Keynote Address

Towards a truly sustainable future and a high quality of life for all people on our planet: the role of the Earth Sciences

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Abstract

We are living in a new period of earth history. I was impressed by the writing of Vladimir Vernadsky, 1929, in his book The Biosphere. He said we were in a transition to a new geological era which he termed the psychozoic era. As he stated, mankind as a whole would become a new and powerful geological entity able to transform the planet. I very much liked the words of Sir Crispin Tickell in his British Association lecture of 1993 "I was recently asked if I was an optimist or pessimist. The best answer was given by someone else. He said that he had optimism of the intellect but pessimism of the will. In short, we have most of the means for coping with the problems we face, but are distinctly short on our readiness to use them. It is never easy to bring the long term into the short term. Our leaders, whether in politics or business, rarely have a time horizon of more than five years". I have been fortunate that I have walked in over 60 nations. When you walk you see, smell, the problems and you meet people of all types.
Keywords: the Psychozoic era, education needed for all people, diversity, energy and waste reduction, soil quality.

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1 What are the great world problems today?

When we look at many regions of our planet there is no question we face the problem of too many people. An excellent data source is provided by the publication by The Economist [1], pocket world in figures, which is published every two years. I am looking at the edition for 2003. For example, we see that the average female in Niger has eight children, Ethiopia 6.75. This can be compared with advanced nations like Spain 1.13 children, Italy 1.20, Sweden 1.29.

But there is no doubt that related to such problems is quality of education for every male and female. For example, in Niger adult literacy is only 15.9%, compare Spain 98%, Italy 99%, Sweden 99%. I have noticed when I have visited some nations in Africa, most females do not go to school! It is interesting that the Scientific America (September 05), recently reviewed such problems including a section on the Population Peak.

I was born on a farm in New Zealand. The main activity was sheep farming. One thing we all knew: Every year the climate, rainfall, can be different. If there is too little rain, there is too little food and the animals die. This is also true for humans.

There is also no doubt today that our climate is changing - Human activities have changed the chemistry of our atmosphere and the convection patterns in the oceans and atmosphere. There is a fundamental feature of all fluid convecting systems. As the temperature increases, so do chaos and the unreliability of predictions. Today we see new deserts, new floods, etc. etc. As the recent UN meeting in Montreal, Canada, showed, even our leaders in politics are beginning to accept the reality of climate change and the technologies causing such changes.

Our life support systems include climate, air to breathe, water quality and quantity, and quality food. At this time millions of people suffer from serious malnutrition as in the nations of Africa, India and many more.

As the famous French scientist and philosopher, Montaigne, said in 1581, “diversity is security”. There is no doubt that good nutrition requires great diversity.

Food diversity again depends on climate, water and soil quality. Soil quality is not well appreciated by many. In many of the most fertile regions of the world the soil quality and quantity is related to recent tectonic events, including volcanism and mountain building. Good soils need complex mineral components, quantity and diversity. Recent studies in the NW of the U.S.A. show that crop yields increase following many volcanic eruptions. Work in many nations has shown that the use of pesticides, etc., can decrease quality and increase health problems. As they say in the U.K., such chemicals are *BIOCIDES*. As with all animal species, we require a very wide range of chemical elements in our food. We have studied soils of laterite soils, and water chemistry in many parts of the Amazon region. Temperature is warm, rainfall can be extreme. The key nutrients in the soils can be washed away leaving soils not productive and not producing quality food. The great trees live because of

complex root systems and dust. We have shown that some parts of the Amazon River water systems are very deficient in mineral components. For a general discussion, see Van Straaten, 2002 [5], Brown and Wolf, 1984 [1].

Without our present energy technologies we would not have our present population. Imagine Canada, where I now live, if there was no electricity, natural gas or oil.

One of the most urgent problems on our planet is to improve energy technologies. The largest consumers of energy at the present time are: the U.S.A., China, and Russia. Major components include sources from coal, oil, nuclear, hydro, etc. All lead to environmental problems.

Given our present knowledge, can we produce adequate clean energy for all nations? The first problem we must consider is how to reduce waste by intelligent construction technologies, and use of fossil fuels. I have noticed the potential use of underground construction in some nations.

Do we all need a big automobile?

Work in many nations has shown how we can use natural energy resources such as the Sun, Wind, tides, and beneath our feet, geothermal energy. As the temperature rises about 30^{o} C every km beneath the surface, there is vast potential for geothermal heating. Even more potential is available where we have recent active volcanism. A few nations have made use of such resources. And there is active volcanism in certain rock types, the hot fluids are rich in hydrogen, a clean gas energy resource (see Fyfe, 1999) [2].

We must improve our management of waste products. In this respect, 'Europe leads the world! First reduce the use of materials which cannot be recycled and reused, as with plastic bags, etc.

In most nations that use nuclear power, there is a problem as to where do we put nuclear waste where it will be safe for millions of years (Fyfe, 1999) [2]. But we also have many other examples of waste problems, as with materials which involve elements such as arsenic in mine wastes.

Recent work we have done on the volcanic basalt rocks of Hawaii show that these rocks will absorb carbon dioxide. When we burn coal and oil, why not put the gas products underground? I have discussed this problem with many people in China and India.

Do we design cities intelligently? Again, in this respect Europe leads the world. As I mentioned above, storage facilities, etc. can be built underground. Don't waste the surface! To live in a city, do you need a car? My daughter lived in London, U.K., for several years. As she once said, a car is a nuisance. Public transport is excellent. Can you walk to work, etc. etc.?

I have been in many cities in Europe. You do not need a car. Many hotels are designed to save energy and water needs. It is possible!

We all use massive quantities of materials derived from our mining industries. How much iron do we need? Do we recycle what we have used? Do you need a gold ring? How much rock was mined to get that gold? Was it in your nation or imported? Most gold ores are rich in arsenic and there are many examples of deadly arsenic pollution related to gold mining. The same is true for many of the materials used in the fertilizer industries of our agri-technology.

2 Concluding thoughts

I always remember discussions during a meeting of the International Union of Geological Sciences in Florence, Italy. There was agreement that the two basic sciences are astronomy and earth science, from which all others are derived. Also, there was concern about how few scientists were working on the urgent world problems. As was said, too many scientists spend their life finishing their Ph.D. research projects.

World data are clear. The quality of life in nations is related to the quality of education for all people, all ages. And another feature of education is clear. Numerous studies of animal life including our relatives, the apes, show that in general the females are more intelligent than males. There are many reasons why this should be. When we examine nations and their problems, such as AIDS, there is a clear relation between problems like this and female education. We also need more females in governments as with the situation in N. Europe. I recently attended a wonderful conference in England. It was based on the need for education for all. We had about 10,000 young people of all ages, and about 1,000 school teachers from all Europe. The discussions were wonderful (see Moody et al, 2000) [3].

We need new systems, new groups of experts to integrate knowledge and the planning of our world for future generations. Such groups must include scientists, sociologists, economists, politicians and, particularly, citizens of both sexes. As Sir Crispin Tickell stressed, we must plan for now and for future generations. That is why the focus of this meeting on Landscape Evaluation is so important.

My final question to all experts at this meeting. When you leave the planet, is it better for all people than when you arrived? My answer is NO, it is not better and a major cause is overpopulation in many nations related to a poor quality of education for all people. We must improve our systems and plan for the next generations.

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