* at 4:12 AM 4/22/2002

In Canada, a "basic" level of community data collection on waste management practices and impacts is undertaken by a number of authorities, including the community itself and various regulatory bodies. The premise of the data collection is for compliance monitoring of the communities water licence, and compliance with various pieces of environmental legislation. The use of this data for a comprehensive base of information to serve science as well as compliance has been occasional, and limited in scope.

A standard compilation and sharing of the basic scientific data, as well as data on system operation, maintenance, and costs would provide a tremendous value to scientists, engineers, regulators and government staff. I believe the absence of this information boils down to the absence of funding for the exercise, and a lead organization.

Post Title: WMP The example of Northern Norway (JoLynn Carroll)

Posted by: *JoLynn Carroll* at 8:49 AM 4/22/2002

Northern Norway is another interesting example. Here there are numerous small and medium size communities where sewage is pumped directly into the sea. At the same time, aquaculture and shipping are major industries in a number of these communities. With respect to sewage discharges, local and regional authorities initiate periodic investigations by environmental consultants and the results are evaluated within the context of regulatory limits set forth by government agencies. The resources of the regional authorities are limited so that these investigations typically occur every 5-10 years. This timeframe is fine for many of the smaller communities but not necessarily for the larger ones.

With respect to mari/aquaculture impacts, monitoring is conducted by environmental consultants only at the request of the site operators themselves. In some cases monitoring is carried out once each year and for others the time period between investigations can be much longer. The impetus for monitoring is based on the business objectives of the farm operator and the obvious need to maintain an environment in which healthy fish can be produced efficiently. The one clear regulatory control on the farmers is that site operators wishing to increase production must apply to the regional authorities to do so. They are required to demonstrate that the carrying capacity of the environment will not be exceeded if the production increases. When it comes to shipping, there are only occasional harbour surveys identifying the levels of environmental contaminants related to shipping practices (e.g. PAHs). But there is growing concern over the problem of ballast water and alien species introductions into northern Norwegian waterways. In some communities with economies heavily dependent upon ship traffic, the amount of nutrients (and possibly other pollutants) supplied by ballast water exchanges far exceeds what the community supplies through the discharge of untreated sewage. With the likelihood of increased shipping in northern seas related to oil and gas development etc. and the upcoming ban on the main ship anti-fouling chemical TBT, these problems will only be exacerbated in the near-term.

Obviously there is a need for greater regulatory oversight and coordination among the various coastal zone users. But the resources available to the regional authorities are limited and must be distributed among numerous competing social needs of the communities. In general Norway is an environmentally conscious nation and local action is an important mechanism to initiate change. The greatest response to problems comes when individuals and local communities take it upon themselves to promote a problem they are concerned with through the media-science alone is not enough. At the same time, a regulatory framework for better coordination will likely be developed in step with the newly accepted European Union Directive on Water. The Directive outlines a concept of an integrated coastal zone management plan to be developed at the regional level within the various EU-related nations. According to the EU the goal for implementation of the Directive is the next 15 years. How this will be done in practice is still on the drawing boards both at the EU and national levels.

Finally, there are relatively few examples in Arctic Norway in which research and consultancy work are tightly linked. In general, government-sponsored organizations conduct basic research while private, for-profit firms conduct pure consultancy-based projects for communities with little

interaction between the two groups. One exception is the research and consultancy firm, Akvaplan-niva in Tromsø. This 15 year old company is a consultancy firm that is a branch of the government sponsored Norwegian Institute for Water Research in Oslo. Approximately 50% of the staff conduct environmental consultancy projects for government authorities and the aquaculture and petroleum industries. The other 50% carries out basic research funded through the Norwegian Research Council and also participates in consultancy projects. The interactions between the two groups has provided an important 'real-world' perspective to basic research and has lead to the collection of comprehensive data sets relating industrial practices with environmental effects which the scientists are then able to use to identify cause and effect relationships between human interactions and the associated environment impacts.

