

## **Quotes and Definitions from “How the World will Change - with Global Warming” (2006) by Trausti Valsson**

### **Comments on the book P. 6**

“Trausti Valsson is an academic who is not afraid to be controversial. In his new book he argues that global warming can be good for you – if you happen to live in the northern extremities of the globe, which are destined to become the new centre of human civilization...” P. 6

*Sir Peter Hall Bartlett Professor of Planning and Regeneration, UCL*

“Valsson's new book is at the same time provoking and refreshing because it counteracts the prevailing discourse viewing the climate changes foremost as a disaster and instead introduces a historic-geographical perspective in the discussion focusing on possibilities seen from a high North perspective.” P. 6

*Ole Damsgaard Director of Nordregio Nordic Centre for Spatial Development*

“... Valsson offers a new and a daring perspective on the climate change debate, highlighting opportunities that may come about in the Northern regions as a result of global warming. While some of his observations are likely to provoke controversy, Valsson challenges us to think afresh and to get beyond the gloomy predictions and grievance-mongering that frequently characterize ongoing debates over global climate change.” P. 6

*Gunnar Pálsson Ambassador of Iceland and Chairman, Senior Arctic Officials of the Arctic Council 2002-2004*

“... Professor Valsson is well known in Iceland for his books, articles and interviews on where future trends will lead the Icelandic society. In this work, his background as an environmental planner has made

him qualified to drawing reasonable conclusions from various scientific data relevant to the issues...

Professor Valsson's book is a ground breaking work which is likely to be of great use.” P. 6

*Dr. Thor Jakobsson Head, Marine Meteorology and Sea Ice, Icelandic Meteorological Office, Reykjavík*

“In his latest book Professor Valsson, takes a "planners look" at a globe faced with climate change. His main conclusion is that while southern regions may suffer from these changes, the Arctic and Sub-Arctic regions will benefit overall due to increased biological production, influx of southern species and new development opportunities. Hence these regions will become a magnet for human migration and visitation. This is certainly a fresh perspective which will be much discussed and debated in Arctic circles and elsewhere.” P. 6

*Snorri Baldursson Head of Information Department Icelandic Institute of Natural History Member of the ACIA Assessment Integration Team*

### **Introduction P. 7**

“... Actually, cycles of warming and cooling of Earth's climate are not new. Historically humankind has responded to the changes in various ways, though largely by spreading settlements and activities either towards the poles or to higher elevations during periods of warming...” P. 7

“...Today's world of fixed settlements and fixed political borders, however, makes this process of migration more difficult than it has been in the past.” P. 7

“...There is a third strategy, the one primarily studied in this book and seldom mentioned in public discussion, and that is to prepare ourselves for the migration of people towards cooler areas; towards the poles, towards higher elevations, and to cooler coasts.” P. 7

“...The retreat of this ice will make the polar areas – which today are almost totally uninhabitable because of ice and cold weather – space that mankind can

start to utilize and perhaps eventually migrate to and start to settle..." P. 8

"One of the tasks of this book – which examines the possibility of the creative utilization of the now cold areas – is to introduce the polar regions of Earth to the reader. Today the polar regions are almost unknown to us..." P. 8

"... Mercator projection, presents the world by cutting off the polar caps (as shown in the picture above to left), and then the cylindrical ribbon around the central regions of the globe is cut apart and flattened out, whereby it becomes the flat ribbon world map we know today. In more advanced world atlases circular maps of the two polar regions are added to the ribbon map..." P. 8

"... most of Earth's landmass is located in the northern hemisphere..." P. 8

"One additional benefit of these newer shipping lanes is that they are not limited by the width of canals and therefore a new generation of large containerships and tankers can be put into use in the Arctic routes, making the transportation of goods cheaper." P. 9

"... The "ribbon world" that appears on today's world maps is nevertheless quite useful for a practical reality of the world of today. Up to now we have been able to safely allow ourselves to cut off the polar regions because they are today mostly unavailable for human use..." P. 10

"With global warming, however, the Arctic will become a very active geographical element of the globe, which will mean that our world will no longer be a world on a ribbon..." P. 10

"...What hits us most is how narrow the gate into the new Arctic world is through the Bering Strait..." P.10

"...Practically speaking it is the so-called GIUK gates between Greenland and Iceland, and secondly between Iceland and the UK, that are the entrance from the North Atlantic into the Arctic Ocean area..." P. 10

"If the warming of the globe becomes extensive these shipping routes will become some of the world's main shipping lanes. This will mean that the nations placed at the described gates: Russia, the USA (because of Alaska) at the Bering Strait and, to a lesser degree Canada, Greenland, Iceland and Norway, will acquire a strong geopolitical position at the Atlantic gates..." P. 10

"In addition to the possible control of these very important shipping routes in times of crisis, the depletion of the resources of today's world will make the natural resources of the Arctic regions – be it oil, gas, timber, fish or minerals – very important for the future, putting the Arctic coastal countries in a very strong position..." P. 10

"... this book rather focuses on the new possibilities that mankind is offered by the warming of the Polar regions. This is not because the author is comfortable with what is happening with global warming but rather that this is a viewpoint that has been very little studied in the literature, a study that can even be termed a "study of the positive impacts of global warming"..." P. 12

"It should also be understood that the author is not a climatologist but a planner, so he has no possibility of making a judgement as to how fast the globe is going to get warm, or how warm it is going to get..." P. 13

"In the future it is possible – if warming continues for a long time – that many central regions of the globe will actually become uninhabitable, so the only option left to humans is – as in earlier times of excessive warming on Earth – to migrate towards the poles..." P. 12

"Very often in history we have experienced human migration, often as a response to changed climatic conditions. An example is the migration of Northern Europeans to America in the late nineteenth century as a response to a very cool period." P. 12

"... the new areas that will become habitable by the warmer climate are to the north (and south) of the inhabited areas of the globe, primarily in Northern

Canada, Greenland and Northern Scandinavia and Northern Russia..." P. 12

## **GLOBAL WARMING**

### ***1 Warming: The Catalyst of Change***

#### **1 How global climate changes P. 13**

"... the globe is getting warmer. Meteorologists, climatologists and other scientists have already described the changes in numerous articles and reports. This book will take that knowledge and these projections further and describe which areas of the globe will become more liveable, and which areas will become less liveable." P. 13

"... Global warming entails both positive and negative factors – whereas most reports indicate global warming as being solely negative..." P. 13

"... Regions close to climatic limits – for example in terms of cold or dryness – are of course much more vulnerable to climatic fluctuations..." P. 13

"... several times a drop in only one to two degrees Celsius had a catastrophic outcome for ... In contrast, Icelanders have regarded warming by one to two degrees as a gift from heaven and the country prospered accordingly." P. 13

"... Polar bears even survived the warm periods, and humans in the northern regions spread south with the advances of the ice and north again as the ice retreated P. 14

"... the cause of today's warming is not of central interest for this book – but rather the impact the warming is going to have on human existence..." P. 15

"... The car-based planning of US cities makes it almost unthinkable to commute without cheap gas; most are too sprawling to support public transportation." P. 15

"... the greatest importance concerns what will happen in the USA, China and India. In January 2006 these nations, together with Australia, South Korea and Japan, held a conference in Sydney, Australia. There a ministerial conference of these six nations – that already today, account for half of world emissions – established an organization parallel to the Kyoto group, called the Asia-Pacific Partnership on Clean Development and Climate." P. 16

"In the Sydney Conference these A6 nations presented objectives that seem to hold some promise in terms of gaining significant results in eight main areas ... : 1. cleaner fossil energy; 2. renewable energy and distribution generation; 3. power generation and transmission; 4. steel; 5. aluminium; 6. cement; 7. coal; and 8. constructions and appliance in general." P. 16

"...The Kyoto nations, their leaders being primarily European, opt for the cult of regulations, whereas the Asia-Pacific nations put their faith in the belief that the industries themselves will have the urge to curb emissions and reduce the use of energy..." P. 16

"...Ian Macfarlane, the Australian Minister of Industry, said "the reality is that new technology will deliver three times the savings in greenhouse gases as the Kyoto Protocol will." P. 16

"It is probably also true that by 2012 the Kyoto nations will already have gained the most they can out of the quota pressures they have put on their own industries..." P. 16

