

Human Security in the Arctic:

An Examination of Some of the Multiple Influences combined with Climate Change Affecting the Arctic Ecosystem

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Abstract:

The notion of human security is rarely if ever applied to the Arctic region. The reasons why this is the case are probably numerous, however, it is becoming increasingly clear that the Arctic region ought to be a region of human security focus. It offers a great deal to our understanding of human security, particularly in the context of environmental impact and change. As a region generally considered “pristine” it has few local sources of pollution. However the region is affected by transfers of industrial substances from the south, which in turn affect the human and animal populations living within the region. The relationship between the environment and human populations in the Arctic is not yet well explored, but reports are beginning to take note of the impacts of persistent organic pollutants (POPs), other pollutants, and climate change on northern communities. In the human security context these environmental impacts demonstrate themselves through diverse securities and insecurities, including food, health, societal (identity), and economic securities. This paper will present a number of the human security and environmental relationships to be found in the Arctic region. It will also demonstrate the importance of the Arctic region to the development of the human security concept with relation to environmental change. In addition we will demonstrate the importance of a multidisciplinary approach, where social system and ecosystem research must meet in order to best understand the relationship between human security and environmental change.

‘Security means nothing if it is built on others’ insecurity.’

Women’s International Peace Conference, Halifax, Canada, 1985

In 1994 the UNDP Human Development Report focused on the concept of “human security” claiming that security is integral to human development, and through an expanded definition, can be largely associated with human well-being. Human security was generally defined as ‘freedom from fear, and freedom from want’, and was further identified 7 broad categories of security: economic, food, health, environmental, personal, community, and political. In addition to widening the parameters of security, human security also differentiates itself from traditional security approaches by placing the individual, not the state, in focus. Since then the definition of human security has evolved, been the centre of much debate, and has been adopted in many different ways by different agencies or groups. At its core, human security refers to the dynamic process through which basic material needs are met, while concurrently securing and realizing human dignity, which is integral to this process (Thomas, 2001; Hoogensen & Rottem, 2004). This paper therefore attempts to analyze the present level of overall security, as understood in its broadest sense, of the men and women of the Arctic.

In the Arctic it becomes very clear that the ‘categories’ we use to identify human security are very fluid, and by and large very closely linked. Economic security cannot be completely isolated, for example, from environmental security or political security. Food security is connected to environmental, health, and economic security, and so on. We will use these categories just to assist us in identifying some of the key trends that are relevant to human security in the Arctic, but these categories cannot be understood as complete or permanent.

The Arctic and the Environment

Human security is really a relationship of in/securities emanating from the level of the individual, or non/sub-state level. These related securities are further engaged with other levels of security such as state, regional, and international securities (see discussion below). The manifestation of in/securities depends on the context – what are considered as in/securities in Botswana are different that those in central China, or those in the Arctic. They may all have some similar in/securities, but these nevertheless depend on the context. Crime, poverty, violence, tendency towards war, disease,

Environmental securities have significant impacts on people of the Arctic, both connected with economic securities (for those economically dependent upon the land) as well as with health securities and cultural securities, among others. Persistent organic pollutants

have been linked to increases in breast cancer, impacts on reproductive health, and transfer to children through breastmilk (*Taking Wing* 2002). The health of the ecosystem is also integrally linked to the culture of many indigenous peoples in the Arctic, with a great deal of the protection and promotion of this culture taking place in the home by women. Environmental exploitation without any sense of sustainability threatens Arctic lifestyles and well-being by wreaking havoc on cultural, ethnic and national identities and security.

Many of the eight states comprising the Arctic have undergone significant reduction within their public services, and as such health security in the Arctic becomes an increasing concern. Access to adequate health care is a challenge for remote locations catering to multicultural needs based on predominantly natural resource industries (be they traditionally-oriented or otherwise). Advances in distance delivery systems such as telemedicine are extremely important to the health security of the Arctic region. Additionally, acknowledging the interplay between different sectors of security, such as economic and environmental, is important in identifying current threats to health security, such as problems in work conditions or environmental impacts on health.