Post Title: Re: WMP The example of Northern Norway (JoLynn Carroll)

Posted by: *Lee Cooper* at 2:10 PM 4/22/2002

Interesting to hear of the differences among Canada, the U.S., and Norway with respect to the degree of governmental oversight of waste discharge. There is at least some on-paper oversight in Alaskan Arctic coastal communities, but I think the working assumption is that most of these communities are small and the impacts must be relatively minor. Outside of what might be considered Arctic Alaska, though, there are documented localized pollution problems (Kodiak Harbor, Adak, Dutch Harbor) or the suspicion that they may exist (e.g. Amchitka). In the Alaskan Arctic, there also have been government legacies of waste, such as at CapeThompson and at Northeast Cape of St. Lawrence Island. It can be rationally argued that the costs of some of these clean-up operations far exceeds any likely human benefit. Nevertheless, these operations have happened anyway because of a complex history of mistrust of distant government and the more recent empowerment of local communities to address environmental problems created during previous eras of lower environmental awareness.

Post Title: Re: Waste management practices and impacts (Henry Huntington)

Posted by: *Kenneth Johnson* at 4:56 PM 4/22/2002

An example of a compilation of community and industry data on wastewater systems was prepared by Johnson and Wilson in 1999 (see attachment). This was a overview compilation, but provided a big picture on systems in the NWT and Nunavut.

Post Title: Re: Waste management practices and impacts (Henry Huntington)

Posted by: *Tom Dunning Newbury* at 7:29 AM 4/23/2002

Henry asks about ways to improve communication between agencies and scientists. One way is for northern communities to help organize scientific conference sessions. An example is the highly successful series of bowhead whale conferences that were sponsored by the North Slope Borough.

Post Title: Re: Waste management practices and impacts (Tom Dunning Newbury)

Posted by: *Kenneth Johnson* at 3:45 PM 4/23/2002

Scientific conference sessions are certainly a tool for communication, but many small communities do not have the capacity to participate in such conferences. Bringing northern science to communities in general will require a number of incremental steps hinging initially on some local multi-year project where the scientist becomes familiar and trusted by the community.

A good example of this approach has been established by Steve Solomon of the Geological Survey of Canada with his scientific work on shoreline erosion in Tuktoyaktuk.

Post Title: Re: conferences in outlying Arctic communities

Posted by: *Lee Cooper* at 5:12 PM 4/23/2002

I think the points made about the advantages of getting scientists and local residents together (outside of the time scientists spend conducting field research) in outlying Arctic communities to exchange information are good, but there are always going to be practical limitations to science conferences in outlying communities. Transient housing is scarce, and meeting facilities are not always ideal, although schools, at least in Alaska, are often well equipped in theory to handle small conferences. The real problems though are the high costs and limited transportation capacities in getting people into these communities. There are a few exceptions; Barrow comes to mind, and I suppose any community served by jet service, e.g. Iqaluit, Inuvik, Nome, Kotzebue. In Europe, where a lot more people live in the Arctic, and there is a much better developed transportation infrastructure, Tromso, Murmansk, Kiruna, Rovaniemi, and many other cities are certainly practical venues for meetings.

But really in the end, in remote Arctic communities, long-term relationships, for the most part acquired while conducting field research and living within or near the community are the only ways that outside scientists and local residents can get to know each other and exchange information, and understand each other's needs and motivations.

Post Title: Re: conferences in outlying Arctic communities (Lee Cooper)

Posted by: *Kenneth Johnson* at 6:45 PM 4/23/2002

An organization called the Northern Territories Water and Waste Association (www.ntwwa.com) was formed several years ago to provide a platform for community personnel, senior government personnel, and the consulting community to share their common interests and challenges in cold region water and waste technologies.