"...the assessment of what the nations involved in this debate are in fact thinking, also needs to consider what the geopolitical consequences will be: what areas and nations would gain and what nations would lose geopolitically with global warming." P. 17

"Looking at Russia first – with its wide, cold, northern terrains – we at once recognize that it does not need to be very negative for Russia that it is going to become somewhat warmer there; the Russian

population can rather easily, over a long period of time, spread to the more northern areas. This also holds true for Canada.” P. 17

“In general, the old industrial nations are mostly northern nations of rather cold climates, so one is tempted to doubt that they are, in fact, so very worried about the climate getting somewhat warmer, since warmer temperatures will mean a more comfortable outdoor life for them. ...” P. 17

“...one must, however, also keep in mind that it is not only increased warmth that comes with global weather changes; it is all kinds of alterations in weather patterns such as changes in precipitation, where some areas may experience less and others more precipitation...” P. 17

“Another consequence of global warming and the melting of glaciers and the expansion of the volume of the oceans, which leads to the prediction that the world's sea level will rise by about 50 to 90 cm in this century. To combat the resulting coastal flooding will be very costly – and here again the industrial nations, the rich nations, will have more funds to deal with the problem...” P. 17

“... settlements in very flat estuaries, like Bangladesh, are so densely populated that they lack space to move people out of the very dangerous flat terrains...” P. 17

“... The third strategy is the natural way, that is, to accept, and go with, the changes and move people and settlements away from areas that are becoming too problematic to the areas that are going to be more benign...” P.18

“...One deals with the conveyor belt of ocean currents, postulating that disturbances in this system of ocean currents that transports warmth to the colder areas of the globe might change the climatic future in individual localities or regions of the world... But these are just theories and data to verify them, or refute, are largely missing.” P. 18

“...It is of considerable significance that the warming will become much greater towards the poles – especially in the Arctic region. This warming will make the Arctic more ice free and more accessible, whereas, at the same time, many of the central regions of the world will be prey to the negative side of this development...” P. 18

## **2 Changes in natural environments P. 19**

“The study of global warming in the literature, historically, started with a study of climatic changes. This has been continued with studies on how these climatic changes will impact natural environments. The third aspect, the impact on human settlement structures and habitats, has been much less studied...” P. 19

“The first detailed report on global warming for a large section of the globe was written by the Arctic Council, which is an association of the eight countries that boarder the Arctic area... at the end of the Icelandic term in 2004 a summary report from this work was published at a ministerial conference in Reykjavík.” P. 19

“... under the title of Arctic Climate Impact Assessment, or ACIA. The general scientific methodology of Environmental Impact Assessment (EIA), applied in this report, was largely developed in the last few decades...” P. 19

“...the Arctic is warming much faster than areas at lower latitudes. The reasons for this speedy warming are: 1) Reduced snow and ice; 2) More of the energy trapped under the Arctic skies goes into warming rather than into evaporation; 3) The atmospheric layer of the Arctic is shallower, so it will warm more; 4) As the sea ice retreats more, more heat will be absorbed by the oceans; and 5) Alternations in atmospheric and oceanic circulations can increase warming, and as the sea ice retreats more, the warm currents coming from the south will have easier access to northern areas.” P. 19

“...a projection range to the year 2100. At the end of this period it is projected that the temperature will probably have risen by some 4 to 7°C over land areas in the Arctic. Northern areas, like Scandinavia, will in the same period, only have experienced a 2°C increase...” P. 20

“With the result of so much additional energy trapped under the atmospheric layers, with global warming, all climatic processes on Earth will accelerate. There will therefore, in general, be more precipitation and more strong winds. Another feature that we have already observed, not least in the last 15 to 20 years, is that various climatic patterns on Earth have been changing...” P. 20

“... specific climatic alternations, and if the changes do not happen too swiftly, ecosystems can adapt to new environmental conditions – though they may emerge as changed ecosystems...” P. 20

“...What is already now happening with the warming of the globe is that a large number of organisms are migrating towards cooler areas...” P. 20

“As the world climate, becomes warmer and wetter, especially in the high North, vegetation there will increase and the now arid and sparsely vegetated Arctic tundra will slowly start to become like the northern vegetation zones of today...” P. 20

“...This northward shift in vegetation zones – along with rising sea levels and thawing of permafrost at coasts, means extensive coastal erosion and the flooding of lowland areas...” P. 21

“...in general the whole Arctic region will become more productive, both the land areas and the ocean.” P. 21

“... On the positive side, with global warming rivers become more ice-free so that larger boats will increasingly be able to navigate the rivers as well as the coastal waters. The increased industrial activity that comes with easier transportation will mean large

changes in the environment. Industrial pollution and oil spills will become more frequent...” P. 21

“Many nations, like Norway and Iceland, are somewhat worried that the Russians, who own by far the most natural resources in the Arctic, will not set and adhere to stringent enough environmental standards. This holds especially true for standards regarding oil and gas drilling in Siberia and in the Barents Sea...” P. 21

“On the previous spread there is a matrix that provides an overview of how changes in some basic environmental features, like temperature, precipitation and airflow, have an impact on vegetation, organisms, land, air and water...” P. 24

“...most of the climatic changes that will come with global warming will have a negative impact in warm areas but a positive impact in cold areas...” P. 24

“Scientists are able to tell us in which direction deserts will be spreading, they can tell us where there will be more floods and where there probably will be higher winds and hurricanes. These extremes in weather have been hitting the world at increasing rates...” P. 24

### **3 Changes in human habitats P. 25**

“The main patterns of human habitats today still follow, in a fundamental manner, the patterns of agriculture, fisheries, industry, tourism, etc. Future changes in these occupational patterns will therefore eventually also lead to changes in human settlement patterns.” P. 25

“...The matrix on the next spread is therefore divided into three: Tropics, Temperate areas and Polar areas in the columns of the matrix, with the main changes in terms of Agriculture, Fisheries, Tourism etc. explained for each of these climate zones...” P. 25

“... When natural processes reach such strength that man has a hard time coping with them, we talk about them as hazards. In cases where human habitats are

not threatened, we are willing to understand that it is a basic characteristic of nature to be dynamic and ever changing..." P. 25

"...Modern man's haughty confidence in his own ability, on the other hand, has in many cases reached a level of arrogance and overbearing towards dangers in nature with the result that we today often disregard the potential power of natural processes..." P. 25

"... In spite of the highly advanced ancient knowledge of the Chinese about environmental management – which modern man thinks is a new invention – occasionally in the history of China the most extreme river floods have surpassed the limits of the management systems, causing enormous casualties..." P. 25

"In spite of the highly advanced ancient knowledge of the Chinese about environmental management – which modern man thinks is a new invention – occasionally in the history of China the most extreme river floods have surpassed the limits of the management systems, causing enormous casualties..." P. 25

"...Finally, there are two columns that describe the impact of these hazards on two of the most vulnerable areas on Earth: low coastal areas and the permafrost areas in the polar regions." P. 28

"... global warming, in many cases, will mean a vast extension of earlier hazard areas. As an example of a necessary precaution, sensitive buildings should not be allowed to be built in areas that are now defined as "100 year river flood plains"." P. 28

"Rising sea level and increased coastal erosion mean that flood prone areas along coasts also have to be redesigned and re-determined in view of the new realities..." P. 28

"...Therefore, a coastal policy also needs to be created that determines where more funds need to be allocated..." P. 28

"In general, it is not a wise policy to try to fight mega-scale changes in nature along coasts; it is instead a much wiser policy to retreat to higher ground..." P. 28

"...Today's haughtiness and urge to test the limits of how far people can go in terms of challenging the forces of nature will have to give way to more realistic approaches..." P. 28

"The design philosophy of the future therefore needs to be characterised by a policy that seeks to make all plans and all designs able to cope with a very wide variety of occasions..." P. 29

"Again the main characteristic of the needed philosophy is humbleness in terms of our ability to build something that lasts, humbleness in terms of respecting the forces of nature, and humbleness in terms of admitting that we cannot use our empirical knowledge of nature on which to base construction and planning standards." P. 29

"In the spring of 2004 central Europe, for instance, experienced a so-called 100 year flood – supposedly only occurring once a century, but only two years later there was another 100 year flood. To make matters worse, the river channels have become narrower..." P. 29

