



## **CLIMATE CHANGE AND THE FUTURE OF ENERGY – THE LESSONS FROM ICELAND**

**A Keynote Speech  
by  
the President of Iceland  
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at COMEXI  
Mexico  
11 March 2008**

*The speech was delivered without notes,  
the basis is a set of graphs and pictures.  
This is a post-speech typescript.*

Members of the Mexican establishment,  
if I can use that word in a good sense since I have had the opportunity to meet here with some old friends and reminisce about what we did when some of us were younger than today.

In the last few years many things have been said about climate change. We all know the origin of this challenge, how the ice has been melting in different parts of the world, how the deserts have grown, how the energy created by our economies, more and more traffic in our cities, the general well-being of nations on all continents, have gradually created the situation where the fundamental nature of the earth's climate is being threatened.

We in Iceland can witness this every year. We have seen a tremendous retreat of our glaciers. I put here on the screen the picture of Gígjökull from 2003 and then again a picture from 2005 so you see how in two years one of the Icelandic glaciers has retreated. I could spend the entire evening presenting many other pictures of this fundamental development. We have had in my country many decades of research into the glaciers of Iceland. The conclusion is be that if climate change and global warming continues at the present state most of the Icelandic

glaciers will have disappeared by the end of this century or the beginning of next century.

We also see this in other areas. I was recently in India and engaged in a discussion with members of the Indian government and the academic community on what is happening to the Himalayan glaciers. In the entire global debate about climate change what has been mostly neglected is the disastrous, frightening development in the Himalayan glaciers, both on the Indian and the Chinese side. There are all together about twelve thousand glaciers in the Himalayas. On the Indian side they are the origins of the great rivers of India, of the water systems that keep the food production going for about eight hundred million people; just on the Indian side alone, in addition to providing the electricity and the basis of other economic activity.

Although research needs to be done in this area the prevailing view of those glacierologists who have studied the glaciers on the Indian side seem to point out that within the next thirty or forty years, and I repeat that, within the next thirty or forty years the entire glaciers on the Indian side of the Himalayas will disappear.

I do not hesitate to say that with all due respect to the rising sea levels on all continents and the affect it will have on our countries the disaster of the disappearance of the Himalayan glaciers will be the most fundamental human and economic disaster caused by climate change; involving the direct livelihood of almost a billion people only on the Indian side. If we add the Chinese side as well we can see just what can happen.

What is more recent studies from last year and the year before on the Greenland ice and the Arctic ice seems to indicate that predictions from only a few years ago about what would be the state of play in the Arctic and Greenland around the middle of this century, 2040 or so, has already arrived. The picture which the scientists have brought to us from the research of last year, a picture which is in a way so startling that they didn't themselves believe the results in the beginning, seems to indicate an increased speed in this development of such a scale that nobody five years ago thought that that could happen. If we look at the September Arctic ice sheet from 1979 to 2007 on the next slide we will also see how this is happening.

As I said before we could spend the entire evening presenting the scientific evidence. There has been a debate in the last ten years or so about whether this is happening or not. But I think the debate is now more or less over. Whether it is the recent Nobel Peace Prize to Al Gore and the IPCC, a gathering of three thousand scientists from all over the world,

whether it is the meeting of the G8, whether it is the Bali Conference or whether it is the recent meeting of the Security Council of the United Nations, both the formal international community as well as the established scientific institutions are now all in agreement that this dramatic change is happening. We see it in the Greenland, the Arctic and Antarctic ice; we see it in the potential rising sea levels; we see how it threatens the existence of island states, a threat that is so serious that it is like a war on the very livelihood of these countries.

The only debate which is now left is simply this: Do we have ten or fifteen years to take the necessary measures to prevent this from happening or do we have twenty or thirty years? That is the only disagreement which now exists within the established scientific community. My view is that it doesn't matter which camp is right, whether it is the camp that says that we only have ten or fifteen years or the other camp that says that we have twenty or thirty years. In either case it is an extraordinary short time. I sometimes take the example, to wake people up, that this summer I have been president for twelve years and it has passed very quickly. To me it is alarming that it might be true that we only have the same amount of time since I was elected president to take the necessary measures.

