

*REVIEW***SUSTAINABLE DEVELOPMENT AND HEALTH**

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In tackling the issue of sustainable development and health, I will address the obviously desirable linkages between socio-economic advancement, health, ecological sustainability and environmental integrity. I want to propose that the quantity, and more particularly the quality of research that has been applied so successfully to human health (though very unevenly in geographic terms) must be simulated in regard to health of the environment. The state of the biosphere is not good and we in this privileged society, in this part of the world, have got to do something about it. The traditional foundations of therapy and prevention of disease are hygiene, surgery, drugs and biologicals. Spectacular advances continue in these four areas especially with computer-aided drug design and new methods of molecular synthesis. We all marvel at the achievements and are excited by the future in these four components of human (and animal) health. When it comes to environmental health, we as a species seem totally incapable of implementing even the most simple preventive measures, let alone the "high-tech fix".

In sustainable development and the responsible utilization of global resources, the dual goals of economic development and ecological stability are often in direct conflict. The polarized debate in this country between developmentalists and environmentalists is most regrettable - the greener than green environmentalist and the red-neck developer are moving further apart and we have got to find the middle ground - even the new ground - for the debate to proceed in an atmosphere unencumbered by entrenched attitudes and intolerance. The issues are too important to have human failings mess things up once again.

We know that whilst many economies are growing, the ecosystems in which they are embedded are not. We do have an ecology as well as an economy. We get very passionate about the environment but we also get very passionate about employment for our children and, let's face it, our own personal economic situation.

Of the four interrelated global crises - human overpopulation, environmental degradation, loss of biodiversity, and non-sustainable utilization of natural resources - that which looms largest is overpopulation. With figures of 5.3 billion and an annual increase of 90-100 m, we as a species are doing remarkably well notwithstanding the fact that whilst 1 b of us enjoy an unsustainable lifestyle, a further 1 b of us endure abject poverty. We know human population pressures on the environment will increase. Can global ecosystems withstand the famous 20-30 year "demographic

transition" between improved health and socio-economic security on the one hand, and the resultant voluntary restriction in family size so obvious in developed countries? The answer to this question in many parts of Asia and Africa is a resounding no. With development often equating with attainment of what the industrially developed Western world now has, the prospects for sustainable utilization of natural resources and the reversal of environmental degradation and biotic impoverishment seem bleak indeed. The prospects of a monoculture of *Homo sapiens* are rather real when we compare human population growth to the percentage of species remaining on the planet. The current rate of loss of one species per day and one profile species per year is frightening.¹ It must be remembered that current consumers of the world's natural resources are not concentrated in the populous tropical countries but rather in the affluent countries of the temperate zone.

As exponential human growth continues and the juggernaut of the economic imperative rolls on, certain legacies are beginning to haunt us - acid rain, global warming, atmospheric pollution, green house gases, ozone depletion, water contamination, toxic wastes, desertification, deforestation, salination, soil loss overgrazing, habitat fragmentation, species extinctions, etc. etc. - the headlines also roll on!

Why the overstatement and, I hope uncharacteristic pessimism? We know we are the "clever species" capable of solving problems we create. Combined with improved biological literacy in the community, Science and Technology of the sort we celebrate in this Symposium, can do much. Characteristically, Gus Nossal (Director of the Walter and Eliza Hall Institute of Medical Research, Melbourne) has put it beautifully: "Science and Technology have released many minds from ignorance, prejudice and superstition revealing an incredible human reservoir of inventiveness and creativity". As indicated above, we have witnessed the expression of that cleverness and the extraordinary application of Science & Technology in our own health status. However, many predict that we are going to need a larger dose of that cleverness to tackle a new set of health problems in the very near future. A goodly amount of enlightened self interest dictates that we in this part of the world had better be active because impacts are going to be substantial in the region. I refer to the "Changing Patterns of Disease in an Altered Environment". Some of these are summarized below:

1. A decrease in stratospheric ozone concentrations leads to higher UV-B (290-320nm) exposure and can in turn result in increased incidence of
 - . Non-melanoma and malignant melanoma skin cancers
 - . Cataracts
 - . Immunosuppression

2. Global warming as a consequence of increased atmospheric carbon dioxide
 - . Altered seasonal and geographic abundance of invertebrate vectors of disease
 - . Inundation. Changes in availability of water. Changes in crop yields, livestock output (fertility), fisheries output etc.
3. Air pollution resulting from industrial and vehicle emissions
 - . Respiratory disease
 - . Cancers
4. Industrial accidents
5. "Ecological refugees" - displacement of people with consequences for physical and mental health.

Two aspects dominate in this scenario - holes in the ozone layer and global warming and I do not have to elaborate on the skin cancer problem of increased UV-B exposure in Queensland. In addition, we have continuing urbanization leading to pollution and continuing industrialization leading to accidents such as the recent spectacular nuclear power plant disasters. Many believe, however, that the greatest effects on us, our lifestyle and our "health status" will be mass population movements in the region - the ecological refugees are likely to become a reality putting enormous pressure on health delivery services in many countries and impacting on Australia in no uncertain manner.