"The damage caused by floods is more than people realize. The floods in 2005 in the Czech Republic, for instance, caused more damage than all the damage caused in the Second World War." P. 29

"... today's deforestation and expansion of hard surfaces that are created by streets, roofs and parking lots, also contribute greatly to the problem. The hard surfaces mean that the time it takes rainwater to reach rivers has become much shorter..." P. 29

"The problem of less precipitation will be most serious close to the deserts, which will expand, for instance in the sub-Saharan region. This is a region where desertification is already on the increase, not

only because the climate is getting drier but also because of erosion caused by overgrazing..." P. 30

"... In the summer of 2005 the wild fires in Portugal got so much out of hand that the government had to seek assistance from the European Union to cope with the problem. Water, at the same time, became so scarce that hotel owners were not allowed to fill their swimming pools..." P. 30

"Again, it is environmental management and environmental planning that are the main tools that can help us to cope with these problems. To help control wildfires, for instance, forests need to be cut by fire breaks..." P. 30

"A balance score card will tell us that areas that will be lost – for instance to desertification and to too much warmth and dryness – will be substituted and "paid for" by areas that are now uninhabitable in the sub-Polar regions, areas that will become fruitful and inhabitable..." P. 30

#### **4 Three strategies to global warming P. 31**

"In 2004 the EIA Institute in Denmark called for a conference in Copenhagen where the then most threatening global problems – as well as the most sensible solutions to these problems – were discussed. Pro and contra speakers introduced the ten main global problems or challenges." P. 31

"One of the challenges discussed in the conference was global warming and the opportunities that are at hand to combat it. The three opportunities that were discussed were: the measures of the Kyoto Protocol, optimal carbon tax, and finally, value at risk carbon tax." P. 31

"...The panel was asked to answer the question "What would be the best way of advancing global welfare, and particularly the welfare of developing countries, supposing that an additional \$ 50 bn of resources were at government disposal?" P. 31

"...First in rank is the challenge of contagious diseases and the highly effective opportunity of controlling HIV/AIDS..." P. 31

"Surprisingly the three policy options discussed at the conference to combat climate change got the lowest rating..." P. 32

"... it seems obvious that as long as the fossil fuels are inexpensive, the incentive to reduce the use of them will not be great. High fossil fuels are therefore needed to make alternative energy economical..." P. 33

"The big problem with the so-called "clean" energy alternatives is that they are not only costly but are also harmful to the environment. The large spaces needed for the solar panels and the visual and noise pollution produced by wind power generation is, for example, very negative..." P. 33

"... "that it would be better to turn back the wheel of time and reduce the industrial production of countries, because it is primarily the increased production – that is in some relation with the increase in population – that is primarily leading to the increased environmental problems. The problem with this thinking is that improved wealth of the developing nations is needed to combat environmental problems..." P. 34

"As the permafrost becomes more and more ice free, these piles of organic soils will start to rot ever more. It is now being attempted to calculate how much the resulting emissions will be. It seems that it will be in such quantities that it, in due time, it may possibly exceed all human emissions of the Earth today" P. 35

"If this is really what is going to happen, it becomes less sensible to put costly restrictions on human activity for instance by quotas, in order to reduced human induced emissions. The conclusion of the author of this book is therefore that the idea of stopping global warming is, sadly, probably not going to work..." P. 35

“If this turns out to be the way things happen, the third strategy man has available as a response to a warming climate – to retreat from warm and dry areas into cooler and wetter areas, will be the only practical strategy available – and this is the strategy outlined in this book... this is the strategy that organisms and humans have always used in global warming periods in history. And in a broader sense, this is the philosophy of going with changes, and not trying to combat them.” P. 35

“...how this will physically appear in terms of the future settlement patterns on Earth. The three most basic patterns will be: 1) Migration of people towards cool coasts, 2) To migrate to higher and cooler areas, and 3) – which is the main option if the Earth’s climate is going to become extensively hot – to move towards the polar regions.” P. 35

“A positive aspect of this migration will be that the old inhabited spaces on Earth already have so many environmental problems that habitation in them, in some cases, has become, and will probably become, almost impossible. The primary problems are: 1) The reduced amount of water in aquifers and rivers, 2) Pollution of the soil and 3) Desertification...” P. 35

“... The Arctic areas, on the other hand, have been protected by frost against human activity, so in most places soil, water and even air are clean. In addition there is in the Arctic an abundance of all of the main resources needed including oil, gas, coal, timber, water and clean agricultural soil.” P. 35

“...it does not seem to need to lead to unsolvable problems to follow the strategy of migration. Migration is the way humans have, in all of the world's history, responded to global warming, or cooling; spreading towards the poles with warming and migrating away from the extending polar ice in periods of cooling” P. 35

“The global population has, in contrast to this, to develop an attitude that welcomes changes; a culture

that is happy that everything in the world is always changing...” P. 35

“Planning and preparing for the changes is a very important activity. First of all we have to be able to outline, to map and describe, which will be the problem areas in the decades to come, and also which will be the desirable and habitable areas with increased temperatures in the world.” P. 36

“Every nation needs to create plans taking into account which areas need to be abandoned, for instance because of the rise in sea level, or because of desertification, and at the same time, point out areas where people will be safe from floods and expanding deserts...” P. 36

“Some of the Nordic countries of Europe will become more habitable in the future, like Greenland, Iceland and Norway...” P. 36

“Because of these important spaces in the north, the European Union needs to create a policy for the needed extension of the European space to the north. Such a policy is quite different to today's policy of extending only to the east into the former east-bloc regions. Some Eastern European areas hold some promise, but many of them will be rather problematic in the future...” P. 36

## **PATTERNS**

### ***II How Global Patterns Change***

#### **1 Worldview of time and change P. 37**

“Most of us realize that the way we think and act is directed by certain fundamental ideas in our cultures...” P. 37

“.... The governing world view of the West is characterized by ground rules which were mostly formed as a part of scientific reasoning in the 17th century by scientists like Newton, Bacon and Descartes...” P. 37



“In physics, the strange absence of time, recognized by Einstein, led him to formulate his Theory of Relativity in 1905. The 20th century experienced further discoveries as concerns the active nature of time, as for instance in the work of Ilya Prigogine, regarding the activity of the Arrow of Time, in certain natural processes...” P. 37

“People might be inclined to view entropy as a negative force in nature, but in his book Order Out of Chaos Prigogine explains that life and creation depend on the dynamic interaction of entropy and order; "order through fluctuation"...” P. 37

“As we review these new findings ... we start to understand better how today's mechanical and static world view is flawed and that time and change need to be included to form a new world view.” P. 37

“...we can start to deal with the phenomena that develop from active time, phenomena like change, development, dynamism, growth, cycles and processes.” P. 37

“The new world view of time and chance will also, this time round, take a long time to accept. The dramatic situation of today as so many global patterns are changing, makes it an urgent necessity to accept time and change as basic parameters of our existence...” P. 38

“Because of what has now been described in the previous chapters, we understand that this book fundamentally deals with man's relationship with Nature. The book declares a "war" on the characteristic Western tendency not to respect the forces of Nature, but rather to try to control and manipulate them...” P. 38

“Patterns of change have repeated themselves throughout history. Patterns in small spaces or time frames are not of interest in this book, but rather larger megapattern trends, which are spatial trends that extend over long spans of time...” P. 39

“The prognosis presented in this book is mostly based on a study of megapatterns in Nature that come with climatic change... we can look at the history of the world and see megapatterns in how Nature and humankind have responded to such changes earlier...” P. 39

“...It is therefore an important task of this book to outline, through the study of earlier megapatterns, how we can adapt to such changes, largely by finding ways to get out of harm's way, mostly by retreating out of areas that become hazardous...” P. 39

“The most basic preamble for being able to put ourselves in the right frame of mind is not to try to combat the changes but rather to embrace them, since the climatic changes will be so enormous that there is no other way than to go with them...” P. 39

## **2 Changes in weather patterns are nothing new P. 43**

“Many scientists and artists also have very little understanding of how capable science and management are in coping with problems that certainly, at earlier periods in time, would have meant catastrophic disasters. Many such problems can today be dealt with by thorough planning and management...” P. 44