The mission statements of the NTWWA are as follows:

The advancement of knowledge in the design, construction, operation, and management of water works, wastewater treatment and disposal works, and solid waste site works;

The encouragement amongst its members of a friendly exchange of information and experience in an effort to continuously improve the provision of water and sanitation services provided to the public; and

The improvement of the professional status of all personnel engaged in any aspect of the provision of water and sanitation services to the public.

The association meets once a year in a major regional centre for training sessions and technical presentation sessions.

Although this is not a purely "technical" platform, it does provide an appropriate means to potentially serve all the waste management stakeholders in the north, including the engineers, and scientists.

Post Title: Re: conferences in outlying Arctic communities (Kenneth Johnson)
Posted by: *Henry Huntington* at 7:19 PM 4/23/2002

I've just been revising a paper on the use of workshops to improve communication between holders of traditional and scientific knowledge. We look at three case studies to see what we can learn about what works and what doesn't in these settings. One conclusion (admittedly tentative because of the few cases, but no one else has looked at this before as far as we can tell) is that preparation and continuity are key elements of success. Often, workshops simply bring a few people together and hope that they'll be able to talk to each other. They are also often conceived as one-time events, with little or no formal follow-up (future workshops, collaborative projects stemming from the discussions, etc.). These sorts of workshops can be interesting and informative, but are less likely to result in better understanding and trust over the long term. By contrast, workshops where there has been extensive preparation (including time and effort devoted to helping the community participants think about the issues in depth and gather information as needed), and where there is some type of follow-up (which implies accountability for promises made, etc.), seem much more likely to create an atmosphere of collaboration and trust. Kenneth's example of the Northern Territories Water and Waste Association seems to fit this model, and I'd be interested how the participants evaluate the success of the association.

Post Title: Re: conferences in outlying Arctic communities (Henry Huntington)
Posted by: *Anne Jensen* at 11:32 PM 4/23/2002

I agree that nothing can take the place of time and personal interaction for bringing scientists and local residents together. It often improves the science greatly, and as scientists learn to take local residents advice, often saves time & money as well.

The logistical constraints Lee described are all too true for most northern communities. Not only that, but they are very expensive to get to, and attendance might not be too high at such conferences. I went to a conference in Seattle last year, and even though Barrow is a hub, not a real Bush Village, my travel cost more than did that of participants from Norway and the Netherlands!

I think the NSB bowhead conferences are a special case. The NSB Dept. of Wildlife Management is in part a research organization, and a reasonably well funded one, at least in the past. The DWM employs a number of scientists and contracts with others. This is not true of most communities in the Arctic (other North Slope villages would be hard pressed to do a conference).

Another issue is how scientists tend to present information at conferences. It is generally not all that easy for lay people to understand, even if there is no language barrier. Minerals Management Service has held one Information Transfer meeting in Barrow and the two translators were just exhausted. I think I gave about the only presentation which they didn't feel needed translation, since I tried to use language comprehensible to the audience (and I live here so they probably thought folks could catch me later if they needed to!)

Post Title: Re: conferences in outlying Arctic communities (Anne Jensen)
Posted by: *Kenneth Johnson* at 12:15 AM 4/24/2002

The value of community links has been highly under rated in the past, and in fact, as pointed out, these links may provide a better overall result to the scientist or engineer, and a benefit to the community.

Appropriate visual communication tools become a key ingredient to nurturing and sustaining these links. With the technology to collect and manipulate graphic information, the creation of these visual communication tools has come a long way from where it was a mere decade ago. Vivid colour drawings, enhanced with digital photographs create presentations that maintain an interest and explain the intent.

Post Title: Re: conferences in outlying Arctic communities (Kenneth Johnson)
Posted by: *Anne Jensen* at 12:55 AM 4/24/2002

Kenneth suggestions are good ones. Most members of Arctic communities do not find tables and numbers very compelling means of information transfer.

