Human Ecology embraces the principles of natural and moral philosophy. It draws on knowledge and understanding from the sciences and humanities, to develop and promote holistic, integrative, sustainable initiatives, ideas and development projects to enhance and strengthen people’s relationships with each other and the natural and built environment on which they depend.

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The island states and territories and the countries of the rim are linked by both natural events and by human activities. The Indian Ocean’s 26th December 2004 tsunami affected almost every country of the rim, many more severely than others. This single event reminded people in India, Sri Lanka, Kenya, Tanzania that they shared experiences with people on the other side of the Ocean in Indonesia and Thailand. The tropical storms that develop in the Ocean and sweep into the Bay of Bengal and at other times on to the northwest coast of Australia show that the countries share a common climatic destiny associated with the configuration of the Ocean that produces the great Asian monsoon system. Events in the atmosphere over East Africa affect the development and intensity of the winds that carry the monsoon to the South Asian sub-continent. Those events in turn may be influenced by ocean currents in the Antarctic Ocean and southern Indian Ocean, as part of the general circulation of ocean waters. The sense if just part of a global interlinked ocean-climate system with which navigators have battled since the first fragile craft carried early humans across narrow seas at the margins of the Indian Ocean from Africa to Asia and eventually to Australia and the Pacific.

Geopolitics; the colonial legacy

Historically, the Ocean has been the scene of constant movements by traders and invaders by sea. Many violent encounters occurred between those from other areas and the peoples of the ocean rim. For example, in 1507, Afonso de Albuquerque from Portugal attacked the town of Hoja on the East African coast, killing the sheikh and looting the town which was then torched, some of his men were so busy looting that they too perished in the flames. Later that year he attacked Goa in India and wrote to his superiors:

“I burnt the city and put everyone to the sword and for four days your men shed blood continuously”¹.

In 1640, the Dutch fought the Portuguese in Sri Lanka, but the fighting involved the peoples of the ocean rim as well, the Portuguese using their slaves brought from Africa, while the Dutch employed Sinhalese auxiliaries². By the end of the 19th century European countries had a set of colonies around the ocean linked by coaling stations and maritime trade. 100 years later, nearly all those colonies had gone, but some significant island legacies remain.

Réunion is an Overseas Department of France, its 600,000 people being represented in the French Parliament by three deputies and two senators. Christmas Island
and the Cocos (Keeling) Islands are administered by the Federal Government of Australia through the Department of Regional Australia, Regional Development and Local Government. Both have Shire Councils providing local government according to legislation based on that of Western Australia. Just over 600 people live on the Cocos (Keeling Islands). In 1984 the Cocos community voted overwhelmingly to integrate with Australia and the then Federal Government made a commitment to raise services and standards of living to a level comparable with those on mainland Australia within the next ten years.

There was a less happy outcome for the people of the Chagos Islands on the other side of the Indian Ocean. In 1964, the US and UK governments began negotiations regarding the possibility of establishing a US military facility on Diego Garcia. The UK government enacted the British Indian Ocean Territory (BIOT) Order 1965, which excised the Chagos Islands from the colony of Mauritius and created the BIOT. Through an Exchange of Notes in 1966, the UK government made Diego Garcia available to the US while retaining sovereignty over the island. The US took possession in 1971. Pursuant to US requirements, between 1965 and 1973, the UK government secretly exiled the indigenous people of the entire Chagos Archipelago (some 1800 individuals). The majority were transported to Mauritius. The UK government paid £650,000 to the Mauritian government in 1973 in connection with the process of displacement but this sum was not distributed to Chagossians living in Mauritius until 1978. The English courts upheld the Chagossian public law right of abode in the BIOT (the Chagos Islands) with the exception of the island of Diego Garcia. While these decisions are crucial to the Chagossian people’s cause of returning to their ancestral homeland, it is unclear how this displaced and (now) chronically impoverished people could realise this right without the support of a publicly funded resettlement programme. Their situation is further complicated by the April 2010 declaration of the world’s largest no-take Marine Protection Area (MPA) (210,000 square miles) surrounding the Chagos archipelago in the BIOT. This was met with press criticism and mixed feelings among conservationists. The concerns arose because the designation was put in place even though there had been no final legal decision on the native Chagossians’ right to return to the islands. Should the islanders return to the archipelago, they could be prohibited by the MPA from engaging in fishing or any other exploitation of marine resources that could provide subsistence and enhance their livelihoods. This colonial hangover situation remains an embarrassment to many people in the UK.

Another important Indian Ocean island Territory is the Indian Ocean Territory of the Andaman and Nicobar Islands, a 800 km long narrow chain of 572 islands, islets and rocks, 30 of which are inhabited by a total of just under 400,000 people. Although 1250 km from nearest Indian mainland coast, the islands are only 90 km from Indonesia and a few hundred km from Thailand and Myanmar. There is no legislature for the Territory, which is ruled by a Lieutenant-Governor. However one member of the Indian parliament is elected by the people of the islands. Originally used by the British as a penal colony after the Indian Mutiny of 1857, the islands now house a major Indian Naval Base. China’s concern for access to the Indian Ocean, perhaps by a land bridge through Myanmar, led to many reports including from Japan, still mentioned in Indian books in 2007 and 2009, that China had built electronic surveillance, radar and naval facilities on Myanmar’s Coco Islands just 20 km north of the Andamans. Remote sensing and visits by Indian military officials is untrue, but the issue serves to demonstrate the strategic importance of all these ocean islands, as well as perhaps the lack of attention to the concerns of their original peoples.

The changing biophysical environment

The impacts of typhoons (hurricanes or cyclones) and the monsoon as a whole are changing with global climate change. Many of the island states, as well as territories such as the Andaman and Nicobar Island of India and Christmas Island and the Cocos (Keeling) Islands of Australia, are feeling the impacts of that change already. The coral reefs, valuable for tourism and fishing and often providing critical protection against rising sea levels, are under threat from ocean acidification, coral bleaching and
attack by other organisms\textsuperscript{10}. These impacts are by no means uniform in occurrence, timing and intensity, but they are significant problems in which the sharing of experience and information around the ocean can help in mitigation and adaptation. Some analysis predict that rises of only 0.1 °C in regional ocean temperatures could trigger 35\% and 42\% increases in the geographic extent and intensity of coral bleaching, respectively. However, these general patterns of biological responses to climate change vary substantially regionally and locally. Such heterogeneity in temperature anomalies could interact with predicted shifts in community structure and species interactions to produce more localized climate change impacts\textsuperscript{11}. Already ocean acidification is affecting shellfish, mussels, and sea urchins, and to a much lesser extent the crab \textit{Necora puber}, are sensitive to internal acidification of body fluids and use shell dissolution to compensate\textsuperscript{13}. The whole set of changes in ocean chemistry will change the marine ecosystems on which aquatic life depends and will thus greatly influence fish stocks.

Around the reefs, coastlines and out into the oceans are important and significant fisheries where the local interests of islanders and the commercial interests of the nations on the ocean rim are often in conflict. Total weight of fish caught has risen dramatically since the 1970s\textsuperscript{14}. The Indian Ocean stocks of bluefin tuna are “depleted” (FAO’s worst category), whilst stocks of Emperors, narrow backed Spanish Mackerel and various nantian decapods are “fully exploited to over exploited” in the western Indian Ocean and stocks of Croakers and drums, Ponyfish, Stolephorus anchovies, Indian Mackerels, Scads, Banana Prawn and Giant Tiger Prawn are “fully exploited to over exploited” in the western Indian Ocean\textsuperscript{15}. More species are depleted in other oceans, but the situation must cause concern to all fishing nations because the increase of the human population will stimulate greater demand just at the time the impacts of global warming may reduce the productivity of parts of the ocean.

\textbf{Australian and the Indian Ocean}

For many Australians living on the east coast in cities from Cairns to Hobart, the ocean is where the sun rises and the west is where it sets behind the hills. However, from Perth the perspective is different: the sun rises inland and sets over the Indian Ocean. Across that ocean came the European settlers of Australia. Now across the ocean there exist a huge trade in primary products and mineral resources that contribute to the rapid industrialisation of the countries of the Indian Ocean rim and beyond. The value of Western Australia’s exports to Indian Ocean Rim countries (IOR-ARC) grew by 14\% in the 10 years to 2009, but those to India grew by 57\%, mainly through the export of non-monetary gold. Gold accounted for 40.8\% of the value of the exports to IOR-ARC nations\textsuperscript{16}.

Trade across the Indian Ocean is booming. Already about half the world’s container ships, just under three-quarters of its petroleum products and ever-growing quantities of raw materials are being carried across its waters, particularly to the factories of China and India. Into the Ocean through the Straits of Hormuz passes 40\% of the world’s seaborne oil, including 33\% of that supplied to China, 70\% of that going to Japan and 90\% of India’s. Together with the Malacca and Sunda Straits and the pirate infested zone off the Horn of Africa, the Straits of Hormuz form a set of key potential choke-points for future crises.

\textbf{Geopolitics: trade and marine security}

Economic ties are burgeoning across the Indian Ocean region, with China and India, the two mega-economies of the region, depending on its sea lanes for key energy supplies and resource flows. China is India’s biggest trading partner. The trade has also been driving a mineral boom in
Australia. This upsurge in commerce and in manufacturing has lifted tens of millions of people out of poverty, sustaining and otherwise slowing global economy. However, despite the increasing volumes of shipping there are major security concerns. With pirates near the Horn of Africa, occasional threats from Iran to close the straits of Hormuz, a build-up of naval strength by both India and China, and Chinese assistance in building ports and other infrastructure in both South Asia and Africa, security worries and anxieties about other people’s intention loom large in thinking and writing about today’s Indian Ocean.

South Asian countries look at the Ocean in terms of India, China and economics. Their specific interests reflect their geography, economics, political relationships and extra-regional roles. For India, the Indian Ocean has a huge and growing strategic importance and is highly significant in its relationships with the USA. Some argue that a regular American presence in the Ocean serves India’s interests. For Pakistan it is one arena in which its rivalry with India is played. For Bangladesh and Sri Lanka, their dominant concerns about the Ocean are economic, but also they are highly susceptible to environmental change, including rising sea levels.

For the small island nations, such as the Maldives and Seychelles, assuring their independence and diversifying their economies is important. In 2011 the two countries agreed to do more to improve their regional collaboration and share expertise, especially because both countries depend on fisheries and tourism. Fishing provides livelihoods for 40% of the Maldivian population. Artisanal fisheries in the Seychelles could be improved with Maldivian expertise.

The Indian Ocean region has several bodies to promote regional co-operation. The main one, established in 1997, the Indian Ocean Rim Association for Regional Co-operation and Development (IOR-ARC) has 18 member states: Australia, Bangladesh, India, Indonesia, Iran, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Oman, Singapore, South Africa, Sri Lanka, Tanzania, Thailand, United Arab Emirates and Yemen. Some see it as one of a number of multi-lateral bodies with primarily economic interests that are now “widely considered moribund”.