“The Danish statistician Björn Lomborg has written a book on faults in the theoretical foundations of the environmental discussion of today. The title of his book is The Sceptical Environmentalist – Measuring the Real State of the World...” P. 44

“Lomborg's work has ignited the fury of environmentalists as he lays bare the fact that many statistical interpretations in so-called scientific reports are false and not actually the work of professional statisticians” P. 45

“Once again, the author of the present book wants to stress that we can only understand and effectively respond to global warming by developing and utilizing a global overview. This overview tells us that,

at the same time that there are areas, mostly in the south that will suffer from global warming, there are other areas towards the poles that will gain greatly..." P. 45

"This needed action in development aid, however, is not only based on moral responsibility but also on the realization that the world has become so globally interdependent that problems occurring in, say Africa, will almost certainly have severe consequences for most other regions of the world." P. 46

### **3 How global structures change P. 47**

"An easy illustration of a dynamic pattern is how settlements move towards cooler areas in times of global warming. In the case of such large-scale movements we talk about a megapattern..." P. 47

"On a global level the best known global structures are the transportation structures on land, on the sea and in the air..." P. 47

"Looking to the next one hundred years – this century – we can be certain that the transportation structures of the world will change significantly...The third and last part of this book – The Future – will make an attempt to predict what the changes will be..." p. 47

### **4 The static world of today P. 53**

"The first method or strategy that should be employed to reduce these increased risks is to define the hazard zones and enlarge the zones that have already been determined..." P. 54

"The natural direction of migration of the future problem areas of the Sahara rim is to Southern Europe and from the Middle East into Russia..." P. 55

"Some decades ago there was a huge demand in Western Europe for a workforce from less developed southern countries, but with the further

development of automatic manufacturing processes and the developing third world economies the need for this workforce – and a workforce in general – is decreasing..." P. 55

"The migration process to the north described here has actually started, even though not yet really driven by global warming. This migration has already led to huge cultural clashes, most notably in France." P. 57

## ***III How Spatial Systems Change***

### **1 Today's "linear centre" around the globe P. 59**

"An inhabitable Arctic will therefore make the world global, as the third section of this chapter will describe. This will effect a change from today's spatial system of a ribbon to a spatial system of a global or semi-global space in the northern hemisphere..." P. 59

"In today's world centrality is enjoyed by areas closest to the linear centre that runs around the globe approximately 35 degrees north of the equator. This linear centre now goes through the Mediterranean Ocean..." P. 59

"In earlier times the inhabitants of the areas on the rim of this ribbon of habitation suffered a great deal, both from the cold and from the distance from the central activities of the globe..." P. 59

"At the end of the 19th century the development of new communication methods accounted for technological leaps in helping to connect the world..." P. 60

"The warming of the Arctic has meant that shipping has already increased substantially in the Arctic Ocean..." P. 60

"... with its access to rich supplies of resources, oil and gas, transportation from there by ship has already begun and will increase hugely in the next few decades..." P. 60

“...With no restrictions on the size of ships, the Arctic shipping routes will therefore – in addition to the short distances – have a huge advantage over these canals – and to the routes south of Africa and S America.” P. 62

## **2 Today's "ribbon of habitation" P. 63**

“At the beginning of this linear centre of development around the globe the lands and continents newly discovered by Western Man had the position of colonies of the countries of the old world. In due time the colonies gained independence and created their own centres of power...” P. 63

“Today the Arctic regions, which are already becoming of huge importance for the world, are not even shown on most world maps, and if they are shown, they appear in a very distorted and unrealistic way that makes them look very peripheral...” P. 64

“It takes a lot of study to recognize what this "strange" spatial system of the semi-globe means, and will eventually mean...” P. 65

“The first point that is important to recognize is that the Arctic is close to the middle of the land areas of the world, which means that the Arctic Ocean can, actually, be termed the Medi-teranean-ocean, the Middle-of-the-Earth-ocean of the globe within the spatial system of Earth in the future...” P. 64

“...we realize – to our amazement – that today's linear centre and ribbon of habitation is no longer in the middle of the future picture of the globe but rather out on its periphery!” P.64

“Let us now, for experimental purposes, draft a scenario of how the world will change with continued and excessive global warming. First of all: the Arctic will have a warm climate that opens it to use as a rich and clean environment. What follows is the development of towns, ports, roads, industries...” P. 66

## **3 The Arctic will make the world global P. 69**

“The activation of the polar areas – especially that of the Arctic – will occur as the global climate continues to get warmer...” P. 69

“...As the North continues to warm it will, as a result, become spatially stronger. The importance of the South, in contrast, will weaken as, in many areas, it becomes undesirably hot for human activities.” P. 69

“These reasons, taken together, mean that it makes sense – in terms of a global planning policy – to designate large global conservation areas in the Antarctica and the Southern Ocean, rather than areas in the Arctic.” P. 71

“Of course, it is not only the Arctic area itself that will benefit from the warmer climate and the increase in global shipping in the area...” P. 73

## **4 Not a "ribbon world" but a "global world" 75**

“...this book is aimed not only at understanding the principles and patterns of how things have evolved in the past, as with Darwin, but that the patterns should also be used to learn how things are likely to evolve in the future.” P. 75

“A profound understanding of the two spatial global systems is absolutely essential for being able to understand what consequences the gradual shift from a ribbon world to a global world is going to mean...” P. 76

“...The world of the future – practically speaking – will not be global but rather semi-global, that is, a world of the northern hemisphere. There are several reasons why this will be so. First and most important is the fact that most of the land mass of the Earth is located in the northern hemisphere...” P. 77

“This world of the future, with its semi-spherical shape as a stage, will function in ways that are very different from the ways activities and interactions function on the cylindrical ribbon of today.” P. 78

“How long the shift from the ribbon world of today to the semi-global world of the future will take depends primarily on how fast the Arctic warms...” P. 78

“If global warming continues beyond 2100, and if the warming becomes excessive, the Arctic will bask in a very benign climate in the 22nd century. With this same rate of warming the whole central region of the world could become almost uninhabitable because of excessive heat, desertification and lack of water.” P. 78

“In this case the world population will understand how lucky it is that the Arctic region exists because it will be the area where people can escape to from the excessive and devastating heat of the world's central regions.” P. 78

## THE FUTURE

### *IV The Future Structure of the Globe*

#### **1 Transportation structures P. 79**

“Today there already exist planning offices for continents and for large entities like the European Union, the United States and the Russian Federation...” P. 79

“On a global level not much planning has been done as yet in terms of infrastructure on an institutional level. However, we probably very soon will arrive at the stage of globalization where it would be a wise move to create such an office...” P. 79

“...it is necessary to give an introduction to the main steps as to how a plan is made... The first step is the mapping of today's structures. The second step is to make maps that show good areas and bad areas, meaning: to show the areas that are best fit for settlement and areas that should be avoided. The third step is to study how some main basic conditions will change...” P. 80

“...The fourth step is to study how spatial structures and systems have evolved... Once these foundations

have been established it becomes much easier to draft a picture of the planning elements of the future, in our case of the globe as a whole...” P. 80

“Let us now start to study the most important characteristics of our physical world in terms of transportation structures... the global shipping and railway systems...” P. 80

“... the high North with its permanent layer of snow and ice that is the main obstacle today...” P. 81

“...novelty regarding global transportation – that may well become a reality in the future – is the introduction of high-speed trains for connecting distant points of the globe...” P. 81

“The author of this book suggests that a global network of such high-speed trains can be created in the future, partly replacing the very energy consuming and polluting system of air travel... great benefit of the system will be that the trains can arrive in the heart of a settlement area, in railway stations within the metropolitan areas...” P. 83

#### **2 Good areas - bad areas P. 85**

“One of the main tools of the planning profession is the evaluation of areas in terms of negative and positive aspects...” P. 85

“... Understandably, one of the basic goals of a plan is to avoid the negative aspects of an area and make efficient use of the good qualities. Most often this evaluation work is presented on several separate maps...” P. 85

“The warming is also the main reason why the huge rivers of Northern Canada and Siberia are already becoming more and more ice free. They, therefore, will gradually become very important transportation routes. This means that the areas around them – and elsewhere along the Arctic rim – are going to be very important for future exploitation of resources and habitation...” P. 85