The spoken word (more so than fliers in whatever language) is also very important. Culturally this is very important. People tend to speak precisely, and assume what they hear is precise too. Historically this was critical. This means that communications need to be as unambiguous as possible (including unambiguously saying "I don't know" if that is the case), and if the audience is not completely bilingual at a fairly sophisticated level, having a translator, and taking time beforehand, if needed, to explain any terms that may be unfamiliar to them so they can work out a clear way to say it beforehand.

Another point is that it is worth the time and effort to talk to Elders, especially the older ones who may no longer be attending community meetings due to health or language issues. What they say may contradict the younger people who may now be in a lot of leadership positions due to their greater engagement with the modern world system. This was brought home to me very clearly in Point Hope, where the North Slope Borough was spending a couple million on a sea wall to prevent flooding such as had occurred the previous year. The flooding had affected some ice cellars, and the solution was a sea wall, which was being placed in part on top of the Ipiutak archaeological site, a National Historic Landmark. We were conducting a mitigation excavation in front of the seawall construction. As part of our work, we were bringing Elders out to Ipiutak. The older folks kept saying that the seawall was on the wrong side of Point Hope! It was on the north coast, south of the entrance to Marryat Lagoon. They all said it should be on the south coast, between Jabbertown and the point. Their reasoning was that the previous years flooding, and several other similar events, did come from the north, but they were relatively minor. The larger floods, where the water got so deep people had to boat around the old town site, were all from the south. Those events were less frequent, but they were far more serious. The new seawall would not only not prevent them, they were afraid it would make them worse by trapping flood waters on land.

Post Title: Re: conferences in outlying Arctic communities (Anne Jensen)
Posted by: *glemoine* at 8:53 AM 4/24/2002

I agree that talking to elders is important and would like to add two points. First, we have found that a rather informal setting is more productive than any sort of 'conference' venue. We tried a

public slide talk to show the results of our archaeological research in Resolute Bay. It was attended by one of the students who had worked for us and a friend she dragged along. The next summer while we were in Resolute on our way back from the field, on the spur of the moment we un-packed a bunch of the artifacts and invited the community to a show-and-tell, with a much more enthusiastic response that was helpful to us and (we like to think at least) to the community.

On the second point, we were also able to fly community members out to our field camp for a visit, so that they could see archaeology in action, talk to us about the site etc. The first season we invited elders (numbers being restricted by the plane capacity). For the second season, they (the elders) asked if young people could come along as well, so that they (not us) could teach the kids about their past. It is not always feasible to bring visitors to a research site, but when you can it is a worthwhile effort - seeing is far better than reading or listening to us talk about it, even with pictures and artifacts to show. With archaeology, visiting a research site seems to have an inherently high level of interest among many people. Has anyone doing other sorts of research (biology, hydrology...) tried this sort of thing?

Post Title: Re: conferences in outlying Arctic communities (glemoine)

Posted by: *Lee Cooper* at 2:38 PM 4/24/2002

We have had people come aboard research vessels that we have used such as the Alpha Helix and the Sir Wilfrid Laurier for short periods while anchored or in port. This can give people an idea of what the ship does and the equipment that is onboard, but it's sort of limited view, as all of the frenzy of activity that happens when the ship is actually being used for research is not observed. We have extended invitations to come aboard research cruises for longer periods through groups such as the Alaska Eskimo Walrus Commission, IRAs on St. Lawrence Island, and so forth but so far, no one has accepted that opportunity. The offer is usually over a 2 to 3 week period, so it is a fairly long time to be away from home, and as scientists, we are the ones funded and motivated to spend that time at sea. So from ship platforms, it's normally hard for us to connect with local communities.

Since 1999 I have had a research project with some oceanographic data collection (as well as marine mammal tissue collection) efforts located in the middle of the village on Little Diomedede Island, and I do find that I have the opportunity to share what we are doing quite closely with the local community, and in fact we couldn't have accomplished much at all out there without critical local help on a number of occasions. But as others have pointed out, stand up and talk presentations with slides and Powerpoint aren't effective communication in these circumstances.