The small island states are not members of the IOR-ARC. As Pat Stannard shows in her article on the Pacific in this issue, small island states play one powerful nation off against another. Mauritius, for example, is playing China off India. These small countries are, to a degree, in an advantageous position, able to leverage both rising Asian powers against each other. As Africa develops economically and stabilizes politically over the course of the twenty-first century, the formerly disaster-prone continent will play an increasingly vital role in Indian Ocean trading networks, making a place like Mauritius very strategic.

The powerful nations are increasingly looking after their own strategic interests. The Chinese military’s “string-of-pearls strategy” for the Indian Ocean involves building the construction of a large port and listening post at Gwadar, Pakistan on the Arabian Sea, whence the Chinese could monitor ship traffic through the Strait of Hormuz. There could be another Chinese-used port in Pakistan, at Pasni, about 120 km east of Gwadar and joined to it by a new highway. At Hambantota, on the southern coast of Sri Lanka, the Chinese seem to be building the oil-age equivalent of a coaling station for their ships. At the Bangladeshi port of Chittagong on the Bay of Bengal, Chinese companies have been active in developing the container port facility, where China might also be seeking naval access.

Eastern African states are also gaining Chinese investment. In 2009 alone, companies from China agreed to spend more than $3bn building dams in Ethiopia and a $1.9bn on a dam in Mozambique. Overall, the Standard Bank Group Ltd has predicted that China’s gross investments in Africa will rise to $50 billion by 2015. The bank expects bilateral trade between the two to hit $300 billion by 2015, double the 2010 figure. All this growth raises the importance of the Indian Ocean to China.

Indonesia has the fastest growing middle class in the Indian Ocean region. Its demand for consumer goods is rising rapidly. Its imports of raw materials, natural gas and food from Australia have all increased considerably. It is Indonesia’s interests to see harmonious relationships
between India and China and to foster better understanding across the IOR-ARC. It could be a key player in developing collaborative maritime security links and in pooling resources to mount rapid responses to natural disasters and other contingencies. It could provide an example to its Muslim cousins on the Straits of Hormuz by ensuring continuity of the freedom of passage for shipping through the Malacca and Sunda Straits.

Reading American comments on marine security in the Indian Ocean one finds assertions about threats and rivalries to the freedom of passage. Inherent in the argument is that the US Air Base at Diego Garcia in the centre of the Ocean is essential for “keeping the peace”, and not merely a useful position for maintaining aircraft to go on bombing raids into countries on and adjacent to ocean rim. One comment on the internet relating to an article making such an assertion asked: “The “whites” still persist in policing the world. A God given right? One day the Supreme Being might choose to answer with a show of great displeasure”.

Is there a better way of ensuring that the Indian Ocean provides safe passage, sustainable fisheries, improved quality of life, political freedom, and natural resource conservation for the benefit of all its peoples, from the smallest islands to the megacities of South Asia? Perhaps real collaboration between the twelve Commonwealth countries in the IOR-ARC and the Commonwealth island states within the Ocean could make a difference. With over two-thirds of the states in the region being members of the Commonwealth of Nations, this is surely an Ocean of Commonwealth Concern.

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China’s Challenges to the Commonwealth in the South Pacific

Pat Stannard
New Zealand

China hits the headlines almost every day in some way. In the remote area of the world known as the South Pacific its influence is no less an issue. For the Commonwealth’s representatives in the region, international politics are being played out in ways that raise issues that challenge the Commonwealth and the democratic ideology that underpins it.

The Pacific Islands Forum (PIF) consists of two first world states, Australia and New Zealand, a resource rich Papua New Guinea, and twelve small, impoverished and vulnerable states: the Cook Islands, Federated States of Micronesia, Kiribati, Nauru, Niue, Tonga, Tuvalu, Samoa, the Solomon Islands and Vanuatu who are all Commonwealth members, as was Fiji until it was suspended in 2006 from both the Commonwealth and the PIF. Palau and the Marshall Islands are also PIF members.

China’s expansionist policy has led to the United States renewing its interest in the South Pacific. This involvement had almost disappeared at the end of the cold war. Hilary Clinton said in March 2011 that the US is now in open competition with China for Papua New Guinea’s gas and oil. Politics in the South Pacific has always been predicated on aid. For very many years Australia and New Zealand were the major players. They saw themselves as exercising influence on the region and exporting along with the aid, the principles of western style democracy. From the point of view of the receivers though, Australia and New Zealand have been quasi-colonial players, however much they would deny it. Despite first world status, Australia’s booming economy is dependent on mineral exports to China which are not inexhaustible. New Zealand’s vital dairy industry is similarly dependent on exporting to Asia.

It’s not just about resources though. It’s about votes at the UN and elsewhere. The Middle East is a long way from the South Pacific, so why would the entire PIF block at the UN recently call on Iran to return disputed islands in the Gulf to the United Arab Emirates? The answer is the Arab League has offered $US50 million in aid to the South Pacific. Specifically Morrocco is giving scholarships to students from Tonga. It is unsurprising to learn that Israel is providing medical help to Tonga.

China’s relentless pursuit of resources means in the Pacific context, fisheries, and sufficient leverage to be well placed in the future to participate in sea bed mining. It has for many years been giving soft loans (that is with little or no repayment date as part of the deal). It may not always be so forgiving. Heavily indebted small vulnerable states could find themselves in the future with less choice than ever, should China decide to call in their debts.

If China and the US are manipulating Pacific Island states in their quest for hegemonic influence, Taiwan has entered the contest and has split the PIF between those who accept aid from them and those who take it from China. Taiwan’s loans generally come with even fewer restrictions than China’s so-called soft loans. Far less of their aid is project oriented, and they are unconcerned if corrupt leaders appropriate it. Taiwan is not a UN member, but being recognised as a player in Pacific politics gives credibility to their case to be one. Six of the PIF member states recognise Taiwan.

China’s aid comes without the economic restructuring demands often accompanying loans from the World Bank and doesn’t come with ideological hooks that have seen Fiji suspended from both the PIF and the Commonwealth since 2006. Fiji is currently a military dictatorship led by Colonel Bainimarama. Amnesty International has registered human rights abuses ranging from arbitrary arrests, torture, sacking of judges, and the almost complete muffling of the press.

The military authorities have promised elections in 2014 but few believe they will happen. Aid from Australia and New Zealand has ceased but the Chinese Government has provided aid for infrastructure projects and built its own
embassy. The US is currently building an embassy as well.

Democracy seems to be flexible currency however. Fijian troops bring in much needed income from their employment by the UN in peace keeping operations. An appeal to the UN to refuse to employ them until democracy returned to Fiji met with refusal, the availability of well-trained troops apparently trumping ideology. Democracy and human rights are not issues to overly concern China.

The regime in Fiji is gaining support from an increasingly fragmented PIF. A Melanesian Spearhead Group has emerged whose Secretariat is in Vanuatu, its building donated by China. It consists of Fiji, the Solomons, Vanuatu, Papua New Guinea and New Caledonia all of whom have ethnic and trade links with each other. In addition, the coral island micro-states of Kiribati and Tuvalu are highly vulnerable to environmental and political changes in the Pacific and are thus in an impossible situation. They cannot survive without Fiji, so must not antagonise the regime there, but nor can they support Australia and New Zealand who continue to stand firm on a return to democracy in Fiji. It remains to be seen if unrest will be sufficient to overturn the dictatorship, and even if so, what sort of regime would emerge or whether Australia and New Zealand would regain their influence.

Australia and New Zealand regard the PIF as a vehicle for influencing the region and have been negotiating a Pacific Agreement on Closer Economic Relations (PACER). However, the Melanesian Spearhead Group has withdrawn and the negotiations are suspended indefinitely. It seems inevitable that Australia and New Zealand’s influence will continue to decline. Their credibility has not been helped by the outcomes of their aid programmes which too often have been ‘boomerang’ programmes, i.e. the aid money are spent by the donor.

Less developed Commonwealth countries in the South Pacific and other small states in the region increasingly see their best strategy as playing off those competing for their loyalty. Their UN votes are now important enough to matter to China and therefore by extension to the US, which gives them confidence to exert influence on their own futures in a rapidly changing political climate.

A Letter from New Zealand: some environmental and human ecology initiatives

Keith Thompson
Ecologist

Introduction

It is perhaps 15 years since I gave a formal account to CHEC of environmental activities and initiatives I have been associated with, so I shall use the 1995 Auckland CHOGM meeting, at which I gave a talk on behalf of CHEC New Zealand, as a starting point for this short historical narrative, followed by an account of current activities.

The last 15 years

My involvements fall into two categories: Wetlands and Education. I retired from teaching and research at Waikato University in 2004, having established, or helped to establish, during the 1990s, courses in Environmental Science (Year 1), Applied Ecology (Year 3), and three Masters courses: Environmental Technology, Environmental Sustainability in Business,
and *Principles of Sustainability*. The latter brought together several different disciplines and was the most ‘popular’ graduate course in the Department of Biological Sciences. My 30+ research students almost all studied aspects of wetlands functioning and management, rehabilitation of wetlands, practical uses wetlands, sustainability of peat land agriculture.

In 2002 I passed on the task of Supervisor (programme director) of the Hamilton Junior Naturalist Club (for 9 – 18 yr olds) after 15 years in that role, and helped to establish the Te Kauri-Waikuku Trust (TKWT). The Trust is a Junats initiative tasked with (a) managing the pest control programme in the 1000ha forest around the Club’s 90-bed lodge and, (b), administering the *Learning Experiences Outside the Classroom* (*LEOTC*) environmental education programme funded by the Ministry of Education. In our seventh LEOTC year, we have three part-time educators, who instruct classes from visiting schools in ecology and sustainable management of the forest ecosystem. We are the only community group in New Zealand running an education programme of this type.

Our LEOTC programme at Te Kauri is related in its objectives (there are no organisational links) to the programme developed by the New Zealand Enviroschools Foundation (2003). Indeed the NZEF founding director, Heidi Mardon, was a member of the Te Kauri Trust for many years as our two programmes evolved. Schools (primary or secondary) choose to join the Enviroschools programme, which promotes a whole-school approach to healthy, sustainable communities, by empowering students themselves to actively design, manage and revitalise their school ecosystem in some way – waste management, energy conservation, etc. In our Te Kauri model, visiting students experience a natural forest ecosystem outside the Lodge door and are instructed in the things that make it self-sustaining, and the factors, such as exotic predators and browsers, that can disrupt ecosystem functioning.

New Zealand is a world leader in animal pest control methodologies. It is the only large country in the world without indigenous land mammals, so Regional Councils, the Department of Conservation, the Animal Health Board (bovine TB protection) and dozens of community groups around the country spend millions of dollars every year controlling rats, feral cats, hedgehogs, goats, deer, mustelids (stoats, etc) and possums to protect our native forests and our vulnerable birds and reptiles. The Te Kauri-Waikuku Trust has a network of 400 poison bait stations to manage.

I have also been a Trustee of the Miranda Naturalists Trust (MNT) for several years. This Community Trust is New Zealand’s premier shorebird ecology organisation and, the Trust represents New Zealand on the East Asian-Australasian Flyway Partnership – the only community-based member of the 25 current Partners. Trust members regularly visit key countries on the flyway (Australia, Korea, China, US (Alaska) in particular) to maintain checks on bird numbers. A recent ornithological trip to North Korea was a diplomatic first. Miranda Trust members have also been able to advocate for protection of bird estuarine feeding habitat in critical areas of the flyway such as the Yellow Sea region, where massive coastal development is threatening the very survival of the migration route.