A broad, relational concept of security is complex, but can still be understood while altering according to time and space or context (McDonald, 2002: 288). To develop this argument, we look at human, societal, state and international security and illustrate how they are related to one another. This results in a very broad conception of security which more adequately reflects the complexity of the concept, but which makes it very unwieldy. However, we take our theoretical departure in security theories of marginalized groups, which emphasize the importance of context (Hoogensen and Rottem, 2004: 168-169). The focus of this article is on theory and developing an understanding of non-state based security (human and societal) that might provide new insights into human security in the Arctic, using climate change and multiple influences on the environment as our empirical case.

Relations of security:

Security considerations in the Arctic have been traditionally dominated by national security agendas focused on territorial integrity of the state through political and military means. Within the traditional parameters, security requires a sense of urgency and legitimacy to use extraordinary means (Buzan 1998). Security exists to secure the state, largely regardless of, and disconnected from, its 'contents'. Insofar as this traditional approach has affected the Arctic, it has been, for example, an early warning zone for incoming missiles (between the USA and the Soviet Union), or as in the case of Iceland and Greenland, 'stepping stones' of security between Europe and North America (Solheim 1994).

Although the military and political aspects of security are still considered relevant in the Arctic context, a broader sense of security issues is beginning to dominate, particularly with regard to the environment: the extraction of natural resources (primarily oil), the increase in persistent organic pollutants, and the preservation of the Arctic ecosystem (Verhaag 2003).

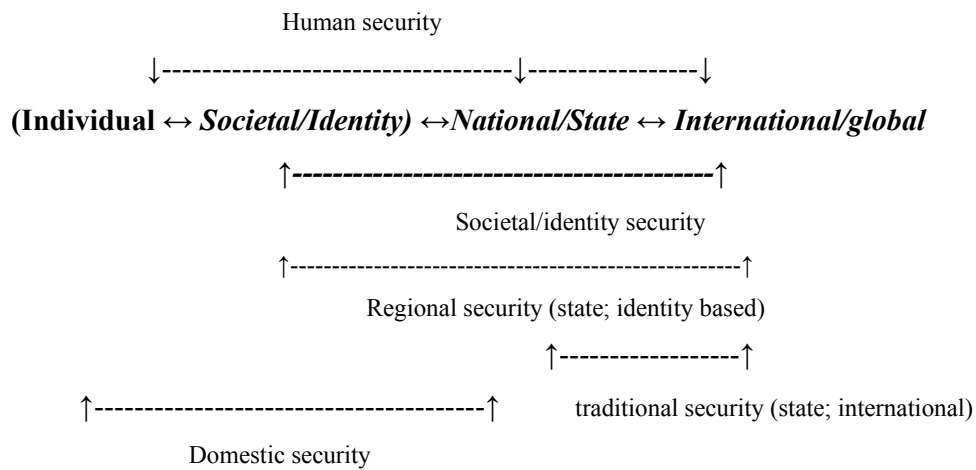
When speaking of non-state based security, two “types” of security seem to dominate: human and societal security. These are, however, not often discussed as complementary and relational units, but as one versus the other. Barry Buzan (along with colleague Ole Wæver) has played an instrumental role in the development of societal security, and essentially “writes off” the efficacy of human security, claiming that the only way to study security at the non-state level is through societal security. As Buzan notes, human beings are always interacting with others, and take their meaning from the societies in which they live (Buzan, 2004). The human security debate does not help much either in bringing these questions to a resolution. There is little to no agreement on a definition, and as such the parameters move from state/military friendly definitions that seek to ensure security to “people” who are in the throws of traditional war, to a broad development/security orientation that includes a wide range of security issues from physical and political to economic and environmental. The former retains the narrow cohesiveness policy makers enjoy, but it does not really address the issues that human security was created to highlight, namely security from “below” or the bottom-up. Security of people is not always synonymous with security of states; just as “trickle-down” economics is riddled with pitfalls, so is “trickle-down” security.