Some consequences to Australia of global warming may be highlighted:

1. Increase in the numbers of invertebrate vectors of disease, particularly *Anopheles farauti* and *Culex annulirostris*, two mosquitos of concern in Australia
2. Increased incidence of diseases including those not reported previously in Australia,
 - Parasitic - malaria, (schistosomiasis), filariasis (trypanosomiasis). (leishmaniasis), intestinal worms, amoebic encephalomyelitis
 - Bacterial - cholera, meningitis, melioidosis
 - Viral - Dengue, (yellow fever), Ross River fever, Australian encephalitis
 - Tick-borne diseases
 - Allergies
3. Increase in agricultural pests due to the production of more generations per year.

Are we equipped to take on these new problems and the wider issues of environmental change, overpopulation, regional biotic impoverishment and the like? There is a real problem here. The holistic nature of environmental research is overwhelming for most of us steeped in the worthy reductionist traditions of laboratory-based biological science. We formulate hypotheses, design experiments to test them, write up the results and get a lot of publications and kudos out of it all! In matters concerned with health of the environment, values come into play and focusing on the problem let alone quantitation of it, is difficult and we categorize it as too hard and do not record it as "hard science" anyway. We also have an enormous task in improving ecological literacy through education in the hope that this will increase the chances of reversing some of the alarming trends we have talked about today. In mentioning values, I want to give one example of just how anthropocentric we really are. Let us look at how much we as individuals give to charities. As is often the case, the best data come from the USA. In a comparison of US household donations to charitable causes, one stands out - "Religion" \$ 400. "Education", "Health" and "Human services" are noticeable (\$ 50); Environment and others are barely discernible (\$10).¹

As an aside, it has been said that the environmental debate got off to a bad start in Western culture - Greek philosophy and its dismissive approach to natural phenomena, and the Judeo-Christian emphasis on property and the individual with much time spent working out our relationships with God rather than with nature. More recently, of course, we have the dangerous phenomenon of semi-religious beliefs dressed up in scientific clothing. As scientists we have a new responsibility - to ensure that science, scientific methods and scientific data are not misused in the environment debate or any other for that matter. This comes home to us when we realize that a combination of physics, chemistry and engineering now enable us to measure minority components - contaminants if you will - at the level of 1 part per trillion. Politicians and the general public need help in how to interpret this kind of data and a lot of other data that is now easy for us to generate. I suggest that from our laboratories we are not good at doing this and our standing in the wider community suffers as a consequence.

There is no doubt that health improvements and both demographic and ecological stability will be essential components of sustainable development regionally and globally. Nowhere are the needs greater than in a country like the Philippines where I have been privileged to work with a group of superb Philippine collaborators on schistosomiasis for a decade or so. There are 61.5 m people in Philippines increasing at more than 3% per annum. In terms of the population explosion, we know that appropriate birth control programmes in the Philippines would be worth billions of dollars in aid.

Many animal species that are endemic to the Philippines are threatened with extinction. In the area I have been working in on schistosomiasis, namely Sorsogon, of 140 species of bird known to occur there, 63 are listed as endangered. Thus 45% of the bird species in the region actually face extinction now and this is indicative of the biotic impoverishment that is continuing apace in many countries of SE Asia. We in Australia have an appalling record of species extinctions over the past 200 years and our neighbours are now about to enter their most destructive period. The underlying reasons for species extinctions include over exploitation by humans, habitat loss, environmental contamination and introduced competitors and predators. Three of these four factors are out of control in the Philippines. Natural disasters do not help—volcanoes, typhoons, mudslides, floods. Any slight economic advances are neutralized immediately by population growth and calamities. These extraordinarily resilient and resourceful people are constantly having to pick up the pieces and of the components in the vicious cycle of poor health, undernutrition and socioeconomic stagnation amongst the rural poor, undernutrition is the only factor that is not obvious.

In our studies on schistosomiasis and from a base at The Walter and Eliza Hall Institute of Medical Research in Melbourne, we have emphasized training and technology transfer providing the Philippines with the means of frontally addressing their own health problems through a partnership and genuine collaboration in what has been, I hope the antithesis of colonial paternalism. The need for a vaccine against schistosomiasis has never been greater even with the advent of a very effective drug against *Schistosoma japonicum*, namely praziquantel. This drug will effect cure quite readily but reinfection is virtually complete within 2-3 years depending on the age of the patient (and water contact). There is some indication that if praziquantel is not administered regularly (and that is expensive), disease manifestations on reinfection can be more severe than was the case before treatment was initiated in the village. More field-based research is required to pursue this and many other aspects of schistosomiasis control.

Even at the level of zoos, opportunities exist in the Philippines for assistance in shaping positive attitudes to wildlife and in education and training. A scene from Manila Zoo of the king of beasts lying on a tiled floor in a small barred cage is not the best way of transmitting the conservation message to visitors. I know that we in the Australasian zoos can do good things in regard to environment, wildlife preservation and conservation research and training regionally as well as locally and to supplement our more traditional recreational, tourism, social and cultural roles with education, conservation and research.

I express the hope that we will continue to explore imaginative and innovative programs that link health with ecologically-sustainable development, an interface that has not yet occupied the minds of some of the most creative thinkers in Australia with

a superb record of achievement namely, the biomedical research community of this great country.

[An edited version of an address delivered by Prof. Graham Mitchell, Director of the Royal Melbourne Zoological Gardens, at an International Symposium on the occasion of the official opening of the Bancroft Centre - Queensland Institute of Medical Research, Brisbane, Queensland, Australia, on October 18th 1991]

Reference

1. Soule M.E. (1991). Conservation: tactics for a constant crisis. *Science* **253**: 744-750.