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After feeding on the food-rich mudflats of the Thames Estuary all summer, it is March and the godwits are ready for their 11000km journey to the breeding grounds in Alaska. For many of them, their first stop will be the Yellow Sea in China, where they will ‘refuel’ before completing their journey.

*(Picture: Keith Woodley)*

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There are about 20,000 visitors to Miranda each year, over 25% from overseas.

(Photo: Keith Woodley)

Recently, the Miranda Trust promoted its key Southern Hemisphere role in migratory bird studies with the publication of Keith Woodley’s *Godwits: Long-Haul Champions*, which includes the story of ‘E7’, the godwit, fitted with a transmitter at Miranda, which holds the non-stop flight record of 11,700km for its journey from Alaska to New Zealand. Janet Hunt’s *E3 Call Home* is a children’s book describing the godwit story. Recently the MNT has been able to use its international connections to establish environmental education links.

Until the establishment of the New Zealand National Wetland Trust in 1999, this country did not have an independent (non-governmental) organisation dedicated to advocating for the conservation, wise use, and restoration of wetlands. The 13 trustees are drawn from a wide range of professional and voluntary organisations. I have been a Trustee almost since the NWT’s inception. Agriculture is New Zealand’s largest export earner and also the greatest threat to most lowland wetlands, through drainage, nutrient increases. New Zealand also has the highest proportion of exotic wetland and aquatic plants of any country in the world. Much of the trust’s work involves advocating for a better balance between economic and conservation interests.

From its inception in, the Advisory Committee Waikato Region Environment (ACRE) has been the only one of its type in the country. It is an independent voluntary organisation, with 15 elected members and currently representing about 35 community environmental advocacy groups around the Waikato Region. Its purpose is to advise the Regional and District Councils on policy matters of community concern and to act as a forum for ideas regarding resource use and sustainability issues. I was on its establishment committee in 1991 but, since retiring from university employment, have able to devote time to ACRE as a contributing member.

**2010 – 2011**

Junats celebrated their 50th anniversary in March 2011 – from being the first club of their type in the country, to being one of many in the 1970s, and now being the last one still standing. Many of the hundreds of ex-Junats are now in influential environment-related positions throughout New Zealand. Today young people have such a wide range of choice for their out-of-school activities, but Junats and its Trust are doing everything they can to maintain, and to grow, awareness and practical experience of the environment among the students who will be managing the environmental show in the future. So anticipating success, the Club has started to look for funding to do a major upgrade of the 1960s Lodge, built by parents. This year, its sister organisation, Te Kauri Trust, has supplemented its established environmental educational programme for schools visiting Te Kauri Lodge with an alternative package which our educators deliver on the schools own premises. The teaching package is similar to the residential one (i.e. based on natural ecosystems) and is designed to fit within the school curriculum.

Hamilton Junior Naturalist Club members (‘The Junats’) overlooking part of their home forest of Te Kauri (Photo: Mike Safey)
This year the LEOTC residential and off-site programmes have reached over 1500 students and about 30 schools and out contract targets are higher for next year – nearer 2000 students. The Enviroschools Programme too is increasing its coverage, with at least 715 schools in 15 Regions of New Zealand having now registered. The Enviroschool Foundation is now also implementing a Youth and Community Programme, outside schools.

Like other community groups, the Te Kauri-Waikuku Trust is dependent on grants and donations for its pest control programme, but it has just received new funding which will enable it to distribute the cholecalciferol rat bait for another year. Junats members will, as usual, assist with programme monitoring. We also need to check our kauri trees in the forest. Kauri – a huge conifer - is New Zealand’s national tree, but recently a new strain of Phytophthera fungus has started attacking and killing kauris. We measure growth rates and look for resin secretions or epicormic ‘stress’ shoots.

Along with many other community groups engaged in ecosystem restoration, the TKW Trust will be presenting its recent achievements, and concerns, at the annual Sanctuaries New Zealand Workshop, organised by Landcare Research (a Crown Research Organisation). This is a really valuable forum, which enables community groups to share and discuss experiences, and to learn about the latest developments and techniques. Community-based organisations are hugely significant in conservation management in New Zealand.

In February this year, the Miranda Naturalists Trust hosted, at its Shorebird Centre, a visit from 20 South Korean Intermediate school students. South Korea is on the East Asian-Australasian flyway for birds such as the godwit, which breed in Alaska and spend their summers in New Zealand. This was an exciting occasion for us, because our link with the Education Office of Busan (Korea’s second-largest city) developed from five years of migratory bird monitoring in Korea by Miranda Trust members, culminating in the signing of a ‘cooperative education agreement’ in early 2010. Environmental Science does not feature much in South Korean school curricula, but the idea of Korea as a refuelling stop for birds flying halfway around the world was enough to encourage the Busan Education Office to look for schools to participate in a shore study project in Korea with a view to collaboration and exchange with schools in the Miranda area, and with expert instruction on shore and shorebird ecology from Miranda Trust members. After all, the godwit, ‘E7’, holding the world non-stop flight record of 11,700 km, was fitted with its transmitter at Miranda.

Keith Woodley, Manager of the Miranda Shorebird Centre, and I prepared a six-day programme for the visitors, which included two local ‘counterpart’ schools. Everyone considers the visit, and the educational concept, as a success and we hope our local schools will be able to make the return visit sometime soon. We are looking now at ways to develop a website so that our New Zealand schools can link with a website currently being developed in Korea. The problem for us, of course is attracting enough finance to sustain the project, whereas the Koreans already have good funding. There is some funding available for individual schools developing innovative curriculum-based programmes, or establishing cross-cultural links (eg Ministry of Education, Regional Councils, Asia-New Zealand Foundation), but it is difficult for coordinating bodies, such as the Miranda Trust, to source finance for a project such as this. In fact, we are discussing ways in which we can make our shore ecology programme available to schools in other parts of New Zealand, by developing curriculum-based education packages and an upgrade of our Miranda Shorebird Migration Education Kit. We also think the South Korea initiative could be adapted for use in establishing cultural links with schools in other countries too – at least through web links.

The New National Zealand Wetland Trust has launched a major campaign to establish a National Interpretation Centre at a wetland (Lake Rotopiko) in the Waikato Region. The Centre will, of course, be designed for visitor experience and education and will incorporate a number of constructed wetlands representing the range of New Zealand wetland types. Lake Rotopiko is administered by the Department of Conservation and the land on which the Centre will be established is a Waipa District Council Recreation Reserve.
The Trust is grateful to both organisations for their support and cooperation. Securing funding for the Centre is an altogether more problematic issue but, by constructing to a modular design we expect to complete the project within about five years.

The NWT published its Newsletter Wet & Wild four times a year, with news of wetlands around the country. The Trust has a Carbon Committee, looking at ways in which the carbon market might be exploited to assist with wetlands conservation. We are also discussing ways in which incentive-based schemes, such as biodiversity offsets, can be promoted to improve the uptake, quality and sustainability of wetlands conservation initiatives. Our Wetlands Trails website now provides information on visitor access to wetlands in five of the country’s administrative regions, and work on this is proceeding. Preparation is well advanced for our fifth biennial conference on Wetlands Restoration, to be held in Southland in 2012.

ACRE, the Advisory Committee Regional Environment, has devoted much time this year to three specific issues. Apart from making our usual detailed submissions on the Waikato Region Draft Annual Plan, the Draft Regional Policy Statement and several Draft District Plans, we have released our Vision for Agriculture in which we express our concern at the generally poor compliance with voluntary measures designed to improve environmental sustainability in the face of the recent intensification of farming operations (particularly dairying). The debate now is between more, and better, regulatory measures, on the one hand, and more effective incentive schemes, on the other. ACRE favours the latter approach, but with targeted rules as backup.

ACRE is also concerned at recent government ‘fast-tracking’ of intensive coastal fin-fish farming (marine aquaculture), especially in areas with nationally and internationally acknowledged biodiversity values, such as the indigenous fish and migratory bird feeding habitat in the Ramsar-registered Hauraki Gulf. We believe that short-term commercial gains may be being prioritised without due consideration of the long-term nature of ecological processes and responses to change. Thirdly, ACRE is taking issue with the recently released - and poorly drafted - National Policy Statement on Indigenous Biodiversity. The proposed NPS is intended to provide clearer direction to local government authorities on their responsibilities for managing indigenous biodiversity under the Resource Management Act 1991. However, we believe it lacks clarity and has inadequate vision.

Conclusion

New Zealand has all the environmental problems and human ecology issues of much bigger developed countries and, although scales differ, our problems are certainly not always scaled down because of our small size. Thus we have only a small industrial and manufacturing sector, but a very dominant farming sector. We also have a globally unique ecosystem, with over 80% of our indigenous species in many groups being endemic. 50% of our indigenous land and freshwater birds are threatened. We have more introduced species of plants and animals than natives, and many of the exotics are aggressive.

It is with this background that the importance of community groups in New Zealand becomes obvious. There are, for instance, almost 180 community groups concerned in some way with biodiversity registered with the Waikato Biodiversity Forum – and that is only one of 15 main administrative regions in New Zealand. Obviously there is a lot of competition for funding to support conservation and sustainability projects.

Since retiring from the university, I have been operating an environmental consultancy, specialising in the management of wetlands and organic soils. Most of my projects deal with land-use conflicts of one type or another. Often it is drainage versus conservation – short-term economic time scales versus long-term ecological ones. Often it is spatial scaling – a wetland or forest remnant is simply too small to survive unaided. With migratory birds, the ecosystem is global – what happens at one end of the flyway can affect community dynamics at the other end.

Not only are we not going to solve our environmental problems without community participation, but we aren’t going to approach sustainability without education initiatives and knowledge sharing.
so that both habitat conservation and land-use development understand and apply best practice methodologies. Ecosystem services can only be sustained through long-term planning and monitoring the right parameters. It’s not, for instance, how many wetlands we have left, but the quality of what we’ve got left.

Human Ecology as open transdisciplinary inquiry

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London: Earthscan.

What does it mean to be a human ecologist conducting an open transdisciplinary inquiry? Human Ecology in its various forms - as a way of knowing, a form of transdisciplinary inquiry and a university teaching program - has spread from a narrow base in a few universities in 1972 to world-wide programmes in 2011. This article tells how the field of inquiry has developed and gives details of one current Human Ecology Program as presented to students in 2009. While Human Ecology is a disciplined form of inquiry, it is a disciplinary, in that it is inclusive of the disciplines but is not bound by any. In being transdisciplinary it draws eclectically on the disciplines as well as other ways of knowing. The findings are unified through a systems approach.