“Let us now start to study how the first map (see below) – that shows the bad areas of the globe in the future, was conceived and designed...” P. 86

“...The light yellow colour shows today's deserts and the dark yellow shows the areas where the deserts are predicted to expand to with global warming... The areas of the greatest concern are the areas that the deserts are going to expand over... These often highly populated areas of today will in the future be overblown by sand and will experience excessive heat and extreme dryness...” P. 86

“The map below has the task of assessing which will be the most important areas for future development... The dark green colour... shows areas that will be improved by global warming...” P. 87

“In Siberia, it is mostly the corridors along the largest rivers that are shown dark green, and also in Canada, especially in areas close to the Atlantic coastline of Labrador, Newfoundland, and areas by Hudson Bay. In Alaska the dark green areas lie around the Yukon River, and in NW Canada by the Mackenzie River and also along the northern coastline of the North American continent” P. 87

“The last map of this section, on the right page, shows an assessment of what areas in the world will gain or lose most from the opening of major shipping routes through the Arctic Ocean. As these new routes have become highly frequented other traditional shipping routes will lose relatively...” P. 88

“Assessment of the positive features connected to the new shipping routes is shown in three shades of green. Falling into the first category is Iceland because it sits in the middle of the opening of the Arctic Ocean into the Atlantic. Northern Norway will in the next decades be conveniently situated...” P. 88

“The areas, however, that will gain the most are on both sides of the narrow Bering Strait where the Arctic Ocean opens into the North Pacific...” P. 88

### **3 Megapatterns of change P. 91**

“Let us now introduce the two main categories of megapatterns: First, we have megapatterns driven by global warming, and secondly, megapatterns driven by the governing transportation modes of each period of time. This section will make use of these megapatterns in clarifying how certain regions of the globe have developed historically and outline in what way they are likely to develop in the future...” P. 91

“...One of the great benefits of living close to coasts is that people have a gradient of climate to choose from, i.e. people can go to the coast or vacation in the mountains on warm days or stay inland on cool days...” P. 93

### **4 Spatial structure of the future P. 97**

“The North Pole area will also be strengthened by the fact that there are huge landmasses in all directions that will have access to the Arctic coastal waters and the Arctic Ocean shipping lanes. The great rivers that flow through northern Canada and Siberia into the Arctic Ocean will provide easy access to the more southern terrains of the northern hemisphere...” P. 100

## ***V Impacts on a Global Scale***

### **1 Areas that will gain P. 103**

“Iceland and Norway are those Western European countries that will gain most from the opening of shipping routes through the Arctic Ocean... What, however, is of most importance for the near future is the development of oil production in the Barents Sea and the transport of oil by sea from Western Siberia...” P. 106

“Western Europe, north of the divide created by the Alps. This is one of the areas on Earth that will gain most from global warming... The summers and the winters are rather cold in Western Europe, so an increase in temperature is welcomed...” P. 107

“As the Arctic Sea routes open, the northern part of Western Europe with Norway, Great Britain, Denmark, Germany, Holland, and Belgium will be very well placed in terms of global shipping...” P. 107

“... Europe south of the Alps and including Northern Africa and the Near East. This area will run into some problems because of increased heat and the rate of evaporation, leading to lack of water and an increase in wild fires. This, however, will not be very serious in the long term because once the forests have been burnt they will be replaced by desert vegetation that is more adapted to a dry climate.” P. 107

“...the Persian Gulf. This area is already very warm, but since it is very rich because of oil, most of its inhabitants have the means to cool buildings sufficiently for comfort... Nevertheless, difficulties could arise in say 30–40 years as the oil reserves start to be depleted...” P. 107

“The fifth area on the map is Russia, Siberia and Central Asia. This rather cold northern area will gain much from global warming. Transportation access will be greatly improved by new transcontinental railways, and as the rivers leading into the interior have become more or less ice-free...” P. 107

“The sixth area on the map is the area to the south of west Central Asia, the Asian Subcontinent, composed of India, with Pakistan, Bangladesh, and other countries. This will be one of the worst problem areas of the globe, together with Central Africa...” P. 107

## **2 Areas that will lose P. 109**

“The four aspects that can lead to a worsened situation in the future are:

- a) Increased heat in the warmer areas of the world that already today are at the edge of what can be considered tolerable for people, animals and vegetation...
- b) Areas that run out of oil will lose...

- c) With the increase in use of the Arctic sea routes, some countries will lose their present advantageous position in global ocean shipping...
- d) The reduced importance of today's linear centre and ribbon habitation around the globe...” P. 109

“Generally speaking, the North will be gaining in topological importance, whereas areas south of the Mediterranean latitudes will be losing importance, the more so the further south they are” P. 109

## **3 Impact on the global economy P. 115**

“Global warming – and its many consequences – will without doubt have an impact on the political stability of countries and regions in the future... The overall picture, very generally stated, is that northern economies will in many ways gain from global warming, whereas many southern countries will be badly affected...” P. 115

“The computer and the Internet are only one more step in the extension of these old systems. These extensions, however, are still today causing several important consequences, mostly in terms of enabling borderline people and borderline nations to enter the mainstream. Because of this, elite peoples and nations have lost some of their former privileged status...” P. 115

“The bottom line: there are new, northern areas that will be much better for agricultural production in the future than many of the traditional agricultural areas of the South. Therefore an extensive relocation of agriculture on the surface of the globe is to be expected in the future...” P. 117

“...If, on the other hand, we accept that everything is constantly in a process of change and that no nation or region will or can remain static and unchanged for many decades – with or without the impacts of global warming – we can get into the necessary frame of mind to be willing to embrace the changes that are coming upon us” P. 117

“...the money that now goes to support man made warfare to combat instead the catastrophes, the "nature warfares" that are coming upon us. The nations of the world need to unite in helping the regions that will be hardest hit...” P. 118

“Some of the largest tasks of our world in maybe the next 100 years, will also include physical tasks, such as a major relocation of agricultural areas to the North...” P. 118

#### **4 Impact on geopolitics P. 119**

“As the West will not be as dependent on Arab oil because of the new Arctic oil fields, the conflicts and tensions in the Persian Gulf region and the near East will ease considerably. The reason why the West has been engaged so heavily in the affairs of the Gulf region is the necessity of assuring access to the oil fields in the Gulf...” P. 119

“One of the reasons for the rising oil prices of late has been the uncertain geopolitical situation in the Persian Gulf region. Therefore, hopefully as early as 2010 or 2015, as the West has started to become less dependent on oil from the Persian Gulf, the geopolitical tensions caused by the threat of oil shortages will lead to the easing of the West-Muslim conflicts, and oil prices come down...” P. 119

“...a partnership between Russia and China has started to develop because Russia will not only be able to supply the West with oil and gas but China as well, most importantly with gas...” P. 119

“...The opening of the Arctic sea routes – where the ships can go "north of conflict", is therefore very valuable geopolitically, especially for the North...” P. 120

“The two maps on his page show the areas the author thinks will be the main conflict areas of the world in the 21st century. These areas are the Persian Gulf, the area between Russia and the Muslim world, the border between Russia and China, where China is probably going to claim areas for its needed northern

expansion, and areas north of Japan: the Sakhalin and the Kuril Islands that Russia acquired as the victor's booty after the Second World War. These areas and the Arctic are becoming increasingly important because of global warming and because of oilfields” P. 121

“The map also shows the whole Southeast Asian area as a possible conflict area, simply because of the dynamism and the uneven economic developments in the area. A disturbance in a balance of power very often leads to political conflicts...” P. 121

“... The possibility to sail north of the conflict areas will be of benefit for the whole world because a more secure global transportation in times of crisis is very important. If world shipping is disturbed the globe will collapse into a worldwide economic crisis.” P. 121

“One of the main tools available to reduce conflicts is to integrate regions and abolish borders. In this way areas become interdependent – i.e. they become one area in terms of the economy, as well as in other ways. This was the main thinking behind the establishing of the European Union in 1957...” P. 121

“This scheme of creating large interdependent regions needs to be applied in all areas of the world. This scheme of interdependence is the very best tool the world has at its disposal to become a peaceful world.” P. 122