Post Title: Re: conferences in outlying Arctic communities (Henry Huntington)

Posted by: *Carol Jolles* at 6:14 PM 4/24/2002

Didn't catch yesterday's interactions until this morning. I'd like to go back to Henry's and Anne's points about longer term collaborations and extensive preparations within and with members of local communities. An example of how this can work is the whaling research and follow-up workshop arranged by Roger Harrit and Allen McCartney following several years of work by Harrit, McCartney, Anungazuk, myself, Bodenhorn and Larson, in Alaskan whaling communities (Point Hope, Wainwright, Barrow, Diomedede, Gambell and Wales). By working closely with members of each of the communities over several years, by seeking extensive endorsements from local communities and Native organizations such as the AEWFC and by involving the

affected communities (these were studies of whaling, both traditional and contemporary, and the long term effects of ecological/environmental changes on their ability to engage in productive subsistence whaling) at every level of the planning and research, the responses and the level of engagement was substantial.

Long term commitment from scientists to the communities whose sites are integral to scientific study seems to be the key--a matter of trust and believability. That suggests that whatever the cost and hardship involved, it is absolutely imperative that researchers be prepared to seek the funds that support expensive travel and extended stays in local communities so that there is time to meet everyone and develop true working relationships.

Post Title: Re: WMP The example of Northern Norway (JoLynn Carroll)

Posted by: *Lilian Alessa* at 6:53 PM 4/24/2002

Humans are usually co-localized with nearshore coastal areas because they're so highly productive. My mother's culture (Musqueam First Nation) and the very identity of many native and settled peoples revolves around the nearshore coastal zone (argument for cultures as symbolic systems which derive meanings largely from natural elements...hence the importance of maintaining the cohesion of natural elements). The social order and the natural order are co-variant, and their interaction is reciprocal.

Now, on the other side, a physical feedback that I'm studying falls into this waste mgt discussion. The balance between human settlement, waste and outputs relies on management geared toward mitigating disease, moving it away from the community and maintaining productivity. However, the mitigating tools (in the case we're studying in the Aleutians) include chemicals like Cl.

Chlorine is not inert, it's highly reactive. In southern (tropical) climates it is broken down under UV and high temps. In the arctic, Cl remains bio-reactive and we're finding that it incorporates into living tissues of nearshore benthos (and vertebrates!) at high rates and is metabolically active as chlorinated fatty acid (CFA). These CFAs have effects that include causing "leaky" cell membranes. We're only just embarking on understanding the implications of this to the organism.

So, here's a system where human co-localization has effected a significant input of a xenobiotic into the nearshore ecosystem. But where is the balance? What standards are inviolable? I.e., in terms of understanding and managing this system it is not enough to know what and where the lateral nutrient, sediment and contaminant transfers are and occur. It is critical to understand where the social individual trade-offs (ITTs) occur as well. Do we not treat waste and risk the proliferation of disease vectors? If people co-localize with productive nearshore areas, does management demand ITTs that are community-wide? If so, can and will these be sustained through cultural norms? What risks have been presented to the communities themselves and how do they understand them? What frameworks are used to place the task of choosing trade-offs in the community's hands? How are these choices balanced with regional and global needs and constraints?

And finally, there's the political side. I've been cautioned that studying CFA loading and the corresponding toxic effects is not a great idea simply because Cl is such a useful and ubiquitous chemical for water and waste treatment. That, in and of itself, is a very interesting issue and a

clear case of societal trade-offs and choices that may or may not have been presented to the local scale (the communities).

Post Title: Re: conferences in outlying Arctic communities (Carol Jolles)
Posted by: *Anne Jensen* at 7:42 PM 4/24/2002

I think Carol really hit the nail on the head when she notes that long term commitments to communities are important to building trust and believability.