Introduction

Human Ecology is about the interrelationships between humans, their cultures and their ecosystems. Human Ecology takes a holistic approach to these interrelated parts, meaning that it seeks to understand them as parts of a single, complex interacting system. Human Ecology is concerned with the processes that limit and change this system over time, including whether or not current arrangements are sustainable. Human Ecology is also concerned with the social dimensions of current or proposed alternative arrangements, asking is it fair? is it just? is it ethical? These ethical questions extend at least to other humans, including, arguably, future generations. Some would extend them to other species.

Because Human Ecology does not just describe the state of the systems it examines but is also fundamentally concerned with questions about ecological sustainability and social justice, it has a normative aspect that distinguishes it from other branches of science. That is, Human Ecology is concerned with change that improves the situations it investigates, assessing proposed “solutions” and alternatives against the same ethical and ecological criteria by which the current situation was criticized. Improvement of what? by what means? in whose interest? are all important questions for Human Ecology. As solutions will involve cultural change as well as material or technological change, there are important questions around community acceptance of such change. There are also questions about what right one person has to propose, let alone force, them on another. These are all unavoidable dilemmas with which Human Ecology grapples.

Ultimately Human Ecology is motivated by care and concern for the future. It seeks to imagine what it might be to live and do
well in a humane, sustainable and worthwhile world and to invite and stimulate broader community commitment to work towards realizing those futures. Consequent to the above attributes of human ecology and the nature of the phenomena with which it deals, it is necessarily transdisciplinary. This is not to deny the vital contribution that disciplinary, or indeed any specialist knowledge, can and does make to improve our understanding of the world, and thus help in problem-solving. Rather, it reminds us that the classes of entities and processes with which different disciplines identify themselves are not given “things in the world”. They are the product of human thinking and reasoning. Failure to recognise this partiality can, at times, be problematic:

In our view, the persistence of so many of the problems facing human kind in the modern world is to a large extent due to the excessive compartmentalization, fragmentation and specialism which are so characteristic of education, research and government today. There is an urgent need for more intellectual effort aimed at improving knowledge and understanding of the patterns of interplay between different cultural and natural processes in human situations, and of the principles relevant to this interplay. We use the word ‘comprehensive’ to describe work which has this objective).

Metaphorically then, if disciplinary and other specialised knowledge are like bright torches probing around in a dark cave, then Human Ecology tries to provide the overall outline map of the extent and general features of the cave itself.

Research, teaching and learning and outreach to community and decision-makers within human ecology should embrace the key principles of critical deliberation outlined by Russell. This article outlines key methods used by the Human Ecology program at the Australian National University to achieve this goal, but begins with brief on the origins and scope of Human Ecology internationally.

**International approaches to Human Ecology**

Human Ecology stems from a fusion of biological and social sciences in the early twentieth century. It has evolved from a mono-disciplinary approach under the contested “ownership” of pre-existing domains, such as sociology, geography and ethnology, through a multi-disciplinary phase as a “home” for different disciplines, sharing but not blending their knowledge, to its current manifestation as an inter-disciplinary or even “a disciplinary” subject.

The intellectual community engaging in Human Ecology has a broad range of approaches within a diversity of academic structures, each with their own histories yet motivated by common concerns for the nature of human-environment inter-relations. Programs in Human Ecology can be found across the world including within Japan, Australia, Sweden and North and South Americas. These programs group within various societies for Human Ecology, including German, Nordic, American, Japanese and the Commonwealth, and North American Society for Human Ecology.

The interdisciplinary nature of Human Ecology has not always sat happily within the institutional structures of academia. Discussing the Human Ecology program at the Australian National University (ANU), one thing the Faculties could agree on was that “if a course was Science it could not be Arts and vice versa”. However, the legitimacy of a boundary crossing approach like Human Ecology is much more accepted now than it once was. For example, the prestigious Ecological Society of America recently founded a Human Ecology Section whose mission statement page reads:

*The Human Ecology Section of the Ecological Society of America is a forum for presenting, discussing and applying the ideas, methods and results of human ecology and other disciplines that examine human-environment interactions towards the advancement of ecological science and education.*

(Human Ecology website, no date)

Human Ecology is also represented in a range of avowedly interdisciplinary networks and research programs for sustainability, including the International Conference on Sustainability Science (ICSS), the International Alliance of Research Universities (IARU) and Integrated Research System for Sustainability Science (IR3S). The ICSS aims specifically to serve as a “network of networks”, as so many collaborative partnerships in the field of “sustainability” now exist. However, all
these initiatives are within strictly academic knowledge domains. Moves to extend knowledge beyond academia are underway. It remains imperative that despite (or perhaps even, because of) this surge of interest in the sustainability of human-ecological interactions, Human Ecology continues to develop the future agenda in this field. One of the exciting opportunities that Web 2 (and more) technologies offer is the prospect of creating virtual forums online for human ecologists worldwide to meet and exchange views and help drive the dialogue on the next “New new thing”, in Human Ecology. Student exchanges using wikis have been trialled between students at ANU, the College of Atlantic, Maine and the University of West Washington, with interesting learning outcomes for those involved. ANU has successfully shared online course content with students in Singapore via Facebook. The Human Ecology Section of the Ecological Society of America uses Google Groups to develop coherent symposium presentation proposals that could not be (or could only laboriously be) created by other means. As Borden wrote:

*From the outset, the complexity of human ecology’s interdisciplinary and international mandate was hampered by the limits of communication. The tools - so necessary for collegiality at a distance - perhaps are at last to hand. The challenge now is to keep up with these opportunities, to infuse them into education, and to prepare the next generation of young men and women to discover what it might be to live and do well in a humane, sustainable and worthwhile world.*

**Critical deliberation**

The kinds of transdisciplinary conceptual frameworks used in human ecology programmes require open critical deliberation on the “relationships between evidence, research process and reasoning, and includes the socio-cultural context of our work”. Such frameworks need to recognise the constraints of an open ontology, an open epistemology and an open ethics.

Ontology is the study of the nature of that which exists, so it is important to emphasise that the term “open ontology” is not suggesting that what exists is different for different individuals, and certainly not that things are brought into or out of existence by the puny powers of the human mind. Rather, that in a universe in which everything connects at some scale to everything else, it is impossible that anyone could comprehend, let alone know, the whole. As no greater authority than the Hitchhiker’s Guide to the Galaxy reminds us: “Space, is big. Really big. You just won’t believe how vastly hugely mindbogglingly big it is. I mean you may think it’s a long way down the road to the chemist, but that’s just peanuts to space”.11

As the set of entities any individual or group are concerned with will always necessarily be a sub-set of the total set of entities, then what is open, and can differ from individual to individual, is what is or should be included as relevant objects of concern. Hence, the approach followed here is that of a realist ontology, yet one which critically examines what sub-set of real entities, processes and relational constraints is considered relevant in any given situation.

Epistemology is about the nature of knowledge, the scope of what can be known and about the verifiability of any claim to know something. Human Ecology would hold that there are good grounds to believe that the sense gathering and processing architecture that humans have evolved and share in common with each other provides them with a fairly reliable mental model of the world, at least as it operates at the approximate scale of the human being. What is also undeniable is that there is a gap between our mental model of the world and reality itself that is unbridgeable, since we cannot occupy some neutral ground and compare and assess the match between the two. What we think we know is provisional and subject to change, and is in this sense necessarily open. To that extent, Human Ecology would align itself towards a fallible empiricism.

More relevant to this discussion is that we all operate with “traditions of understanding”; those sets of mental models that we adopt and carry around with us as a ready heuristic for making sense of situations. They allow us to pre-judge what to do or think in a given situation, and it would be impossible for us to function if we had to create novel mental models for every new situation that we encountered. However, pre-judging and
prejudice are definitionally related and it is the negative connotations of the latter term that we need to be wary of, especially when it lead us into “traps”, or “ways of thinking” that are inappropriate for the context or issue being explored\textsuperscript{13}. These traditions of understanding, and the body of accumulated knowledge that individuals and groups bring to situations, are relative to each and as such Human Ecology ascribes to a relative epistemology. It does not hold however that these epistemologies are incommensurable, but does recognise that there is a significant - and often overlooked - methodological challenge in blending knowledge from different sources to produce coherent new knowledge that differs from the sum of its parts\textsuperscript{14}.

Finally, Human Ecology embraces an open ethic. It is well established that the – ‘wicked problems’ that characterise complex social-environmental issues necessarily require collective effort in their resolution. They inevitably bring into conflict the different values and interests embedded in the varied traditions of understandings held by stakeholders. Conflict is an inevitable part of collective change and not a reason to give up, and certainly not to be swept under the carpet\textsuperscript{15}. Instead we need transparent communication and negotiation leading to mutual understanding and collaboration.

At times we need to bring our sense of normality into conflict. “Notions of what it is to be a normal and acceptable member of society have far reaching environmental implications”\textsuperscript{16}. Bringing different values, worldviews and traditions of understanding into conflict can help surface these assumptions and open them for questioning and critique.

Human Ecology takes seriously the need to recognise and reflect on the power dimension of all decision making and action. Transdisciplinary inquiry must recognise the key principles of complexity, realism, partiality, pluralism, provisionally, ethical and critical. This will now be illustrated by the examples of the methods employed by the Human Ecology program to act in accordance with these principles.

Principles into action

One key method relies on the transformational power of personal experience, such as field trips. Because we all are always and inextricably embedded in ecosystems that we both affect and are constrained by, it is not necessary to take students on field trips in order to immerse them in the environment, since they are always so immersed. However, field trips can provide an exemplar experience of the wicked problems that inevitably characterize contested socio-environmental issues. The inspiration that students gain from field experience lasts them throughout their lives.

Imagine, if you will, a student of the ANU Human Ecology program standing on the walls of Eucumbene Dam at the close of a three-day field trip through the Snowy Mountains of South Eastern Australia. Since leaving Canberra the student has seen empty riverbeds spanned by huge, redundant bridges - the water that once flowed under them long since diverted to massive irrigation projects far away to the west. They have been spoken to by an Indigenous representative of the people who cared for the high country region, who told them of their customary laws and the behaviour that it codified. Ecologists, park rangers, river-restoration activists, land managers and hydro-power station operators have all expressed their opinions. They have been told that good is being done by harnessing water that would otherwise be ‘wasted’ and seeding clouds that would otherwise be ‘inefficient’. The same activity they have been told is ‘stealing’ a resource that belongs to another community, or perhaps to ‘nature’ itself. They have walked through fire scarred landscapes, and up to the highest landscape in the continent and looked out over the escarpment and into Victoria, where there is a pall of smoke from control burning. This practice is
argued by some as being crucial to reducing the risk of calamitous fire in this landscape - by others as promoting the growth of the fine vegetation that fuels it. For some, this will have been their first trip into an extensive wilderness area, and they will be unable to resist texting friends to tell them where they are. They have lunched at huts built by cattlemen who are now excluded from the park on the grounds that their behaviour was environmentally destructive, yet the 'Man from Snowy River' remains a celebrated Australian cultural icon.

From the alpine areas they have followed the contours of the landscape that channels snowmelt down hill, encountering initially small but then ever larger concrete structures. These human artefacts gradually gather and divert water into pipes, to eventually disappear down the penstocks feeding into the back of power stations, and thence into impoundments that can hold 4,500 thousand million litres, equivalent to two years total average precipitation. For some of the students this is, as is often proclaimed, one of the great “engineering wonders of the world”. For others it is an out-dated 1950’s folly that desecrates a fragile and sacred environment. Whichever opinion the individual holds, one of its outputs is the food that sustains them and a not inconsiderable economic contribution to the lifestyle that they enjoy.