“It holds generally true for all the eight countries bordering the Arctic Ocean that the northern borders have, up to now, been totally secure against almost any intrusion or threat from terrorist attacks, illegal imports and unwanted immigration. This is very different from the southern borders of, say, Europe and the USA. This picture of the Arctic might change fundamentally as the sea ice starts to disappear from the Arctic Ocean and these long coastlines start to open up for every seafarer” P. 122

“...There are only eight nations bordering the Arctic Ocean, and all culturally related. The thawing of the Cold War in the 1980's allowed them to start holding meetings on the Arctic. This led to the establishment of the Arctic Council in 1996...” P. 122

“It is quite possible that this ocean will be defined as an inland ocean of the Arctic rim countries, where the entrance will be guarded in common by the Arctic nations. It is possible that NATO (the North Atlantic Treaty Organization) will be expanded to cover this task...” P. 122

“If the warming continues in the 22nd century, it is quite likely that there will be increased interrelationships developing among the various opposing regions around the circle of the Arctic Ocean. This will mean that the Arctic Ocean will become somewhat similar to the Mediterranean Sea earlier.” P. 122

“...In the case of the border of the USA with Mexico, in contrast, there are already illegal immigration difficulties that the USA wants to get under control. This pressure to go north will increase with still more global warming.” P. 124

## ***VI The North: The Future Area of the Globe***

### **1 On how warm the North will get 125**

“...the Arctic will experience more extensive warming in the future – probably by 4 to 7°C in the present century – than other areas of the globe. This will result in a rapid reduction of the polar ice and create a more habitable climate that will make the North the premier future development area of the globe...” P. 125

“...This shipping development will be a decisive factor in what steps are taken to utilize the enormous resources of the Arctic Rim and the Arctic Ocean. This development has already started in the huge oil and gas fields of Western Siberia that have recently

started to expand into the Barents Sea north of Siberia and Northern Norway.” P. 125

“The biggest step in this development, however, will take place as this shipping route into the North Pacific Ocean will become open all year round. In the era of thinning ice, to start with, this will be realized by building containerships and tankers somewhat like icebreakers...” P. 125

“The large Arctic Climate Impact Assessment (ACIA) report... that describes how the climate of the Arctic will develop in this century – and what the impacts will be...” P. 128

“...this present book... builds on the ACIA report that predicts that during this century most of the Arctic sea ice will retreat step by step in the summer and that temperatures will rise by 4 to 7°C” P. 128

“...The author makes the basic assumption that the temperatures will continue to rise substantially beyond 2100 – and the descriptions of the future of the world and the North in this book are based on that assumption” P. 129

“... mankind must live with the unfortunate fact that as of now, we are not capable of stopping the warming of the climate. This means that we have to start studying more seriously how we can adapt to the changes in climate. This book is meant to be a contribution to help us find ways to do so.” P. 129

“This book points out that we can also, like animals, birds, fish, and plants, migrate to places that better fit our needs; that is, to leave places that will experience worsened climatic conditions to find new and better ones...” P. 130

“The main novelty, however, of the present book is its overall urge to embrace the changes that come with global warming in ways that allow humankind to gain from the changes.” P. 130



“...If they rise by 4 - 7°C, the impact will be colossal, but if the warming continues much beyond that, the North will indeed become the future area of the globe, as described in this book.” P. 130

## **2 Exploration, research and organizations P. 131**

“...Remote sensing and icebreakers combined mean that the Arctic Ocean is navigable...” P. 132

“...Several programs and institutions that had been established earlier have now been organized under the helm of the Arctic Council. Following is a brief review of the six most important of these. The first we should mention is The Arctic Council Action Plan (ACAP). The main objective of this action plan is to work against pollution of the Arctic. The ACAP has several guiding principles, notably the recognition and use of traditional knowledge, the need to co-operate on a regional basis for protection and preservation ” P. 132

“...In order to supply the researchers and policymakers with the necessary tools in terms of maps and monitoring devices, another institute was established: The Arctic Monitoring and Assessment Program (AMAP). The third institute to be mentioned here is the Conservation of Arctic Flora and Fauna (CAFF)...” P. 133

“...The fourth working group is Emergency Prevention, Preparedness and Response (EPPR), which exchanges information on best practices and conducts projects, for instance on the development of guidance and risk assessment methodologies...” P. 133

“s. In 2004, the EPPR was directed by the Arctic ministers to expand its mandate to include natural disasters...” P. 133

“...The fifth program deals with The Protection of the Arctic Marine Environment (PAME)...” P. 133

“...organization to be mentioned is The International Arctic Science Committee (IASC). This is a non-governmental organization whose aim is to encourage and facilitate co-operation...” P. 133

“Two conferences on Arctic research have been conducted of late. The second was called The Second International Conference for Arctic Research Planning (ICARP II)...” P. 134

“...the first encyclopaedia ever of Arctic matters was published in 2005. This is a huge compilation of more than 2000 pages in three volumes...” P. 136

“It is a strange feeling that until very recently this future frontier of the world was almost totally unknown to the majority of mankind, but as has been outlined in this book...” P. 136

## **3 Environment, Resources and Development P. 137**

“Today some of the fishing grounds are closed by the Arctic sea ice, but as the warming continues the sea ice will continue to retreat...” P. 137

“...The fact that large areas of the Arctic Ocean are shallow means, in addition to the retreating sea ice, that more sunlight can reach the bottom and make it a fertile ground for fish and other marine organisms.” P. 137

“...the Arctic will have a comfortable, or slightly cold, climate with vegetation somewhat similar to what we see in Scandinavia today. The loss of the tranquil Arctic environments, glaciers and tundra will be sad, but global warming is coming and we should not paint the changes in nature that come with it as only bleak and negative. It is, rather, advisable for us to embrace the inescapable changes with a positive attitude...” P. 139

“...a warm Arctic is a new Paradise, and a place to escape to from the possible excessive heat of the future. We have already seen a preview of this as

central and southern Europeans flock in the summer to Scandinavia to escape the intolerable heat spells.” P. 140

#### **4 Planning processes in the Arctic P. 143**

“The Polar regions are the last areas on the globe to be developed, and in a way, they can be said to have been conserved by the cold and ice. Because of the cold, the Arctic ecosystems are unique and at the same time sensitive, both to the impact of human activity but especially to stresses that the very rapidly changing climatic features are putting on them. All this calls for very considerate planning, followed by cautious execution of building projects, industrial operations and shipping.” P. 143

“In recent last decades, important tools have been developed to help us plan in such a way that environmental impacts are kept at a minimum. The main method to prepare and investigate major projects is the Environmental Impact Assessment (EIA) methodology...” P. 143

“...Based on the findings, authorities decide whether to allow or prohibit the proposed construction or project. In some cases the project planning and design are allowed to advance if certain precautionary measures are taken” P. 143

“Today's EIA assessments not only consider the impacts on natural and physical environments but also the impacts on economic and social environments. In the 1990's the EU extended the EIA methodology to a wider sphere, a procedure called Strategic Environmental Assessment (SEA). This method is meant to take the evaluation of possible impacts to the higher levels of policy, law, concepts and programs...” P. 143

“...In 1993 the International Northern Sea Route Programme (INSROP) was established, leading to meetings of scientists from various nations. At the first meeting in Oslo in November 1993, one workshop had the task of screening and creating a

focus on the relative importance of the marine resources in the NSR area...” P. 143

“One of the most important components in this process is the Dynamic Environmental Atlas. The creation of such an atlas was absolutely necessary for those conducting the assessments to enable them to know what degree of impact the various types of environments can take in terms of large projects...” P. 144

“The project also has the proclaimed goal of instigating discussion on the possible impacts of other human activity on these species...” P. 144

“...the impact on activities and projects related to the NSR in terms of the indigenous and other people living in the Arctic, as well as the impact on economic structures of the societies of the areas in question, need to be a part of the evaluation program.” P. 144

“... the data from the Environmental Atlas feeds into a computerized Geographical Information System (GIS)...” P. 144

“The scenarios that need to be created and described in detail for the EIA, fall into several categories. These can be scenarios of types of cargo, scenarios of operational or accidental occurrences, or scenarios that describe the temporal-spatial dimension...” P. 144