In other words, although there appears to be some agreement that human security is not a replacement of state security, it is argued that the presence of the state does not automatically imply security for its people, and nor does the notion of security automatically imply the state (Shinoda, 2004a: 23; Shinoda, 2004b; 6-7; Thakur, 2004; 347; Acharya, 2004; 355). For theorists to remain true to the re-orientation of the security referent however (the individual), it is difficult to avoid an enormous broadening of the concept, making the concept of human security vulnerable to the oft-repeated and common critique that it renders the concept of security meaningless. Both human and societal security are relevant and interrelated in the Arctic context. Of course this demands a wider conception of security in the first place. Traditional security would not, contrary to our argument here, take the environment into account when determining the security needs of the region. In the traditional image, unless the environment and environmental change can be demonstrated to *cause* conflict or war, it is not an issue for security. But if we want to know security from the

bottom-up, are we not bound to hear how security is articulated from this position, regardless of our own biases and prejudices about what security means for us?

Part of the difficulty is the apparent determination to keep different levels of security separate or at least not explicitly recognize the interrelationships and dependencies of these levels upon one another. The following figure attempts to provide a simple visualization of these relationships.

Figure 1:



The levels within and upon which we can identify security interests are highlighted in bold and are *individual*, *societal/identity*, *national/state*, and *international/global* in figure 1 above. I have placed the levels horizontally to eliminate the suggestion that one level is more important or significant than the other. However it is quite common to express the relationships between these levels in a lateral fashion (ie: individual-based security expresses security from the “bottom-up”, national or international security is “top-down”, etc). The arrows indicate the relations between these levels, and all the levels are recognized as having relationships with and to each other. These relationships are further identified between levels, whereby individual and societal/identity security are bracketed together to indicate an additional strength in the relationship, and societal/identity, national/state, and international/global are italicized to indicate a recognized additional interconnectivity between them.

The individual and societal levels are bracketed together because they cannot be considered separately. Individuals, unless living alone in a vacuum, are constantly functioning in relation to others and thus within collective or social surroundings. They are also rarely

treated outside of any or all of the identities individuals assume or are assigned (their gender, race, ethnicity, social class, etc). However it would likewise be inappropriate to subsume individual or human security within the societal security and as such must be recognized as separate levels. The societal level reflects these individual relations insofar as they pertain to identity and the ways in which individuals self-identify or are externally identified to belong or not belong to a particular group. The reason we cannot solely address security for individuals at the societal level is because it leaves no room for identity resistance, nor acknowledges the possibility of hyper-identity (see below). Notions of “individual” security therefore allows for change, where individuals consider themselves to identify more with one “group” at one time, and more with another at another point in time, depending on the context (Maalouf, 2003; 11).

Amongst these levels I have indicated where the differing perspectives of security fall. Traditional security perspectives fall within the relations between the national and international levels, where the military and political sectors would be most prominent, but would also include elements of the economic sector (Buzan and Wæver, 1998). State security, and domestic or internal security (which addresses the relationship between the state and individual such as internal policing, social security measures, etc) can probably be understood as the most common approaches we have taken with security thus far, and they have been largely held separate making it easier for policy makers to focus internally or externally, eliminating the complexities of cross-boundary securities.

Societal/identity and human security have complicated these traditional approaches to security and policy in that boundaries are crossed and jurisdictions are blurred. Human security, the mother of all evils to a traditionalist, spans the spectrum of levels. It reaches from the individual (which is also connected to the societal/identity level, meaning that this relationship is always present when determining human security) to the state and also to the international arena. Human security is taking security down to the lowest common denominator, the individual, and exposing the many complexities of security given the relationships between levels. As such human security seems frightfully unmanageable. The interrelationships with societal/identity level helps to define the context which thus provides the focus at a given time and place. The context guides who responds to these security contexts, be it states, international institutions, local communities, social movements, families or individuals. Societal and state securities are additionally blurred in the contexts of failing, failed and/or burgeoning states, amongst the groups vying for power or amongst regions spanning across states, such as the Arctic. Societal security is additionally relevant in cases

where state security prevails but does not acknowledge/account for/ or address the societal/identity security needs of marginalized groups within the state. When societal and state security are “one”, where the state adequately represents the societal, the differences between the two need not be distinguished. However this presupposes that there are no non-dominant identities within that given state, be they women, ethnic or racial minorities, and so on.