I'm interested in Genevieve's comment that slide shows didn't work well. We've always used slides (lots of them) in our post-and pre field season visits to communities, and had it go pretty well. On one trip to Wainwright after a field season at Pingusugruk, we did seven presentations in classrooms during the day (essentially the entire student body of Alak School) and then did a community presentation at night. We got a lot of people, but somehow the door of the school got locked before everyone got in. When the door got opened, we got another wave and had to do the talk again. Some of the audience from the first talk apparently got on the CB when they went home, because a third group came, and we had to show the slides & talk yet again. At that point we had to call a halt because we had lost our voices. A lot of the kids came back in the evening, and there were a lot of really good questions. Of course, we had had at least 20% of Wainwright residents as site visitors at least once (some many times) during the field season since the site is only 27 miles from Wainwright, and we used a lot of people pictures, especially of those folks and crew members they know. It is not the same presentation I would do at an archaeology meeting. Most people don't want to look at endless artifact shots or stratigraphy.

On the other hand I have a slide show I put together for the carpentry classes at the local community college on traditional house construction. It has about a hundred slides of construction details of semi-subterranean houses & tools for making them. The students seem to enjoy it. I wound up giving that talk at a public meeting of the Yukon Conservation Society in Whitehorse, and people seemed pretty interested there. I guess the attendees were people interested in wooden house construction.

HARC Online Workshops > Combined Vulnerability and Impacts > Links between social and biophysical vulnerability?

Post Title: Links between social and biophysical vulnerability?

Posted by: *Lilian Alessa* at 9:08 PM 4/18/2002

Vulnerability has many components: physical, cultural, economic, political, etc, which function on different scales: local, regional and global that vary over time in a given space. The nearshore environment is characterized by highly productive but sensitive biological communities which are often co-localized with human settlement and hence, vulnerable to impacts. Since human settlements proximal to the arctic nearshore are dependent on nearshore or nearshore-supported resources, they are, similarly, sensitive to change.

Vulnerability may result in impacts (negative) exerted on either a human (social) or physical system. However it may also result in adaptation (positive). The outcome of vulnerability may thus be negative or positive. Proactive management (by decision-makers) can reduce social and biophysical impacts as a consequence of vulnerability. However, before this can be effective we need to better understand how humans perceive the vulnerability of the nearshore ecosystem and their impacts on it. The social component is critical to understanding feedbacks which affect the overall physical system. How do we begin to collect these data?

(This was posted by the Integrated Arctic Natural Resource Mgt. Class at the University of Alaska, Anchorage)

Post Title: Re: Links between social and biophysical vulnerability? (Lilian Alessa)

Posted by: *Henry Huntington* at 1:17 PM 4/21/2002

A very good question--what do people perceive about the nearshore environment, generally and in their immediate locale? Documenting their priorities, concerns, and observations is probably a good idea as a first step to identifying the convergences and divergences between the views of the research community and the views of the local community. Then we could look at the reasons behind those views, which may illuminate areas for better communication, further research, or action to mitigate impacts.

Post Title: Re: Links between social and biophysical vulnerability? (Henry Huntington)

Posted by: *Larry Hinzman* at 9:52 PM 4/22/2002

Documenting stability of the shorelines near existing communities is important, but it is also necessary to characterize current stability/erodability potential and long-term resistance to change all along the coast. It would not be possible to select possible village sites near the coast without some projections of future structural conditions. Although oceanic circulation patterns change somewhat, it may be possible to define a range of extremes likely to be encountered. Models of near shore circulation patterns have probably not been developed on a resolution that is fine enough to be of great value for community planning. These models would also need to be developed if off shore pipelines progress from planning to implementation.