Mexico and Iceland are in a fascinating way linked on this issue through the Gulf Stream which Mexico has throughout the centuries, thousands of years, sent from the Gulf of Mexico up through the North Atlantic where it encircles around Iceland, mixes in within the melting of the ice-water that comes from the Greenland and the Arctic. That combination of the Gulf Stream from Mexico and the melting of the ice and the fresh water that comes from the Greenland and the Arctic is in fact the motor which drives the conveyor belt of ocean currents. A conveyor belt which we didn't know forty years ago existed. It was only in the 1970s that the scientific community realized the phenomenon of the conveyor belt of ocean currents and how critical it is for the climate in every continent of the world.

If the combination of the salt level of the Gulf Stream which Mexico sends up to Iceland and the fresh water that comes from the melting of the Greenland and the Arctic ice will change in the coming years, that could lead to halting or perhaps stopping the conveyor belt of ocean currents, dramatically impacting on the climate not only in our countries but all over the world, would move climate change nearer on a time scale which would be absolutely startling.

Of course many people have said for the last five or ten years: Why are we drawing up these terrible visions of disasters and the human

catastrophe? Why don't we have some nice tidings and interesting pleasant stories to tell? But realism unfortunately points in this direction.

I have to tell you here tonight that despite the tremendous task that faces us, I am fundamentally optimistic that we can deal with it, that we can find the solutions. Why am I optimistic? Part of the reason is my experience here in Mexico and the history of the twentieth century, of the First World War, of the Second World War, of the Depression, of the nuclear arms race and how deeply frozen the Cold War was only twenty years ago or so when I was actively involved in the Six Nation's Peace Initiative with many people in the Mexican foreign service.

Who would have predicted at that time that twenty years later we would see a complete transformation of Central and Eastern Europe, of the entire global situation? Not only have we sent man to the moon, and not only has the Berlin Wall come down, not only have we brought democratic and economic transformation into Central and Eastern Europe, but we have seen within twenty years a more dramatic transformation of cooperation in this field of disarmament and the arms race and in tension between the super powers than anybody could have dreamt of twenty or twenty-five years ago. So my fundamental argument is this: If we succeeded in that fundamental task in the 1980s and the 1990s we can indeed map the road to success in order to prevent climate change.

If that is going to be done we need first of all to realize that it has to take place on all levels, not only international agreements between governments or within the framework of the United Nations or the Bali Copenhagen process. We have to have actions by national governments, we have to have actions by regions and cities, we have to involve the business sector and the companies and we also have as individuals and families to change our way of life. It is a comprehensive transformation that must take place on every level of human activity.

What scares me most is if people put all their concentration on the Bali-Copenhagen process or the post-Kyoto process and wait to take national actions, regional actions, city actions or personal actions; use the stalling of the negotiations as an excuse for not acting in our individual capacities.

The second dimension is this: The climate change is really the wrong term. Fundamentally it is all about the future of energy. The threat of climate change has been caused by the energy system we have produced and utilized in the last 100 – 150 years. If we are going to prevent it we have to completely transform the energy system of our countries.

There are two fundamental sources of clean energy which we have not yet begun to utilize. One is the sun above our head. The other is the fire under our feet; the fire ball which resides inside the earth. We all learn about it at school and then more or less forget that it is there. So we walk on it, we work on it, we sleep on it, but only to a very limited extent have we begun to harness it as a major energy resource.

One of the contributions that Iceland can make to the rest of the world is that we have demonstrated through technological and business innovation in the last thirty or forty years how to harness the fire inside the earth in order to produce electricity and energy on a big scale, on a vary profitable scale: Geothermal energy is about 30% more profitable than any other form of energy. This has enabled my country to transform our energy system from being when I was young in western Iceland, over 80% dependant on coal and oil over to now 100% of our electricity is produced from clean energy resources and over 75% of our total energy use, including traffic, shipping, coming from clean energy resources.

If a small country like Iceland, which up to the 1970s was classified as a developing country by the UNDP, can do this in a matter of a single generation my fundamental argument is: So can others. I don't accept that the Icelandic case is so special that it can be written off by saying: Yes, ok, you can do it in Iceland but it can not be repeated any where else.

If we look around the world we will see an enormous potential for geothermal exploitation in every continent, primarily created by the movement of the continents, the movement under and on the earth's surface which creates earthquakes. I sometimes say to leaders from earthquake prone countries, and I will say it here tonight as well, by being an earthquake prone country means that you are also blessed with an extraordinary productive resource of energy. So you just flip the coin and utilize the good side of being an earthquake country.

In recent years my country has created such geothermal projects in many different parts of the world; in Asia, in China, in Russia, in Central America, in Africa, in Europe and so on. One of my major mission here in Mexico, not only mine but also the mission of the official delegation and the business delegation is to create concrete ways of bringing Mexico into this part of the clean energy revolution as quickly and as effectively as possible.