Regional security has many common features with societal or identity security, at least from a non state-based perspective. Groups that share identities within regions, be these regions confined within one particular state or across states, provide a voice to regional security (for example, Arctic communities, which span eight different countries, may nevertheless articulate a regional security perspective based on their collective identification with the Arctic region, or amongst indigenous peoples whose collective identity is not always confined to state borders). However regional security can also be understood as very state-based; a conglomeration of states in close proximity that share, broadly speaking, traditional security interests and are subject to traditional power dynamics (Buzan and Wæver, 2004). Regional security therefore plays a very significant role in the relationships between societal and state security.

This leaves international security which seems far removed from individuals, instead allowing the “system” to dominant. The relations between states, along with assumptions about state and international system behaviours dominant this view, where superpowers, great powers, soft and middle powers and weak powers become relevant in a game of survival. The state and global responses to terrorism become relevant here, where states vie for power and influence with the superpower USA, responding in different manners to the “you are with us or against us” rhetoric. The relevance of this level to the Arctic can be seen in the renewed interest in oil extraction and export from the Barents region, whereby Russia and Norway are still in dispute over jurisdiction of the Svalbard continental shelf, and where the USA is increasingly looking to the Barents sea as a source of oil to reduce its dependency upon the Middle East.

Of course, seen from this perspective it appears that we suffer from hyper-securitization – every level has a security dynamic, as well as security dynamics between levels – are we thus frozen within a security loop from which we cannot escape and within which we live in constant fear? Perhaps, at least insofar as security is continued to be viewed as a negative concept, dependent solely upon fear and threat prevention. However security has two sides – it clearly exposes vulnerabilities and sources of fear, but it also speaks to capabilities and

enabling – people, societies, groups have been able to ensure their security by a variety of means, to ensure that life continues, to even make sure a good life can be found. These are also factors of security – ways of achieving and maintaining security, not only ways of identifying threats.

There are many ways in which one might be able to theorize both the positive and negative dimensions of security, and such dimensions have been raised before (for example, Bajpai, 2004). Individuals and communities will endeavour to seek security, not just in relation to avoiding threats, but to building their capacities. If we think of security only in terms of threat avoidance however, any and all exercises employed in the creation of security (individual or otherwise) will either not be recognized at all, or seen as a part of this security loop of hyper-securitization where we are in constant fear of threats. Seeking security is not always about immediate threats and their avoidance or prevention. It is also about creating secure spaces, building capacities and capabilities, and enabling – finding and using the resources and abilities to create our own security. Responding to threats is one important aspect of security, but it does not address security in its totality. People need to fulfil their needs, which come in diverse forms. If certain needs are constructed as very important to the individual or community, unfulfilled human needs will cause frustration, resistance, and, eventually, violent conflict (Saikal and Schnabel, 2003; 25). In the Arctic context, adaptation, flexibility and building capabilities and capacities has always been a part of Arctic life (ACIA, 2004). The problem now is that factors, particularly environmental, are changing so fast that it is very difficult for communities to adapt quickly enough. We need therefore increased awareness about the in/securities of the Arctic to be able to provide what is now needed for adaptation, prevention, and rectification, if possible.

Security from the Margins

Rooted at the level of the “individual”, human security claims to represent securities from the “bottom-up.” In other words, human security ideally represents those securities that are not heard at the dominant or state/elite level through traditional security. It has been generally assumed that traditional, or state, security “trickles down” to sub-state levels like the individual; the security of the state implies the security of its “contents” (Hoogensen and Rottem, 2004: 161). Of course, not all states are alike. Some states are more capable of providing general security across their populations than others. Thus how do we distinguish? Secure states do not *always* mean secure people, however the relationship between the state and individuals differs across space and time. To make things more complicated, secure states may very well endow certain segments of its population with security, but not all. Significant

segments can be left out or marginalized. In this case, we are examining in/securities within states that are predominantly considered “secure”. Increasing awareness of marginalized groups or regions within “secure” states better enables us to hear and respond to in/securities; in/securities that if not addressed can, as a result of the dominance/marginalized imbalance, develop insecurities amongst the dominant groups as well, either in terms of resistance or in terms of environmental degradation allowed to go awry.