“...To maintain the present socioeconomic structures in various areas in the Arctic may not be possible in the face of upcoming occupational and climatic changes. Social upheaval, and changes in general, most often mean difficulties, but the abundance of jobs that become available for both indigenous and other people living in the Arctic means that income and standard of living will improve. These are the gains, but global warming and the activities that are going to take place in the Arctic are unfortunately bound to mean the end of many of the ways of the traditional societies...” P. 145

“Warming will also drastically change the ecosystem patterns of the North. The life of the polar bear and the migration patterns of the caribou, for instance, will be affected in ways that are difficult to project...” P. 146

“The Arctic Climate Impact Assessment (ACIA) report for the whole Arctic region, written by more than 300 scientists from 2002-2004, will prove to be very helpful in assessing all types of small-scale projects within the Arctic in the future.” P. 146

“The Arctic Council also had another report written in the same period, the Arctic Human Development Report (AHDR). This human development report is the first comprehensive attempt to document and compare systematically the welfare of Arctic residents on a circumpolar basis. It seeks to expand our horizons by spotlighting the socio-economic and cultural aspects of the lives of the people in the region...” P. 146

“Much of the mapping material for this report was produced by the Arctic Mapping and Assessment Program (AMAP) in Arendal, Norway. In 2005, that institute published the first book of Arctic Graphics and Maps under the aegis of several institutions” P. 146

“...many of these communities live from sea mammals and, in later times, increasingly from fishing, many of these settlements are located on coasts and fjords as well as on estuaries of large rivers...” P. 148

“...the largest indigenous settlements are in Northern Scandinavia, on the Kola Peninsula, close to Archangelsk, and in Western Siberia in general. It is exactly in these same regions where most of the oil reserves have been discovered. This uncomfortable fact will unavoidably lead to more conflicts between traditional lifestyles and the highly modern industrial lifestyles that come with oil extraction and shipping.” P. 148

“...Most of us will regret that the climate and the nature of the Earth – especially that of the Arctic – are changing so fundamentally. Today most scientists agree that the climatic changes cannot be stopped. Everybody, however, agrees that it is advisable to slow these developments down as much as possible. This will reduce the troubles and also, in the process, give peoples and ecosystems time to adjust to the changes.” P. 148

“This book has not been written by an expert on the climatic or natural sciences, but by a planner. In the last few decades he has observed how very serious attempts have been made to stop the increased use of fossil fuels and thus the rate of greenhouse gas emissions, which are the main reason for global warming. The whole world has been preoccupied by these attempts, but scenarios of what will happen if the warming cannot be stopped have been very little discussed, except for negative and doom-like descriptions of the impacts.” P. 148

“The stage where a planner usually enters the picture is when climatologists and other scientists have collected all the relevant scientific material for the area in question. As for the Arctic, it is only with the very recent publication of the various reports that have now been described that the information needed for a planner to start to synthesize from these data has become available. It therefore became possible only very recently for a planner – such as the author of this book – to create a scenario on what is likely to happen in terms of the settlement and activity structures of the globe in the future...” P. 148

“...In the second half of the book the author has given examples of how settlement structures of individual areas or countries might develop in the future...” P. 148

“Environmental impact assessment and planning procedures have also been installed. This work needs to be continued in a very earnest way. If we assure viable and justifiable ways for the settling of this last

frontier on Earth, many of the previous mistakes of the planning of settlements in the older part of the globe can be avoided..." P. 148

## **Glossary p. 166**

### **1) ARCTIC AND GLOBAL ISSUES**

**ACIA** Arctic Climate Impact Assessment, a study conducted under the auspices of the Arctic Council.

**Agenda 21** The UN Rio Conference of 1992 established a global agenda for the 21st century on environmental matters.

**Antarctica** The large island-continent at the South Pole. (See figure on page 9).

**Aquifer** Water-bearing formation capable of yielding exploitable quantities of water..

**Arctic Council** An association of the eight countries that border the Arctic area: Russia, the USA (because of Alaska), Canada, Denmark (because of Greenland), Iceland, Norway, Sweden and Finland.

**Asia-Pacific Partnership (A6)** A partnership of the USA, China, Australia, India, South-Korea and Japan on Clean Environment and Climate.

**Biodiversity** The number of different species or functional groups. Biodiversity is considered to be a resource that needs to be preserved, as proclaimed in Agenda 21.

**Brundtland Report** Alternate name for the UN report Our Common Future, published in 1987 in preparation for the Rio Conference, named for its chairman G. Brundtland.

**Climatic change** Changes in some aspects of the global climate. See global warming.

**Ecotax** A tax used for influencing human behaviour to follow an ecologically benign path.

**El Niño** An irregular variation of an ocean current that flows off the west coast of South America, raising sea surface temperatures off the coast of Peru.

**Geopolitics** Politics that deal with global scale issues of a strategic or military importance.

**Global balance** The essential balance of CO<sub>2</sub> and O<sub>2</sub> in the atmosphere. See greenhouse gases.  
**Global economy** The economy of the globe as a whole.

**Global evolution** Study of global, spatial evolution is given rigour by identifying historic trends and megapatterns.

**Global structures** See structure and infrastructure in 2).

**Global warming** A term used to signify an array of climatic changes happening in the world today. The warming of the global atmosphere can be seen as a catalyst for these changes.

Global warming and cooling have often happened before in the geological history of Earth.

The present warming is believed to be caused by anthropogenic release of greenhouse gases.

**Global world** A world that functions as a globe in a topological sense. See 2).

**Globalization** The increasing interconnectedness of the world; economically, culturally and politically, fundamentally powered by advances in transportation and communication. See cyberspace in 2).

**Greenhouse gases (ghgs)** Gases that absorb infrared radiation in the atmosphere. In nature the release and absorption of ghgs are normally in balance, but the emissions released by anthropogenic activity can no longer be absorbed fully by nature, so ghgs are gradually accumulating in the atmosphere, contributing to global warming. See global balance.

**Intergovernmental Panel of Climate Change (IPCC)** UN organ that has the task of studying global warming and projecting how it will proceed and what influence it will have.

**International Polar Year (IPY)** Takes place from March 2007 to March 2008.

**Johannesburg Conference** UN environmental conference held in 2002, 10 years after the Rio Conference, to assess progress since then and to draft a future direction.

**Permafrost** Perennially frozen ground. Mostly located in the polar areas.

**Rio Conference** UN conference held in 1992 to

discuss and sign Agenda 21, a global environmental program for the 21st century.

## **2) PLANNING—SPACE—PHILOSOPHY**

**Active time** The chemist I. Prigogine demonstrated how the forward direction of time, arrow of time, plays an active role in many chemical processes. In most branches of science the importance of the active passing of time is being discovered.

**Airborne city** A city that has come to be because of travel by air. Often located deep within countries.

**Catastrophe areas** Areas that are likely to be threatened with natural disasters such as floods, avalanches, landslides and earthquakes. See hazards and risk assessment.

**Complementarity** If two binary aspects work together, like city and nature and male and female, they enhance each other so that an extra value is produced.

**Central Place Theory** Describes rules that concern central places in planning, e.g. on how a hierarchy of centres forms a system of hexagonal grids as in crystals. (See figure on page 49). Often named for its discoverer, Christaller Model.

**Climatic change** Changes in some aspects of the climate. See global warming.

**Cyberspace** The electronic space of today that has no physical dimensions.

**Development planning** On a global scale the term is mostly used for inducing positive developments in developing countries or regions.

**Dynamic forces** Forces that impact settlement patterns. They divide into: forces that attract (resources, transportation facilities...) and forces that repel (crime, pollution, excessive heat...). (See figure on page 51).

**Dynamic pattern** The way spatial developments happen in a dynamic way. See pattern. The term static pattern is used to signify a fixed geometric configuration such as a settlement pattern.

**Dynamic world** A world that is in flux and constantly responding to changes. See the opposite: A static world.

**Dynamism, types of** The four main types of

dynamism that are at work in an area: Centripetal force (a pull towards the centre), centrifugal force (a pull towards the rim), forces of exchange (exchange of goods and manpower) and complementary force (exchange with a complementarity effect). (See figure on page 51).

**Ecology** The science of how organisms work and interrelate with each other and with the environment. The term human ecology is defined as a parallel.