Two years ago I was on a State Visit to China. We signed an agreement with the Chinese leadership at that time for the first urban geothermal heating system in China. Two years later we have had such a success that President Hu Jintao and the Chinese government, as well respected regional governments in different parts of China, want to repeat

that experience in many Chinese cities, closing down the coal stations that China has used to heat the houses. We only have to remember the pictures and the stories of the difficult winter in China to realize the importance of this.

Similarly in Germany and with the European Union we have been conducting this discussion. Our Minister of Energy just three weeks ago had a major meeting with the Commissioner of Energy of the European Union, the first such meeting which the European Union has conducted on the potential of geothermal energy in Europe. Also in Africa, in a poor country like Djibouti, we are now engaged in a project which has the ambitious aim of replacing the entire oil based energy economy of Djibouti into a totally clean energy economy, making Djibouti the first clean energy country in Africa.

In addition in the United States in the last one or two years we have seen a completely new level of interest, almost a transformation by many states within America, leading to bills being introduced and passed both in the House and in the Senate. Many of the leaders both among the governors in the Western and the Midwestern states in the US and also elsewhere are actively now taking a very constructive road in this transformation.

And Mexico, although I hesitate to present a comprehensive picture of the Mexican potential here tonight, is clearly a country with has a huge potential in this area. It requires more advanced geological research. It requires formal policy decisions, not only by the federal government, but also by the governors and leaders in respective states. But the beauty of geothermal power is that it can be tailor-made according to local needs. The power system can be built to serve a village or a part of a town or a big industrial complex, all depending on what is the actual need at the particular time. In addition to the power production you can create more than ten different lines of productive businesses like greenhouses for local farmers, spas, medical treatment and others which will help the local economy on many different levels.

So it is not only a question of transforming the energy system because of the threat of climate change. It is also a very attractive proposition in terms of economic development at the local level. In addition, Mexico has technological experience and know-how in areas which could be very helpful in the technological evolution of this energy system. I will mention just three of four areas here tonight.

One is the so called deep drilling project which we established in Iceland last year in cooperation with the United States. The purpose of that is to drill as far down as five kilometres and to examine how one

harnesses a hot temperature area between 400 and 600 degrees. If this project is successful, we learn how to harness these high temperature areas, which we can find all over the world, the potential of this energy source will be revolutionised.

The second project is the so called Kalina project which is the other end of the scale. It is based in northern Iceland. The purpose is to take the so called low temperature areas, below 100 degrees or so, and enhance the temperature so they can be used for electricity production. Many countries might not have, to their best existing knowledge, high temperature areas have vast low temperature or medium temperature areas. This technology could therefore be very helpful.

Thirdly is the ocean bottom. It has become my favourite in recent months because it has been an eye-opener for me to participate in a discussion where it has been demonstrated by scientists that as the land mass on the continents is rich in geothermal resources, the same can be found on the ocean bottom. We only have to look at the Atlantic Ridge that comes from the Antarctic up to Iceland to realize how the great American continents, North and South, and the European and the African countries are linked through the splitting of the ocean bottom. Given the technology which the oil and gas industry has developed in the last fifteen to twenty years, enabling the oil and gas industry to go thousands of meters down to harness the gas and the oil at the ocean bottom, it would be fascinating in the next three or four years to create an international cooperative project exploring the potential of harnessing the geothermal at the ocean bottom.

There, of course Mexico with a similar splitting as you find in the earthquake areas in different parts of Mexico, would have an enormous potential in the ocean bottoms, both on the east and west side of Mexico.

Let me also mention the potential of carbon sequestration. This has become in the last two or three years one of the most fascinating issues when people discuss how to be rid of the CO<sub>2</sub>. What we have done in Iceland in cooperation with Columbia University in New York and the University of Toulouse in France is to create carbon sequestration based on taking the CO<sub>2</sub> and pumping it down through the geothermal bore holes into the ground where it will touch base with basalt layers and turn it into a solid form. The risk of most other carbon sequestration projects is that sometime in the future the CO<sub>2</sub> might escape again into the atmosphere.

If this project is successful, which we will know in about three or four years, it could create the possibility of building what I call pumping stations in those parts of the world where there are such bore holes and

basalt layers. They are not only in Iceland, they are in the American continents, they are in Russia, they are in India and other parts of the world. The CO<sub>2</sub>, as we know, wherever it originates from goes all around the globe. Such pumping stations could serve the purpose of getting rid of the CO<sub>2</sub> for every economy in the world. I don't have to point out to the business leaders present here tonight what an extraordinary lucrative business that could potentially be.