Making the marginalized visible and recognizing “security from below” has been the focus of gender IR studies, and that human security and feminist approaches to security have a great deal in common (Hoogensen, 2005; Ticker, 2001; Keebe and Smith, 2001). By endeavouring to understand security from the position of the individual, human security inevitably opens the definition of security up for a variety of perspectives from “below”. Feminist approaches argue for a reconceptualization of security based on the in/securities of civilian society, the marginalized, and the depoliticised (Wibben, 2004; Tickner, 2005; Peterson, 2004). J. Ann Tickner states: “since women have been marginal to the power structures of most states, and since feminist perspectives on security take human security as their central concern, most of these definitions start at the bottom, with the individual or community rather than the state or the international system.” (Tickner, 2001; 62). In addition, feminist investigations have been explicit in exposing the power relations between the marginalized and the dominant. Thus, security “from below” is not merely an examination of what security needs are expressed at the individual level, but it is also an examination of how the insecurities from below are often a result of the maintenance of security “from above”; elite and/or state security creates and perpetuates insecurities on the margins. Security is linked to power relations, and feminist insights expose the power relations between “above” and “below”, between dominant and non-dominant.

This complex security dynamic comes into view when examining security through the relationships of dominance and non-dominance. States differ in their capacity to endow security to their populations, but all exhibit relations between dominant and non-dominant groups identified through gender, class, race, ethnicity, and so on. These relations may or may not lead to direct, violent conflict, but they do point to recurring vulnerabilities.

The relations between dominance and non-dominance are not meant as reified categories but fluid relations that are dependent upon one another. These relations change according to context; actors who would be part of the dominant in one context may be non-dominant in another. Recognizing these relations exposes the power dynamics of the relationships. The usefulness of integrating power relations into the concept of security is

profound. The relations of power exhibited through dominance and non-dominance exist the world over (MacKay, 2004: 153). A security concept that uses this lens is aware of power relations occurring the world over, including and going beyond obvious areas of conflict.

State security, driven by the dominant positions/powers (elites), endows security upon those who play a role in, or are a portion of, the dominant position/power. Those on the margins however, or in positions of non-dominance, are not necessarily endowed with the benefits of the state-based security arrangements, or more specifically, their positions and needs are not secure. The extent to which state-based security reflects and responds to the needs of individuals depends on the nature of the state (democratic, autocratic, etc) and of the relationships between groups of dominance or non-dominance within that state.

Environmental, health, and food securities interconnected

A significant source of threat to Arctic communities are pollutants arriving by air and water from the industrialized south. Decades of research has already taken place with regard to the impacts of persistent organic pollutants (POPs), mercury and lead on Arctic wildlife, and more recently Arctic scientists have put human communities in focus (Gabrielsen, 2003). POPs have been implicated in the increased toxicity of traditional country foods in the Arctic region, which is one of the primary ways in which these toxins impact human beings, through ingestion. These environmental security concerns impact both indigenous and non-indigenous communities alike.

Reliance upon and linkages (including cultural/societal linkages) to traditional foods is found within many cultures in the Arctic, from Inuit communities that have traditionally eaten whale blubber (containing high amounts of toxins as POPs are predominantly stored within the fatty tissues), to North Norwegian communities that traditionally eat sea gull eggs or cod livers. For example, children and pregnant women in Norway are additionally warned against eating particular products containing cod livers that would not have undergone processing for cleaning of pollutants. Sockeye salmon are returning to their spawning grounds in Canada and Alaska and transporting higher and higher levels of contaminants such as methyl-mercury, and higher levels of mercury have been reported in the Russian Arctic. Higher levels of mercury have been identified in maternal blood and hair samples as well as cord blood in northern Quebec mothers (Gabrielsen 2003). In general, there are noticeable trends of increased toxicity in human systems in the Arctic regions.