Standing beside the impounded waters they are expected to forge some understanding from this complicated range of experiences. What is it that they are expected to understand and how might they go about it? The transdisciplinary approach, outlined in this book provides guiding principles for conducting and evaluating open transdisciplinary inquiry within a generic framework that allows such rich experiences - and wealth of data - to be turned into understandings of why we do what we do and what are some of the consequences.

**The ethical imperative for critical deliberation**

That the mountains are real is not in dispute. No amount of wishing will change the fact that snow really does make canvas shoes get wet. What is emphasised is that in such circumstances it is not the “environment” that has a problem; it is the person who walked in snow in canvas shoes and is now experiencing the cold and uncomfortable wetness of their shoes that has a problem. The snow remains snow, with all the attributes of frozen water, and their more adequately shod colleagues will have no problematic relationship with it.

What the students are being encouraged to recognise is that different “interests, values and contexts of our inquiry shape the nature and processes of our inquiry”. This is done by introducing them to some of the different individuals and groups who hold varied interests with associated values. Among are some Snowy Mountain graziers whose:

*Values were those of a settler society. They believed that Australia’s economic and social progress required the exploitation of its natural resources, in particular the land. They believed also that the producers of the basic necessities of life, food, clothing and shelter, served their country well and deserved the respect of their fellow citizen*.

Other grazier values, both spoken and represented in imagery and recorded narratives, include a strong belief that this was a landscape that they were strongly and emotionally engaged with and which needed their intervention to be protected from its vulnerability to fire. These values are not wrong but are incompatible with other values, such as the belief that more good would be done by diverting the snow melt to irrigate landscapes, including pastures, away to the west, thereby bringing the water to the cattle rather than the cattle to the water.

A coalition of interests uniting irrigators, advocates of hydro power, soil conservationists and those pushing for a “nature reserve” overwhelmed the interests of the graziers, who were removed from the
park. Whether this was the right thing to do was a judgement call at the time with a cascade of real consequences apparent at the present day. The students experience the landscape that resulted from this choice, for good or ill. Information centres and speakers express the values of the victor, since that is how the history of the area unfolded. Likewise landscape and resource managers describe how they maintain conditions and processes that exist largely because of their institution’s continued intervention. “Facts”, such as whether fewer fires are experienced when cattle are present or absent, or whether the rate of soil loss into catchments can be associated with different management practices, can inform this judgement but quite properly not determine it.

The approach taken in Human Ecology is not antithetical to what often is termed a reductionist approach, for it requires this detailed sub-set of knowledge absolutely. However, it also shows how this detailed knowledge “fits” and how it contributes to an understanding of the whole. The approach emphasises that understanding the behaviour of the whole differs from any understanding that could be gained from the mere combination of the individual specialist perspectives. Applying these methods of thought to the Snowy Mountains example helps to generate skill sets that can be applied to any situation in which knowledge integration, or blending, is demanded. This includes problem situations that the students will encounter in the future.

The inevitability of knowledge being partial and provisional

One way of making sense of this is encouraging thinking about the situation as if it were a system, where system is understood to be “system of interest” to someone or some group. This specifically encourages recognition that what different people find “interesting” and what systems they identify differ from one group to another. This approach helps to clarify the source of disagreement between individuals or groups. By clearly identifying what relevant “parts” or variables each has selected, these points of disagreement can be recognised. This makes it possible to see, in people’s different system structures, sources of both differences and potential agreement.

This gives a means of finding linkages that create new systems of behaviour acceptable to all. Such a happy outcome will not always be possible, but at least, greater mutual comprehension can be achieved. This would be of value for all policy makers or administrators who are looking to intervene in a problem situation.

By examining how some particular indicator of change, such as variation in water levels in the reservoirs over time, students using the systems approach can generate some very powerful explanations of the kinds of behaviour being observed. The descriptions that they give of the characteristic behaviour of the system capture some important changes that the real situation is exhibiting. These simple yet generic descriptors of change processes are powerful, whilst also being fully compatible with the more finely scaled, detail or specialist understandings that can be gained at different levels of thinking.

Conclusion

The approach described here clearly does not rely on a perfect understanding as some kind of prerequisite for intervention. On the contrary, the Snowy Mountains example gives an impression of the massive complexity of these wicked problem situations in which intervention is required despite the impossibility of perfect understanding. Yet these problems can be tackled by the systematic application of critical inquiry through the framework developed here.

Through this method we can outline our understanding of what we think are the
most important processes and variables that are operating to cause some particular change, but then continually monitor to see how our conceptual model fits with the unfolding reality. We can build in more variables, or change the relationships between the variables we have, as our understanding increases. We are then required to make judgements about the value or desirability of the processes we come to understand, recognising our judgement may well conflict with that of other actors. But we never need aspire to model the situation in its entirety. That would require a model as complex and detailed as the thing being modelled, and could not remove the value-laden ethics of any intervention. Wicked problems, like the example given here, are inevitably partial, plural and provisional and ethical.

In summary, the “Snowy Mountains story” can be seen as a dynamically changing system(s), whose characteristic behaviour is caused by the interactions between its component parts. Principle interactions are feedbacks between social processes, which are cultural in origin, with ecological processes, which are biophysical. Like all stories, that of the Snowy Mountains is a selective re-presentation of facts, and its central moral depends in part upon the listener’s own interpretation and values. Endeavouring to understand the inter-relationships between human behaviour and ecosystem processes inevitably requires integrating scientific, social, and other knowledge. Equally inevitably, the resultant mental model that each generates will be partial.

Wittingly or not, the everyday demands that we all place on landscapes strongly influence how they change over time, and the capacity they have to meet other demands, including other and future human wants. But as a real, finite entity the waters of the landscape and the Snowy River cannot be in two places at once, irrespective of human wishes that it could be. Where mental models of how reality is are insufficient approximations then it is the human who is going to be disappointed.

The purpose of the field trip is to experience a complex situation that is dynamically changing as a result of many influences, both biophysical and socio-cultural, acting across many different spatial and temporal scales. Human Ecology seeks to find powerful conceptual frameworks that can help us understand these kinds of situations. This requires integrating scientific, social, and other knowledge. The everyday demands that we all place on landscapes such as these strongly influence how they change over time, and this ties our endeavour to understand the effects of our behaviour on these ecosystems directly to discussions of “sustainability”.

Photos thanks to Fenner School of Environment and Society, ANU

1 (Human Ecology course material, Australian National University handbooks, 2050-2009)
7 Ecological Society of America (no date) Homepage for the Human Ecology Section of the Ecological Society of America: http://www.esa.org/humanecology/ (accessed 10 September 2009)
Quo vadis human ecology? An analysis of its basic characteristics

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Introduction

Human Ecology has its scientific roots in the 1920s with the work of Park and Burgess at the University of Chicago. They were the first to describe a city as an interactive system of socio-cultural elements. The approach of these American sociologists mimicked the way biological ecologists described dune or lake ecosystems as reciprocal interactions of organisms with their biotic and abiotic environment.

In Europe the attention for human ecology was renewed in the early 1970s as a result of the search for interdisciplinarity. The socio-economic and cultural complexity of resource use and pollution problems cannot be solved on a simple disciplinary basis. A broad, interdisciplinary approach is required.

Up to the present-day, these vague philosophical considerations are the only glue holding together the worldwide educational and research initiatives that identify themselves as “human ecology”. There is no agreed definition of human ecology despite many suggestions.

The International Centre for Human Ecology – Centre International d'Ecologie Humaine (CIEH) sees human ecology either as the beginning of a scientific discipline, or as a reflection on science and the social conceptual framework, or as a way to study society. Human ecology, starting from different basic trainings, makes a methodological step forwards possible in the study of the bio-cultural dynamics of
ecosystems. By studying the dynamic equilibria in the ecosystems in which humans are involved, this scientific and integrated approach makes it possible to remove barriers that hamper the extension of the present knowledge” (Hens et al., 2003). CIEH emphasises the interdisciplinary nature of human ecology, its methodology, and its integrating and global vision.

This article begins with the question “why do we need multi-, inter-, or transdisciplinary approaches?” and examines the concepts, subject areas, methods and applications that make up research in human ecology today.

Drivers of human ecology.

Interrelated and incommensurable dimensions

In dealing with environmental problems in which humans are involved we need multi-, inter- or transdisciplinary approaches to deal with the interrelatedness of issues, incommensurability of scientific approaches, the variety of scales and values, and the diversity of actors in human ecological processes.

Interrelatedness refers to the situation that human ecological problems are often not a single problem, but represent merely a web of problems at the nodes and multiple relations along the axes. Therefore simple technical solutions usually do not apply to human ecological problems. It is important in human ecology to accurately describe the scope of the problem and the borders of the system that is studied.

Inaccurate or negligent description of the system borders might lead to diverging conclusions. Life cycle analysis provides an example. Depending on whether waste management policies and societal needs are included or excluded from the analysis, polyvinyl chloride (PVC) is either an unsuitable or a highly desirable material for one way packaging of a commodity such as plain water.

Incommensurability (or incompatibility) refers to the fact that different scientific disciplines take different views of an environmental problem. Such differing views often relate to fundamental differences. Timeframes in ecology range from the very short (e.g. in noise problems) to trans-generational (e.g. regarding nuclear waste). In economics, time frames are

Dimensions are an important source of incommensurability. While most scientific disciplines aim at reducing dimensions in their search for fundamental units to which universal laws apply, human ecology deals with dimensions ranging from the local to the global. For example, land use changes (LUC) from the local unit of production up to the global scale are driven by different socio-economical and biophysical forces (Fig. 1).

Human ecology time scales range from the immediate to the trans-generational. These time and scales results human ecology approaches being often
characterised by more scientific uncertainty than those in predictive science (Fig. 2)

Fig 2: Longer time perspectives and wider geographical scales are linked with uncertainty

One of the many consequences of dealing with uncertainty that often the Cartesian, hierarchical “if, then” type of reasoning, characteristic of mathematics and Boolean logic, does not apply. Instead, uncertainty provokes situations where different options are open, using a more complex and more probabilistic type of “if, then, but maybe also, unless this” of logic (Figure 3). This type of logic is also called neural reasoning, using the web of connections described earlier.

Fig 3 Hierarchical and heterarchical type of reasoning

Multi-, inter-, and trans-disciplinarity

The genesis of a new scientific discipline often characterised by a transition from multi-, to inter-, and then to trans-disciplinarity applies to human ecology.

Multi-disciplinarity means that any comprehensive analysis in human ecology requires insights from several scientific disciplines. A human ecologist aims at combining information that stems from both α- and β-sciences as well as from applied sciences as engineering and medicine (Figure 4.)

The contributions of ecology and anthropology are significant. Ecology, because human ecology stems from the conviction that it is interesting to apply the used to study (semi-) natural ecosystems to study ecosystems dominated by humans. Anthropology because of the attention it pays to interrelations between humans and their environment3.