I mentioned also earlier that we need transformation not only in the energy sector but also in many other areas. One of the most important areas is creating other energy resources like hydrogen which we have been doing in my country in cooperation with Daimler-Chrysler, with Shell and with Norsk Hydro using clean energy to produce hydrogen that can be used, not only for buses and cars but also for ships.

In addition we have to completely transform the way we build houses. If you drive around Mexico City, you drive around New York, you go all over the world, to the new cities in China, you see this extraordinary beautiful buildings, sky scrapers and so on, which have been built on the premise that energy is in abundance and there is really no risk in how we use it.

Therefore, we have to transform regional and city planning in a way to create much more energy efficient buildings, where the same functions can take place whether it is a business or a research or teaching with much less energy than we have used up until now. I will just towards the end of my introduction point out to you a few such buildings.

The first one is an office building which an Icelandic company created in Leeds in Britain and was opened last year. It ranks highest on the environmental scale by the British Ministry of Environment. It is a competitive office building in the terms of the rent, but it only requires 20% of the electricity that the normal office building requires from the city grid. Through five years of research, changing the architecture, the engineering and the building practices the energy requirements were cut down to 20%.

The second building is the new National Library in Singapore which is not only a fascinating building in its self and a great library, but is also built and constructed in such a way that it only uses 40% of the energy that a normal building of such a size uses in Singapore.

The third picture is the fascinating plan for the Masdar City in Abu Dhabi which will be fully built in 2012. A city of 50.000 to 60.000 people with a university, company headquarters, cars and traffic systems and everything which is required in a modern city, but with a zero emission. I



think it is fascinating that a small oil state like Abu Dhabi has now taken the leadership to realise that during the lifetime of our children and grandchildren the oil will run out, at least for Abu Dhabi, and therefore we have to transform not only our economies but our entire way of life. They got the famous British architect Norman Foster to draw the plans for the city, unveiled a model of the headquarters when they organized the World Future Energy Summit in February. If I remember correctly you could also read about it in one of the recent issues of Time or Newsweek.

A final picture is the city Shenjen in China which came into being in the 1980s. It was previously a fishing community of farmers and fishermen but the leader of China wanted a city to compete with Hong Kong. It is now a metropolises of over 8 million people. The American National Resource Defence Council has done a fascinating study on cities in China, on factories which has shown that with some alterations in the way production takes place it is possible to reduce the energy consumption by more then 40% without the production or the profitability of the factories being reduced in any way.

I decided to include this in my presentation here tonight to indicate to all of us that although we might be preoccupied with the debate on energy systems, energy structures, winds, solar geothermal, oil and so on, without fundamental transformation in regional and city planning, in architecture and the way we build houses and homes it will be extraordinary difficult to achieve success if we want to prevent climate change. The buildings that have already been created prove that the methods, technology and architectural style, are already here.

What is extremely encouraging for me is how in the last two or three years we in Iceland have observed the transformation of global corporate business thinking. We tried for twenty years or more to get a second aluminium company to settle in our country – with no success. Now, because of the abundance of clean energy resources, we have a queue of companies which want to establish operation in Iceland. Not only aluminium companies like ALCOA or ALCAN or the Russians or the Chinese, but also software companies like Google and Microsoft, SYSCO and Yahoo are taking a look at Iceland. Some of them have even started to discuss how they could utilize this clean energy resource. The Internet which to us is an every-day tool, easy to use, requires an enormous amount of energy, is in competition with the steal and the aluminium sector for the clean energy resources.

This might give us hope that even if the diplomatic discussions will be slow, the leadership provided by the scientific community on the one hand and the business community on the other, be strong.

Fundamentally we are left with the scientific dilemma: How many years do we have? Do we have ten years? Or do we have twenty or thirty years to bring our act together? Whatever it is, it will require the most dramatic transformation that we have seen apart from perhaps the transformation which ended the Cold War, completely transformed international relations twenty years ago. If we could do that I am extremely hopeful that we could also bring about the necessary action in this area.

Mexico played a great role during the height of the Cold War to showed vision, courage and daring in order to map out new ways to create the atmosphere for new treaties and agreements, I hope that our visit now will also help to bring about not only discussions and dialogue in Mexico but also firm decisions by Mexico to play a strong part in the coming years in finding solutions for them climate change challenge.