Research efforts are currently underway to investigate the possibility of pollutants causing mixed gender in men living in North Norway, as has already been noted in polar

bears. A number of polluting chemicals emanating from agriculture and industry mimic sex hormones such as estrogen and are known as endocrine disrupting chemicals (EDC) (Nordlys, 09.07.04). Research has already documented that pollutants exported from southern regions have resulted in low sperm counts and poor sperm quality amongst men living in northern regions. Further investigations are being made into the possibility that these chemicals are causing testicular cancer as well.

Climate Change and the Transportation of Environmental Toxins

In their report “Towards the North” (*Mot Nord*), the Norwegian government appointed committee on the North (Nordområdeutvalget) highlighted climate change and the transportation of environmental toxins as significant and important influential factors in the environmental development of the Barents Sea. The report outlines various perspectives on the development of oil and gas production, as well as claims that there is little doubt about the fact that a continuous warming of the climate will lead to considerable changes and challenges in economic, environmental and security politics. Such changes will influence the future of the energy, fisheries, marine activities, transport and tourism. The Barents Sea represents a melting pot of complex problems that together present a clear challenge to all the governments and people concerned.

During the last 15 years high levels of contaminants have been found in the Arctic environment, having reached there from industrial and agricultural regions further south (Norstrom, et.al, 1988; Muir, R. J., et.al, 1988; Malmquist, 2003). They are transported to Arctic regions by air, ocean currents and rivers. The Barents Sea is a highly productive area with a wide range of important fish stocks, marine mammals, and sea birds. Due to the special physical characteristics and conditions of the Barents Sea, the ecosystem is one is not found anywhere else in the world, and cannot be replicated anywhere else in the world. The basis of biological production is plant plankton and algae in the ocean, which are closely connected to the sea ice. The edges of the ice are important areas during the arrival of spring and the growth of flora and fauna. The energy created here has 15-20 times more energy output than the total energy production in Norway. In the event that the ice withdraws northward, an equivalent movement will occur of the spring growth areas for the animal plankton that is the basic food source for important fish stocks (such as cod). Animal plankton and ice fauna are connected between plant plankton/algae and higher organisms such as fish, sea birds, seals and whales. The biological production in the Barents Sea creates the basis of life for 14-16 million sea birds, 2-3 million seal and 200 000 whales.

No other area in the Arctic has such great seasonal variations in ice expansion as the Barents Sea. This is due to stable transport systems in the atmosphere and the ocean transports warm air and waters from the south to the Barents Sea. As a result, the climate is significantly milder than in other regions that are at equivalent latitudes in the northern hemisphere. The warm Atlantic waters keep the southern part of the Barents Sea ice free during average years. This is the case for the west coast of Spitsbergen as well, which is influenced by the other branch of the Gulf stream which runs into the Arctic ocean from the North Atlantic. During the past 25 years however, the ice coverage in the Arctic has been reduced by 10%. This is due, in large part, to human-created climate change.

It is most likely that the temperature over the greater parts of the Arctic will increase by approximately 5 °C by 2080. The temperature will increase more so during the winter than the summer, resulting in reduced seasonal variation. The Arctic Climate Impact Assessment (ACIA), in cooperation with an overall management plan for the Barents Sea, has recently implemented model-based calculations of the ice expansion in the region. The Arctic ice can be seen as the Arctic indicator (the canary in the mine, so to speak) that provides the warnings concerning the changes that are underway. The results of the models do not demonstrate any significant change of the ice between now and 2020. However by 2050 the ocean ice will have disappeared from large parts of the Barents Sea. By 2075, it is anticipated that the entire area between northern Novaja Zemlja, Frans Josef Land and Svalbard will be, practically speaking, ice free year-round.