However, Figure 4 is incomplete. It does not mention history, which is critical for understanding many contemporary debates, such as that over nuclear energy. It also underestimates the contribution of the applied sciences such as environmental health and sanitary engineering.

The limitations of multidisciplinary approaches can be counteracted by interdisciplinary approaches that are interconnected and integrated. They emphasise the feedbacks between different fields involved and the connections and bonds between the multidisciplinary components of a system under investigation. Interdisciplinarity is characterised by synthesis.

Most approaches in human ecology are characterised by interdisciplinarity. A human ecological approach to biodiversity will look beyond the biological causes of biodiversity loss. It will link proximate causes as habitat loss, reduction of the genetical patrimony or pollution with more remote causes including demography, economics and politics4.

After interdisciplinarity, the next step is trans-disciplinarity which uses new concepts, methods and results not present in the stem disciplines. It is closely associated with understanding of problems.

The signs of trans-disciplinarity in human ecology include aspects of time and geographical scope, of dealing with uncertainty, of stakeholder involvement and of value plurality. Yet human ecology does not yet offer the beginning of a new scientific discipline. Its signs of trans-disciplinarity point to this potential, rather than to its current status.
Stakeholders and indigenous knowledge
People who know their local environment often see threats to their environment clearly even in complex situations. They understand the noise likely to be caused by an airport extension and where it is appropriate to provide green spaces in their urban surroundings. They should be regarded as experts of their own environment. Clearly, their expertise differs from and complements that of a specialised environmental consultant or academic researchers and should be brought into human ecological discussions.

The indigenous knowledge, including taboos and totems related to ethnobiology that has been built up for generations in traditional societies is highly relevant to human ecology. Modernisation processes in traditional societies threaten this
knowledge that is extremely useful when matched with scientific knowledge in such fields as nature conservation and fisheries management.  

Value plurality

The importance of ethics in human ecology is illustrated by a definition used by the University of Gothenburg (Sweden): “The study of human ecology is based on the principles of deep respect for human liberty and dignity and for nature of which man is part”. Many key issues in human ecology necessitate ethical reflections. Biotechnology illustrates the role of ethical and philosophical issues. From the outset, the human genome project from the beginning devoted substantial financing to research on privacy, discrimination and other ethical issues raised by progress in genetics. However, such questions are relatively new for environmental scientists and engineers. Many global scale environmental and health problems emerge from the widespread use of frequently poorly-regulated numerous man-made chemicals whose off-site, downstream effects or neighbouring ecosystems are poorly understood. Such environmental issues require more profound and fundamental ethical reflection and impact research. Geo-engineering to cope with climate offers several feasible solutions, but their planet-altering potential may not emerge until irreversible processes have started. Any human ecological analysis of these options should strongly advocate ethical research on these issues.

Key driving concepts in human ecology are multi-, inter-, and trans-disciplinarity; studies of phenomena on large scales and over long periods of time, and the scientific uncertainty that is inherently linked with these studies; and the ethical issues that are associated with the human ecological analysis. Human ecologists use concepts used to analyse quasi-natural ecosystems to understand human ecosystems employing concepts such as adaptation, competition or niche used in an urban or agricultural context are examples of this. They same applies to concepts (as nature-nurture or nature-culture) that deeply root in social anthropology.

Fundamental interdisciplinary concepts used by human ecologists include sustainable development as it refers to the integration of environmental, social and economic aspects; quality of life in the way it combines dimensions of health with social and house economy issues. Applied concepts involved include environmental impact assessment, life cycle analysis and environmental management which all rest upon systems analysis and thinking.

Multi-disciplinarity

All scientific disciplines one way or another have an environmental component and consequently are linked to human ecology. Links with newer scientific fields such as tourism or mobility sciences which not only have an environmental component, but are also interdisciplinary demonstrate a relationship that content, methods and the search for a scientific identity.

Methods

Human ecologists use general scientific research methods such as literature searches and paradigm development. However, for specific projects they select the appropriate techniques from a wide field of methods from the basic sciences, applied sciences and humanities. Human ecologists have a particular affinity for methods permitting the handling of varied data sets and qualitative information. They use both geographic information systems (GIS) that allow spatial representation of data and statistical treatment and data mining, a method helps to structure data that may at first appear to have no order.

Applications

Human ecology should contribute to the fundamental understanding of complex problems in the interaction between humans, their societies and their environment. However, its re-emergence in Europe after 1960 arose partly because scientists realised that the prevailing answers to problems of declining resources or changing consumption and production patterns, were largely inadequate. More integrated, interdisciplinary and wider ranging answers were sought. WHO’s European “Healthy cities” programme set up in the early 1970s referred much more than the absence of disease, defining a healthy city as one with good environmental quality, management and policy, and a sound social network. WHO Europe found university support for its programme
among human ecologists and endorses the programmes of the International Centre of Human Ecology (CIEH). Much of the academic output of University human ecologists is concerned with applied problems, particularly environmental policy, management and planning.

Discussion
This article has endeavoured to answer two questions:

- What are the problems and the needs that drive contemporary human ecology?
- How can we build on a heritage of at least 40 years of research in contemporary human ecology?

The newer problems in human ecology, relating to climate changes, biodiversity, urbanisation and environmental-social health, are characterised by long time and space scales, and consequently, significant uncertainty. Scientific risk and uncertainty analysis provides inadequate answers. Involving stakeholders, and developing a sound ethical framework, such as that used in human genetics and bio-medical sciences, is a way forward.

Human ecology research covers a wide array of topics, handles a combination of concepts targeted towards integration, derives its methodological authenticity from the mix of methods developed by other scientific disciplines, and is more targeted to policy related applications than towards fundamental understanding. Since 1970, human ecology has contributed to new, interdisciplinary developments, such as sustainable development. This involves new concepts, policy principles, or actions targeted to issues that were difficult or even impossible to address before. The mobility sciences, tourism, or gender research are examples of the themes with which human ecology is actively engaged. Other emerging themes include the carbon footprint and biodiversity, especially in urban areas.

The image of human ecology set out here is not brand new. It builds on its well known characteristics of interdisciplinarity and complexity that have been described before. However, it adds essential elements that stem from practical training and research in human ecology and which complement the theoretical discussions. What emerges is a human ecology that today is well equipped to deal with contemporary issues involving humans and their environment and that provides an analytical framework complementary to other scientific approaches.

Why we need human ecologists: a personal view

Eva Ekehorn
Trustee, Commonwealth Human Ecology Council
Past-President, Society for Human Ecology

Human activities in the world have changed enormously over the last million years; from nomadic groups to settled farmers; from craftsmanship to industrialisation, with intensive farming and deep sea fishing. The way we live on the land and the knowledge we have about our planet interact and help us build a view of the world and our place in it. We need this worldview to understand and interpret our relationship with our environment.

Those changes in our means of livelihoods have taken many small steps and fewer, but significant, gigantic leaps. In modern times, science and inventions have led to major rapid changes. Aircraft carry us around the world in hours, when boats took days or weeks. Power stations generate electricity that keeps the lights on all night. The combined harvester cuts wheat quicker and more efficiently than a horse and cutter.

However, changes also occur through the many small steps we as individuals take. The small steps can be very innocent. A little warmer indoors in the winter – nice to do without the woollies; taking the car to the shopping centre instead of the bus – much more comfortable and easier; an extra weekend trip by air to a nice city - it is so cheap so it is nearly free, isn’t it?

Well, no, it isn’t really free. Those extra few kilowatts multiplied by the billions of people living on Earth are making a big impact on nature. Both the big leaps and our individual small steps have taken us close to limits of what is possible without irreversible damage to the planet. Climate change, depletion of resources and destruction of ecosystems are becoming major problems. Food, water and energy are needed for an increasing population. Competition for scarce resources will lead to serious conflicts. There is talk about Anthropocene¹, an era where man has altered the planet to such an extent to mark it out from other geological eras. But our modern industrialised worldview doesn’t take nature into account. Judging from the views from some decision makers, the key word in their worldview is ‘growth’. Nature is there to be used and the depletion of it is not included in the calculation of GDP, the Gross National Product.

However, ‘nature’ and ‘natural resource’ is not the same thing. It is only when humans - that are we ourselves - look at nature and say, hey, there is something we can use in our society that ‘nature’ becomes ‘natural resources’. Natural resource use is set within a framework of a society - with its cultural, social and economic history and current organisation – and in the frame of the society’s worldview. Uranium was not a natural resource until we found out that it could be turned into energy (via the route of weapons). Some plants have ceased to be a natural resource in many societies as we do not know how to turn them into food or medicine any longer. Natural ecosystems also provide us with services and with such necessities as clean air and water. They help to breakdown our waste and offer us beauty and contemplation for our souls. Surely, nature must be included in our worldview?

Can a human ecological training help?
A human ecologist (HE²) is trained to understand many disciplines and thus a HE can help interpret among scientists and

²Human Ecologists
also between scientists, politicians and the general public. A HE ought to be good to speak the language of scientists and translate it so others can understand. A HE should learn that many concepts are used differently within different disciplines, and can help untangle misunderstandings. A HE is told to set things into wider context and look at consequences, both in the social and cultural world as well as in the natural environment. The aim for a HE is to understand the ‘whole’ in all its complexity. Thus a HE could be useful in helping people to develop a worldview which includes the total environment: natural, cultural and social.

My own entry into the HE field was through Gothenburg University in Sweden. I was lucky enough to join a course in human ecology in 1977. With a background in mathematics and work as a computer programmer for a company making steam turbines, followed by bringing up my own children and others’, it was a challenge to go back to university as a mature student. However, I was soon hooked.

Courses in human ecology began in early 1970s in Gothenburg. A very benevolent Vice Chancellor, Prof. Georg Lundgren, saw inter-disciplinary studies as a challenge to create a special profile for his university. A first approach was a doctoral course open to all graduate students called ‘A humanistic and science based worldview’. The course attracted a tremendous interest among both lectures and students and became one of the most popular courses in the university’s history. The course presented the science based theories about the creation of the solar system including the Earth itself, but also the philosophical implication of this creation and with its relationship with humans.

After the course was finished, there was a surge of interest in doing more, even at undergraduate level. And so, a group of professors, teachers and researchers from such various disciplines as biology, sociology, theoretical physics, history and Latin came together and set up courses in human ecology, with the blessing of the Vice Chancellor.

As Dyball says, an interdisciplinary approach to these ‘world-problems’ was not always welcomed within the universities. The competition for funds, prestige, and students are well known in academia. Human ecology in Gothenburg started out in the science faculty, later to be moved around first to the social sciences and later to the humanities, and is now under the umbrella of School of Global Studies, together with studies in subjects such as Human Rights and Peace & Development.

I joined a special programme which included both theoretical studies and practical work; in our case to build a biogas plant for a farmer, Mr Nils Liljerup, owner of a farm with some 75 cattle. Nils had read that in China biogas generation was a normal way to derive energy from manure, and why shouldn’t a Swedish farmer being able to do so too?