Post Title: Re: Links between social and biophysical vulnerability? (Larry Hinzman)
Posted by: *Dan White* at 9:52 AM 4/23/2002

It is a good point that erosion measurement/predictions should be conducted all along the coast, not just at village sites. It has been my observation that some of the worst bank recession occurs at regions on the coast where frozen silt and organics offer little resistance to erosion. Most of these regions do not contain villages. However, the sediment loading that results from erosion may impact near-shore uses everywhere along the Arctic coastline. I wonder how the increased silt and organic matter loading that results from erosion is affecting marine biota?

In addition to estimating erosion in vulnerable areas, areas of future development (as Larry suggested) and past development (abandoned sites, fuel caches, DEW line sites etc) should be included in investigations.

Post Title: Re: Links between social and biophysical vulnerability? (Dan White)
Posted by: *Anne Jensen* at 3:15 PM 4/23/2002

It really is important to look at erosion in areas besides villages. In villages it tends to be noticed; at more remote sites it may go pretty far without being recorded. I've seen several former dumps (buried landfill) which have eroded to the point where a lot of material is in the water (Kogru River comes to mind) and an abandoned DEWLine site where the main building was undercut by waves. If it wasn't cleaned up in the next year or so, it's undoubtedly in the ocean, along with whatever was in the building.

The effects of sediment transport are also an important point. Although almost all the concern is with erosion (did people differentially select erosion-prone sites for some reason?) sediment deposit can play a role too. The settlements at Icy Cape were eventually abandoned as a permanent settlement because the area silted up so much that ships couldn't off-load goods for trade, and eventually even umiaqs (which are pretty shallow draft) had to be dragged a very long way before people could get in and paddle.

It may be worth noting that a lot of habitation sites on the coast have already eroded. For example, Pingusugruk (on Point Franklin between Wainwright and Barrow) had 60 countable housemounds in a 1949 aerial photo (and there was already visible erosion). By 1986 all but 5-6 houses and parts of 3 others in the main settlement were gone; by 1994 2 of the partial houses were gone as well.

Post Title: Re: Links between social and biophysical vulnerability? (Larry Hinzman)
Posted by: *solomon* at 4:39 PM 4/23/2002

Along the lines of these discussions, I wanted to remind people of the existence of the Arctic Coastal Dynamics project lead by Volker Rachold, Jerry Brown and others. One of the primary roles of the ACD is the development of circumarctic databases of coastal characteristics, rates of change and key monitoring sites. Also included will be a database of climatological data. The importance of the ACD will be to allow us to evaluate the large scale spatial variability of Arctic coastal change as well as to provide a central repository for standardized information about detailed measurements at representative sites. I would invite anyone who is not familiar with the project to visit the website, join the project and think about including site information or getting involved in some of the mapping and data compilation exercises.

Post Title: Re: Links between social and biophysical vulnerability? (Anne Jensen)
Posted by: *solomon* at 5:03 PM 4/23/2002

This discussion is really becoming one about our lack of information and knowledge of the details of coastal processes at high latitudes. We need more information about the role of ground ice and thaw subsidence in driving the erosion process and sediment transport processes as affected by sea ice and frazil. The latter has been established for parts of the Alaskan Beaufort by Reimnitz and Barnes, but there has been little work on this in other areas. The role of salt transport due to brine expulsion in the bottom-fast ice zone remains an important question with regard to degradation of ice-bonded permafrost in the nearshore. Monitoring at locations away from human activity is important if for no other reason that we need to understand the natural situation as well as that which has been influenced by human activity.

Post Title: Re: Links between social and biophysical vulnerability? (solomon)
Posted by: *Anne Jensen* at 5:17 PM 4/23/2002

The brine question is a good one, since there seems to be liquid brine underground at some locations onshore. I don't have a copy of Murdoch handy, but as I recall the hole that the enlisted men were set to digging to measure the depth of the permafrost reached brine at some point. It is now an ice cellar, but the late Thomas P. Brower Sr. said that they had had to install a floor above the brine level.