Despite the long-range transport of pollution from the south, the Barents Sea is still relatively clean in comparison with ocean areas that are located near industrial or agricultural centres (for example the Baltic and North Seas). In an Arctic perspective however, the Barents Sea is nevertheless affected and vulnerable to the areas of relatively high population concentration, its location in relation to stream and wind directions, as well as to the drift of ocean ice which brings environmental toxins through ocean and air streams. While the transportation of toxins through the oceans takes a number of years, pollutants transported through the air from Asia, Russia, Europe and North America to the Barents Sea takes only a matter of days or weeks. The greatest concern at the moment is the affect of organic environmental toxins on the marine ecosystem of the Arctic. These toxins are not very soluble in water, but are very soluble in fat. The toxins are absorbed into the fat of plants and animals and can be found in different concentrations depending on the levels of toxicity, what the animals eat, and their natural capacity to break down and eliminate the toxins. While the level of toxicity of these pollutants is generally low for animal plankton and fish, it is quite high in

sea birds and marine mammals. In the northern parts of the Barents Sea it has been uncovered that the levels of organic toxins existing in the systems of polar foxes and polar bears is 2-6 times higher than in those found in Alaska and Canada.

International conventions have been implemented which have contributed to a reduction of many important toxins in the Arctic, such as PCB and DDT. However, while the “older” toxins diminish, new ones continue to arrive and increase, such as bromerte flammehemmere (used in the production of TVs, computers, furniture and car parts), fluorforbindelser (used in the photo industry, and impregnated into clothing and furniture) and polyklorerte naftalener (used in electrical equipment, lubricants, paints and tettemidler). The levels of bromerte flammehemmere has greatly increased (5-10 times) in the past 10 years in the tissue and blood in a number of species of mammals and sea birds in the Arctic. If these developments continue at present rates, it will inevitably have harmful affects on humans and animals. As such, greater restrictions in fish and meat product intake will have to be implemented precisely because of the levels of toxins in these foods.

There are many ways in which the physical transport of these toxins can be altered due to climate change. The atmospheric connection between the eastern part of North America, of Western Europe and the north can become more quick and intense, particularly during the winter and spring seasons. This will, as a result, carry toxins from industry and agriculture in the south to the Barents Sea even faster than occurs today. In addition the re-released old waste (evaporation from the earth and water reservoirs) in Europe and the east part of North America will be transported by the same air masses towards the North. This will likely result in a substantial increase of toxin levels of such materials as PCB in the Barents Sea. Large open areas of water, which have resulted from the reduction in ocean ice, will increase the exchange between air and ocean. This is not irrelevant as current calculations indicate that the atmosphere in the Arctic transfers approximately 20 tonnes of PCB to the ocean each year. An increase in temperature will influence the increasing concentration of environmental toxins in marine food chains in the Barents Sea. As such, we can assume that the highest levels of toxins will be found in the higher levels of the food chain, such as in sea birds and mammals. Many Arctic species such as seals and polar bears experience periods of starvation due to reduction of food sources or due to reduced access to food sources as a result of changed seasonal shifts. During these times of reduced food intake, these animals burn off energy from stored fat. The toxins are then released into their systems as a result of burning the fat stores. This process often occurs during critical periods such as pregnancy and nursing of young. Longer periods of starvation, changes in the ice conditions, or changes in access to food

sources will ensure that animals in the Arctic are subject to increased doses of environmental toxins.

At this stage we must expect that a continued warming of the Arctic will occur, and that this increase in temperature constitutes in and of itself a stress for the vast majority of animal species in the region. In addition we expect and believe that the stress and burden of environmental toxins will increase in proportion with the increase in temperature due to increased mobility (transport), increased concentrations accumulating at faster and faster rates within the food chains, and increased circulation of toxins. Acquiring the knowledge about the combined effects of climate change and environmental stress due to multiple influences such as mobile environmental toxins is a significant challenge for researchers and governments who want to keep the Barents Sea, and the Arctic in general, a clean and abundant region.

References forthcoming. GH and GWG