The work didn’t only entail building the plant from scratch; we also learned in why energy matters: the 1st and 2nd laws of thermodynamics says energy cannot be destroyed or created, and that it is the quality of energy that deteriorates when we use it. This knowledge about energy came in very handy a couple of years later, when Sweden held a referendum on nuclear power in the wake of the Three Mile Island nuclear power accident. I had then joined the very new PhD programme in human ecology in Gothenburg and was teaching too. I become very active in campaigning for a No to continued use of nuclear power in Sweden.

The referendum was first seen as complex waffle that was a far too difficult for the general public to understand. However, a choice of energy sources is not only about difficult technical issues; it is also about the way we use energy and for what. It affects our daily lives, as well as our actions affect the use of energy.

The referendum turned out not only to be about information, but also became a stimulus for education. There were many debates in schools, in universities, in the workplace and town halls; in the papers and so forth. The good thing then about being a human ecologist in this exchange of ideas and opinions, was that you could widen the debate from just talking about different sources of energy into the consequences of using them and their associated impact on the natural environment; in extraction and processing to the treatment of waste – in emission from fossil fuels, in safe storage of nuclear waste, to the consequences of dam building and
the effects on the landscape by wind power. When people said that alternatives had no chance of being adopted, you could give them your well manured hand and let them smell the success of one farmer, Nils, to provide his farm with a sustainable source of energy, by sheer stamina and willingness to try.

In short: it was a process where we could discuss our different worldviews, their bearing on how we saw the world and the ethics of our behaviour towards others and the natural environment.

Unfortunately the referendum run out of steam when a third alternative came up to the ‘Yes’ or ‘No’ choice, namely a ‘No, but first we say Yes’, which meant that we should first build all the eight plants that had been planned, and then shut them down at a date in the future. Maybe they thought as Saint Augustine: “Lord, make me chaste, but not yet.” This alternative ‘won’ the referendum, and thus Sweden’s nuclear power is still both there and is being shut down.

In a human ecology worldview nature is taken into account. It is a help for understanding how your own small steps of change affects the environment, both the social, cultural and the natural environment. You can understand that that extra degree of warmth in your living room has an impact. Government and decision makers do have the possibility to issue laws and restrictions for what we can do, but we, ourselves, are not simply too small be noticed, but we can make a difference, especially if all of us do it.

Personally, I feel my education in human ecology has made me understand more of the complexity of the world. It makes me more curious about the things I don’t know, but it also makes me more humble about how much there is to learn. It doesn’t always make me happier – on the contrary, it sometimes makes me depressed about the slow progress among part of the general public, as well as politicians and those in power, to adapt to new circumstances. Maybe ignorance is bliss? But is also makes me work harder on the small steps I can take, because I think we must change, and a human ecological worldview is there to guide me.

1 See e.g., The Economist 26 May 2011
2 To use the acronym HE should not be seen as discrimination against women. The Society for Human Ecology is shortened SHE, its journal is call HER.
3 See Robert Dyball’s article in this Journal

Tourism Development in Nigeria and Its Impacts on Poverty Reduction: A Case Study of Selected Tourism Hot Spots.

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Eco-tourism is a niche market that, if carefully addressed, has a great potential in terms of both profitability and long-term impact for the environment and the livelihoods of the poor.

Introduction

Tourism plays an increasingly important role in the world economy. For developing countries, the significance of tourism, in terms of flows of tourists, receipts and expenditures, reached a new high at the beginning of the 1990s. In many African
countries, tourism has been seen as a significant economic force and a means of broadening the foreign exchange base to alleviate the prevailing harsh human conditions. Additionally, the industry is seen as a means of reducing the serious balance of payment problems that have stifled economic growth in many developing countries. Foreign tourists represent an alternative source of foreign exchange earnings and diversification for the single crop economies typical of many African countries.

Tourism has many forms, including include ecological tourism, sport and extreme tourism, fishing and hunting tourism, mountain skiing tourism, sea and river cruising tourism, event and gastronomic tourism, excursion tours (cultural and cognitive), health recreation tours, children and youth tourism, individual tourism and business tourism.

Tourism provides jobs, income and investment opportunities. It acts as a catalyst for the development of other sectors and helps the leisure industry to grow. However it also has some negative impacts, including crime, cultural and environmental degradation, and other social ills, which may render the industry unsustainable. Initially in the 1980s, tourism appeared highly promising, with the Nigerian government seeing it as a possible major component of its economic development strategy.

The fourth largest foreign exchange earner after oil, cocoa and rubber, tourism varies significantly in nature, size, scale, scope, economic impacts, benefits, and environmental and cultural impacts across the country. As around 85% of Nigeria’s tourist attractions and activity are located in rural and depressed urban communities, this article assumes tourist industry development and promotion have significant and positive socio-economic impacts that justify infrastructure development in the area concerned. By providing rural economic development opportunities it offers a viable alternative to migration to urban areas.

Hunger is a symptom of poverty. Poverty is an unacceptable form of human deprivation in terms of economic opportunity, education, health and nutrition, lack of empowerment and security. The complex concept of poverty includes not only income, but also security, vulnerability, identity, social integration and culture. It is a condition characterised by inadequate income that leads to an inability to provide an adequate level of basic necessities.

**Background to Tourism in Nigeria**

After the country’s independence, Nigeria gained international recognition both as a sovereign state and as a country with its doors open to foreign investors and pleasure seeking tourists. The climax for the Nigerian Tourist industry came in 1977, when the country hosted the second Festival for Arts and Culture (FESTAC ‘77). Tourism was at its most prosperous in this period. Subsequent events boosting tourism include the 1984 African Cup of Nations, the 1992 and 1997 Organisation of African Unity Summits and the 1999 World Youth Championships.

**Employment in the Tourism Sector**

Tourism is essentially a labour-intensive service industry, providing relatively more jobs than any other economic sector. Moreover, allied improvements in tourism infrastructure can catalyse other economic activities. In addition to employment opportunities in hotels, the construction of tourist facilities and demands for goods and services increase the number of jobs in the construction, transportation and agricultural sector. Mathieson and Wall classified direct and induced tourism employment as follows:

- Direct employment resulting from visitors’ expenditure in tourist facilities and services;
- Indirect employment in businesses affected by the tourist industry in a secondary way, such as manufacturing and wholesale distribution that supply goods and services to tourism business, banks, handicrafts, and local transport;
- Induced employment, which arises from the effects of tourism, acts as a multiplier since local residents re-spend the additional money which they have earned from tourists;
- Finally, the creation of new jobs in a situation of chronically high unemployment and poverty, as is the experience of Nigeria, is the difference between social order and social chaos.
By 2007, over 60,000 Nigerians were directly employed in tourism, generating more than double that number of indirect jobs⁸. Manpower training for hotel and tourism staff occurs at the Hotel Catering and Tourism Training Centre (HOTCATT) in Abuja, Lagos and other state capitals. Degree and diploma level education is offered at the Nigerian Institute of Tourism, Lagos and National Institute for Hotels and Tourism Studies, Bagauda, Kano.

**Theoretical framework**

Eco-Tourism and Poverty Reduction
As elsewhere the numbers of visitors engaging in ecotourism is increasing in Nigeria. Ecotourism both allows people to re-build their energy while communicating with nature and stimulates environmental protection. The latter is key to building a sustainable tourism strategy that develops the economy and alleviates poverty. Eco-tourism is a niche market that, if carefully addressed, has a great potential in terms of both profitability and long-term impact for the environment and the livelihoods of the poor.

**Study objectives and methods**
This article investigates the role of tourism development at the Olumo Rock (Ogun State), and Ikogosi Warm Spring (Ekiti State), Nigeria in poverty reduction and assesses its sustainability in those locations. The working hypothesis was that tourism development in the Olumo Rock and Ikogosi Warm Spring areas did not have any significant economic impacts (positive and negative) on the sustainable development of the local areas and that it has not affected the poverty level of the people. Data collection was driven by the conviction that information about and generated by local residents was essential to the successful planning and management of sustainable tourism in the two areas.

Interviews were conducted in May 2007 at Ikogosi Warm Spring and Olumo Rock Tourism complex and the corresponding state ministries of tourism and culture (Ekiti State Tourism Board and Ogun State Tourism Board). Over a period of four weeks, structured interviews with questionnaires were administered at random to thirty-five local residents and tourists of different ages, educational background, gender and occupation in Ikogosi and Ikija towns. Additional, interviews were conducted with officials of the two state Tourism Boards. The structured questionnaire, which contained more closed-end questions, was produced in English, but the interviews with the local inhabitants were conducted in Yoruba and English. The questionnaire administered had three (3) sections, providing bio-data, responses on the social impact of tourism and responses on the economic impact of tourism.

**Results and discussion**
Of the 31 people interviewed with the structured questionnaire, 8 (26%) were from the Olumo Rock area, while only 2 (12%) were from the Ikogosi Warm Spring area among the 17 recovered for this area; 15 were male and 16 were female for Olumo Rock, but there were 7 male and 7 female respondents for the Ikogosi Warm Spring. This therefore shows a balance in the selection of the respondents, although this was not deliberate; 55% of them had more than one occupation; 15% were Government officials, 5% were self-employed, 10% were working within the tourism sector and the rest were unemployed.

**Tourism Impacts**
Tourism depends to a large extent on the environment being pleasant and attractive to tourists; negative social, economic and environmental impacts caused by tourism.

![Figure 1: Residents’ perceived impact of tourism on the social environment](Source: Field Survey 2007)
itself may therefore have the effect of 'soiling one's own nest' in the long run. The negative impacts of tourism activities include air, sea and noise pollution, generation of solid and liquid wastes, beach degradation, excessive building development on coastal areas; all of these threaten biodiversity.

**Social Impacts**

Tourism is an alien type of industry brought into the economy because depends on foreigners whose presence has an impact on the social life in the area. It is very hard to measure the social impact of tourism on the people of the study areas, especially since there are so many other outside influences besides tourism operating on the lives of the local people. Some of these influences are television, religion, other foreigners and local people who have travelled outside their native homes.

Ikija residents had a positive view of tourism development in areas like cultural heritage conservation (68%), the traditional dances to mark the official opening of the new management of the tourist centre; and recreational activities during peak tourism periods. Additionally, some of the sacred groves within the rock have been preserved and are not affected by the tourism development. Development has not changed traditional farming and craft occupations. Few of those employed in the tourism sector as life-guards, tour-guides, ticketing assistants and cleaners combine traditional work as farmers, petty traders, or craftsmen with new part-time jobs.

Ikogosi Warm Spring people also have a positive view of tourism development in terms of cultural heritage and the preservation of the spring’s water status which has not changed for times immemorial. Although tourism changes attitudes, behaviour and dress codes at visitor destinations, residents reported that their self-respect and dress codes had not been changed. Crime and drug-use, prevalent at most tourist destinations, were not a major problem at Ikogosi and Ikija. Respondents recognised several negative social effects, the worst of which was overcrowding during peak holiday periods, particularly on the nation’s Independence Day when about three thousand visit the two towns. Prostitution, alcoholism, changes in traditional religious values and gambling were the other social problems induced by tourism in the studied localities.