Post Title: Re: Links between social and biophysical vulnerability? (Anne Jensen)
Posted by: *reportem* at 6:01 PM 4/23/2002

What is the cause of the subsiding along the Beaufort Sea? Is this from natural causes (Warming) or from human activity?

Mino Reporter

Post Title: Re: Links between social and biophysical vulnerability? (reportem)
Posted by: *solomon* at 5:11 AM 4/24/2002

Subsidence along the Beaufort Sea coast is due to a combination of global sea level rise (eustatic) since the last glaciation combined with local isostatic subsidence caused by loading of the crust by sediments in the case of large deltas and by long-term crustal response to glacial unloading and forebulge collapse. The relative contributions of the eustatic and isostatic components are not known and vary along the coast depending on the geological history. The only thing that has been measured is the relative sea level rise, which is the net addition of the two components. In the vicinity of Tuktoyaktuk, long-term rates (several thousand years) and rates from 40 years of tide gauge records are in the range of 1-4 mm/a). There are also short term changes (hours to days) in water level due to storm surges (several metres in range) and seasonal changes on the order of several decimetres with the highest seasonal levels occurring during the open water season. Finally, there is the medium-term issue of coastal subsidence as a result of thaw consolidation. Ice occupies a larger volume than liquid water, so even if there is no "excess" ice, thawing will result in a loss of volume and there for some subsidence as ice-bonded coastal permafrost thaws. Where there are significant volumes of excess and massive ice below sea level, thaw consolidation can be much greater. The time scale for thaw consolidation depends on the water temperature, water depth and hydrodynamics, but is on a scale of years to decades. Dallimore et al (1996) estimate (using simple models) thaw strains of

0.5-1 m over 50 years in the vicinity of North Head (Canadian Beaufort Sea) or 10-20 mm/year - about an order of magnitude greater than sea level. The accommodation space created by thawing sediments will be rapidly filled from nearby sources - notably the adjacent beached and coastal bluffs. However, to my knowledge there has not been much focused investigation on the measurement of thaw strains in the nearshore and the correlation with rates of coastal change in the adjacent onshore areas. The relative contributions of the various water level forcing mechanisms is therefore not well known in the high latitude environments. However, it is likely that a warmer climate will result in longer open water seasons and warmer coastal waters which could lead to an increase in the rate of coastal permafrost degradation. Brine rejection in the bottomfast ice zone may be reduced which would partially counteract the effects of warmer coastal waters, but we do not know enough about the relative importance of the two competing factors to determine the net effect.

Post Title: Re: Links between social and biophysical vulnerability? (solomon)

Posted by: *Jim Jordan* at 5:16 AM 4/24/2002

Monitoring at sites distant from inhabited or developed areas is critical for sure. None of the 24 retreat monitoring stations I established in the mid '80s in the southern Chukchi were placed near settlements, but their broad spacing have not captured the variability in process rates that exist over km-scale (or less) distances. Steve's comment about local involvement made me think about the many native allotments that are scattered along the (AK) coast and the potential that local observations have to contribute to the discussion. Most of these sites functioned as a base for subsistence activities in the past and in that context, environmental changes are certain to have been noted.

Post Title: Re: Links between social and biophysical vulnerability? (solomon)

Posted by: *Jerry Brown* at 3:53 PM 4/24/2002

Folks: I am in the field at Barrow, but trying to keep up when time allows. Steve and Jim's comments cover many of my thoughts related to erosion and sediment transport as do Bill Manley's comments earlier. Keep in mind erosion rates are highly variable in both time and space. Ideally the ACD program will provide a circumarctic database to assess these variations and their causes. We should also consider the effects of storm events on sediment transport in lagoons; not just open ocean coastlines. The mouths of small streams and inlets may be temporarily blocked and prevent both fish and traditional use by boat. This process may have occurred in Elson Lagoon around Barrow following the Aug 2000 storm. Traditional subsistence routes by water were replaced by overland routes to reach to fish camps.