**Entropy** The tendency of a closed system to move from a less to a more probable state.  
**Environmental Impact Assessment (EIA)** A formalized procedure to assess environmental, social and economic impacts. Used for largescale or dangerous constructions or plans. Also, recently, to assess the impact of climatic change.

**Environmental management** Managing an area or a region according to environmental needs and considerations. See environmental planning.

**Environmental planning** A planning method that has the goal of making natural conditions and environmental principles a foundation for planning. See environmental management.

**Environmental principles** There are four main legal environmental principles: User Pays Principle, that those who use an environment or a resource shall pay for protecting or maintaining its qualities. Polluter Pays Principle, that those who pollute shall pay for the damage and its rectification.

**Co-operation Principle**, that disagreements shall be resolved among the parties involved.

**Pre-cautionary Principle:** This principle orders that plans or projects shall not be allowed, or be continued, if environmental harm might result.

**Exchanger** A centre that facilitates exchanges. Can, for instance, be a port, a transportation centre or cities in general. (See figures on pages 51 and 96).

**Forces, field of** Occurrences in a region, or on the globe, that result from dynamic forces at play in an area.

**Future studies** Studies on what the future is likely to hold. Methods employed include expert opinion in various fields, statistical methods etc.

**Hazards** Types of dangers, e.g. created by natural occurrences, such as earthquakes, floods, tsunamis, heat spells and droughts. (See a matrix on page 42-43). See also catastrophe areas and risk assessment.

**Infrastructure** Internal structure in the world, a country, region or town. There are social, economic and technological infrastructures. The most important infrastructures are the transportation infrastructures. Global infrastructures cover the whole globe.

**Integration** Making a whole out of regions economically and socially and in terms of infrastructures. The need for integration is constantly growing.

**Interface** areas An area where two unlike areas meet. Often they are viewed as trouble areas, where they actually have a huge potential for sharing and creating complementary values.

**Linear centre** A spatial system where a line functions as a centre in a long stretched area, as often happens around transportation lines. A settlement area around a linear centre is called a ribbon of habitation.

**Linear world** The world today functions, in a topological sense, as a line or a ribbon around the globe. A global world is gradually taking over.

**Megapattern** A spatial pattern covering large geographic and time scales. Shows dynamic megatrends in a spatial development. (See figure on page 97).

**Megatrend** A general trend on a large scale, omitting small scale aberrations.

**Node** A connecting point in a structure or an infrastructure. Example: A port is a node in a shipping transportation structure. Such exchangers are of many kinds and have many ways of functioning.

**Pattern** The typical way a certain spatial development happens in an area. Dynamic patterns are activated by a pull or repulsion that originates in environmental, resource or activity features. Patterns are also shaped by landscape and other spatial features. See forces and megapattern.

**Paradigm** Ways of looking at things. Shared assumptions that govern an outlook of an epoch and approach to scientific endeavours. A more general term is world view.

**Paradigm shift** A shift from one paradigm to the next, where shared assumptions and approaches change.

**Planning philosophy** The main thoughts and attitudes that guide planning. See environmental planning for an example on a planning philosophy.

**Ribbon of habitation** On a global scale it is the habitable belt that goes around the globe. A more complete term would be a ribbon belt or a cylinder, because the ribbon around the world connects to form a belt. (See figure on page 61). This ribbon covers an area on both sides of the globe's linear centre that goes around Earth. Today the ribbon is about 10,000 km wide, which is half the distance between the poles. With global warming the ribbon of habitation will stretch into the polar areas.

**Risk assessment** Is carried out after a hazard in an area has been defined. Puts the risk at hand into the context of frequency of hazard, value in the area and what protective measures can be taken to reduce the risk.

**Scenario** A sequential description of how development is likely to take place. Often, as a policy has been formulated, a scenario is drafted in order to show how the resulting development is likely to unfold over time. See also sequence development.

**Semi-global world** The world of the future – with global warming – is going to be the semi-global world of the northern hemisphere. (See figure on page 65). See global warming and linear world.

**Sequence development** Towns often follow a sequence; a pattern, in development that starts with some primary function and proceeds in a sequence of steps. The sequence in the spatial development of countries or regions often starts at coasts because of shipping and later moves into the interior with developing inland transportation. (See figure on page 51).

**Settlement pattern** The typical way a certain dynamic, spatial development happens in an area. See pattern.

**Settlement structure** A form-system in a settlement. See structure.

**Spatial systems** Basic types of spatial systems that originate in the topological qualities of form: a one dimensional system (a linear system); a two dimensional system; and a three dimensional, or spherical, spatial system.

**Static world** The assumption that the world is, or should not, be changing. This results primarily from the poor awareness of the active nature of time, which is one of the fundamental characteristics of today's world view.

**Strategic Environmental Assessment (SEA)** The SEA is a further development of Environmental Impact Assessment (EIA) that takes this type of thinking to the higher level of strategies. The main idea is that environmental goals and concerns should be introduced at the initial stages of strategies, laws, plans and programs.

**Structure** A form-system in the world, in a country, in a region or a town. There are social, economic and technological structures. The most important structures are the transportation structures. Global structures cover the whole globe. See also infrastructure.

**Sustainable development** A principle that proclaims that the use of resources should not damage or reduce their capacity. Only in this way can their utilization become sustainable. This principle not only covers the natural environment but also the social and economic environments.

**Topology** A branch in mathematics that studies those properties of figures in space, which persist under all continuous deformations.

**Trends** Investigations are conducted into various types of trends, such as economic- and migration trends. Trend studies are used in future studies. See also megatrend.

**World view** Ways of looking at things. Shared assumptions that govern an outlook of an epoch and approach to scientific endeavours. A more specific term is paradigm. P. 166

## Let's Embrace Change!

*The message of the book told as a poem  
(TV) P. 168*

### *I A New Way of Life*

*Modern man*

*Is static in his ways.*

*This is in conflict*

*With the nature of the world.*

*Time changes everything,*

*But time is not accepted.*

*And we don't accept the changes,*

*That time brings.*

*The world is changing,*

*Fast and profoundly.*

*Today, global warming*

*Is the catalyst of change.*

*Not to fight change*

*Is a lesson to be learned.*

*The new way of life;*

*Is to embrace change!*

### *II Patterns of Change*

*From dust to dust;*

*The story of planets.*

*This same pattern*

*Applies to everything.*

*To a day-fly,*

*Not much changes.*

*The same holds true*

*For us humans.*

*Looking at history,  
Continents change,  
Organisms change –  
Nothing is static.*

*Periods of warming,  
Periods of cooling –  
They come and go:  
Patterns of change.*

### **III To Fight Change**

*Man thinks:  
I can control Nature!  
And man wishes:  
May nothing ever change!*

*On a small scale  
Man is in control.  
But in mega-events  
He needs to reconsider.*

*Nations build levees  
And gain land.  
The fallacy becomes clear  
With rising sea-levels.*

*Not to fight the oceans  
Is the lesson here.  
The oceans will rise –  
It is ours to yield.*

### **V Change: A Disaster?**

*Change is trouble,  
Change is hardship.  
But we can rephrase:  
Change is challenge!*

*We can gain from change,  
Or let it defeat us.  
The same with global warming:  
We can gain from it.*

*There is a simple solution:  
Yield to global warming,  
Seek cooler areas,  
Move toward the poles.*

*We have fouled our nest,  
But new frontiers await;  
Filled with opportunity,  
For a new beginning.*

### **V A New World**

*The Arctic from above  
Is like a new planet.  
Frost and isolation  
Made it unknown.*

*A warm Arctic,  
Is a new paradise;  
A place to escape to,  
From excessive heat.*



*Exploration and settlement,  
Once a pride –  
Have soured  
From bad conduct.*

*Arctic settlement  
Has to be planned  
To make sure  
It is sustained.*

## **VI Objections**

*Some will say:  
Let's stop global warming!  
Sadly, not possible –  
But it saves resources.*

*Others will say:  
Let's create clean energy!  
A good solution –  
But not yet in sight.*

*As of now,  
The warming will continue.  
Let's draft a picture  
Of northward migration.*

*Migration is a natural way  
By warming and cooling.  
Only static thinking  
Makes it seem impossible.*

*P. 168*