**Economic Impact**

Improvement in the local economy seems to have occurred at Ikija and Ikogosi. Respondents acknowledged that tourism brought creation of new jobs, improved standards of living, growth of small businesses and improved infrastructure. Improvements included a good 20 km road from Abeokuta centre (Ogun State) to Ikija, a 24-hour electricity supply and a telecommunications system opening Ikija to the outside world. Job creation has been beneficial to the community. New small-businesses include beer bars, local restaurants and shops. However the situation in Ikogosi (Ekiti State) is almost the exact opposite of that in Ikija, because the access road is poor and the supply of electricity is fitful and unreliable; hence there are no supporting facilities, like restaurants or beer bars, near the centre. Negative poverty indices were in the cost of land, which has skyrocketed with improvements at Olumo rock as a tourist centre and the rising cost of goods and services (73%).

**Environmental Impacts**

Respondents thought that tourism was having an adverse effect on the environment. With vigorous promotion and increasing numbers of visitors, there
remained no proper system for the management of waste. Hotels and restaurants lack adequate wastewater treatment plant. There is no separation of domestic waste. Other areas of concern were increased traffic, waste disposal, noise pollution and visual pollution. The only positive responses noted that the hotel sector sorted solid waste before final disposal.

Economically, the residents of the Olumo Rock Tourist centre area have benefited greatly from tourism in terms of employment opportunities, improvement in the number of petty traders, but there is much concern on the social and environmental fronts. The responses of the respondents were confirmed by interviews with the authorities at the Department of Tourism, Culture & Planning and the State Office of the Environmental Protection Agency in Abeokuta (OGEPA).

Sustainable tourism requires that the sector provides benefits to the communities in a balanced way, uplifting their socio-cultural and economic well-being as well as conserving the fragile environment of the rock and warm spring. The expansion of activity needs a more holistic approach that fulfils economic, social and aesthetic needs, while maintaining cultural integrity, essential ecological processes, biological diversity and life support system.

Tourism has resulted in increased prostitution, alcoholism, and gambling in the area. Increased influx of tourists during peak holiday periods has made overcrowding a major problem for local communities. It has resulted in increased stress on the physical environment and including the Rock and Warm Spring, the main tourist attractions in the area. Littering by tourists is a major environmental problem near the spring, there being no one to collect the rubbish, even though three young boys are in charged of litter disposal at Olumo Rock tourist centre. Additionally, there is no sewage system for Ikogosi village as a whole. The lack of decent public conveniences is a major constraint on tourism development and has serious environmental and public health implications.

Tourism has increased traffic congestion, noise and visual pollution around the natural architectural features of the surroundings. Limited parking is available at Olumo Rock Tourist centre, while none is available at Ikogosi Warm Spring. Often motorists have no choice but to park on the road, thus obstructing the free flow of traffic. During public holidays, like Easter, vehicles are parked from Ikija to Itoku (a distance of 15 kilometres) and Ikogosi to Efon-Alaye (a distance of 10 kilometres) making the return journey along narrow roads extremely difficult. Nevertheless, the surroundings of the Rock and Warm Spring are not seriously affected and there is no danger to tourists visiting the sites and participating in recreational activities.

Possible harm to the environment arises from both development of tourism and increasing urban and agricultural pressures on the land. Thus the current ongoing development cannot be viewed as the best example of sustainable tourism development. To ensure sustainability of the Rock and Warm Spring, eco-system management should be put in place to enhance the social and economic well-being of the local community.

**Conclusions and recommendations**

Olumo Rock and Ikogosi Warm Spring have the potential to contribute to tourism development in Nigeria and thereby help in reducing the current high level of poverty. The success of such development depends on the type of tourism and tourist product provided, as well as the expectations of the local population, government policies and regulation.

To achieve the laudable objectives of both sustainable development of the Rock and Warm Spring tourism potential and the alleviation of poverty, the following recommendations are proposed. Adoption of these recommendations will significantly help in the tourism development and poverty reduction plans of the states and the nation in general.

The Federal Government together with the State National Assembly should attempt to develop tourism and tourism projects on a scale and at a rate of growth consistent with maximising use of local resources, but avoiding serious adverse social, economic and environmental impacts. The following recommendations are therefore proposed:

- That tourism development needs to be fully integrated into public policy formulation and resource management programs.
- That the importance of tourism must be assessed in terms of its contributions to social well-being, economic development and the preservation of the environment.
- A ceiling level of tourism, a 'tourism carrying capacity' should be established, especially to reduce and where possible eliminate negative social and environmental impacts. Action must be taken to limit related pollution sources not to exceed their ecological carrying capacity, including waste accumulation process. Tourism related pollution and exploitation must therefore be carefully controlled, regulated and the precautionary approach should be considered as a fundamental principle in the tourism development at the Warm Spring and Rock.
- An alternative form of tourism (eco-tourism) needs to be considered and developed within the Warm Spring and Rock instead of the current mass domestic tourism product offered.
- A protection zone around the Rock and Warm Spring should be established as an environmental management tool based on the concept of protecting the principal component of the ecosystem.
- An ecological zoning system as part of the integrated development of the Warm Spring is necessary. For example, agricultural practices should be compatible to prevent silting of the Warm spring. Strict conservation and appropriate planning of the steep slopes of the Warm Spring will therefore enhance its conservation.
- Development policies and criteria should be formulated focussing on social, economic and environmental improvement.

Solid waste is a major problem. Its collection and disposal has to be managed efficiently. The currently dumping of domestic solid waste in a depression near the community should cease and be replaced by a sanitary landfill site and the provision of waste bins at vantage points. Additionally, the principle of the “polluter pays” should be implemented to help cut the impact of pollution. A waste reduction system, appropriate waste management systems and infrastructure must be put into place. To reduce traffic congestion during the major holiday period it is recommended that a ‘park-and-ride system’ be promoted as early as possible at Ikija and Ikogosi. Community awareness of tourism among local communities should be raised. The government should ensure that communities are trained to administer joint ventures. Without capacity building it will be difficult to sustain an equitable approach to sustainable tourism development. Capacity Building is essential if local communities are to become real stakeholders in tourism and conservation. Quality and service standards are important elements in eco-tourism. The enhanced employment of the local people requires continuous skills development. Local economic linkages need also to be encouraged for local sourcing and local business development.

Tourism development in the selected tourism spots has had positive impacts in the area in economic terms. It has provided employment opportunities promoted infrastructural development and helped improve the standard of living of the local communities, thereby helping to alleviate the level of poverty in those areas. It has also assisted in the conservation of cultural heritage of the people. However, from the many adverse impacts it has generated, it arguably does not meet the objectives of sustainable development. Tourism development has resulted in increased social costs, including sexual immorality, alcoholism, gambling and a change in attitude towards marriage. The physical environment has also been subjected to various forms of pollution - visual, air, noise, and waste, increased traffic congestion and overcrowding.

From a sustainable development point of view, the study confirmed the working hypothesis that the tourism development in the selected tourism hot spot areas has not had any significant impact on the sustainable development of the local area. The principle of sustainable tourism development presupposes that the development will be socially equitable to the local communities, economically viable and ecologically sound. It is envisaged that the recommendations offered in this study will help redirect the efforts of the state government towards a more sustainable tourism development if implemented.
2 http://www.russiatourism.ru


This paper originally presented at the XVIIth International Conference of the Society for Human Ecology held in The University of Manchester, UK, 29th June to 3rd July 200.
Background
The role of engineers in the emergency/response phase of a post disaster event is not fully appreciated. Although this phase basically involves saving life and supplying food, water, health and shelter, recovery and reconstruction need to start from day one of the disaster. Failure to do so seems to generate a never ending “catch-up” situation. After the 2010 Haiti earthquake, the shelter response failed to operate effectively for three basic reasons:

1) Earlier Structural Input: Early structural input during the emergency phase is needed to anticipate the future demands of recovery and reconstruction work. However, in Haiti and in other seismic responses, the attention to buildings is generally reactive and often unwelcome by agencies that would have ordered material and are positioning their programmes.

2) Critical Structural and Construction Review: A critical review of transitional shelters (known as t shelters) is needed. They should not be treated as “trivial” buildings. This review should occur early in the emergency phase so that logistics, local substitution, costing, budget, training, identification of local suppliers, builders and design aspects can be assessed to ensure an efficient, accountable and effective shelter response occurs in the recovery phase. It also allows better advocacy and outcomes for beneficiaries.

3) Reflective Design Review: In addition to the above assessment, a reflective design review is needed to identify the core problems of present day shelters so that future problems and issues are mitigated. It would also look for “innovation” in what is available and in what is being provided with preconceptions about the role and value of design, analysing the construction

<table>
<thead>
<tr>
<th>Design Details and hazard resistant construction</th>
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<tbody>
<tr>
<td>Rains and Floods</td>
<td>The roof should protect the interior and walling materials from rain.</td>
</tr>
<tr>
<td></td>
<td>Foundations have sufficient strength and height to withstand flooding of site.</td>
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<tr>
<td>Hurricane and tropical storms</td>
<td>Foundations must secure the shelter to the ground in strong winds.</td>
</tr>
<tr>
<td></td>
<td>The roof must be fixed securely to be resistant to storms to be designed with adequate strength for proposed roofing material.</td>
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<tr>
<td></td>
<td>A pitch of 30°–45° for 2-pitched roofs and 12°–14° for 1-pitched roofs is optimum for resistance against strong winds.</td>
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<tr>
<td></td>
<td>Ratio of length to width of the shelter approaches 1.</td>
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<tr>
<td></td>
<td>Metal strapping is strongly advised to provide protection from hurricane and earthquake.</td>
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<tr>
<td></td>
<td>Structures should be designed so that timbers and the joints take the loads rather than the fixings.</td>
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<tr>
<td>Earthquake</td>
<td>Seismic resistance techniques must be incorporated into site selection, shelter form, the location of openings, foundations, bracing and ring beam connections.</td>
</tr>
<tr>
<td>Other design details</td>
<td>Concrete foundations will not be a requirement, as land ownership issues may encourage displacement.</td>
</tr>
<tr>
<td></td>
<td>Consideration must be given on some sites that multi-storey buildings will be built.</td>
</tr>
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1) Table 1: t shelter Design Criteria
process and timeline, achieving balance between policy and detail, identifying small details that can derail a programme and perhaps putting aside what appears to be urgent to deal with what is important.

These lessons learnt stem from the following observations.

**The need for early, critical and reflective structural input.**

Emergency shelter is essentially tents which usually have usually minimal structural requirements. Because the following recovery and reconstruction phases increasingly require structural input, preparation and planning for these subsequent phases happens (or should happen) in the emergency phase. In Haiti, because this essentially linear response (emergency-recovery-reconstruction) occurred at different rates in urban and in rural areas shelter organisations had to deal with both emergency and recovery (t shelters) concurrently. At the end of the emergency shelter phase, Haiti also had to deal with permanent shelter. This difference was largely due to disparities between earthquake impacts in urban and rural areas. Rural areas had space while the urban spaces did not. This resulted in the rural shelter response being faster. In addition, the urban areas had limited to minimal access to water and sanitation and poor road/lane/alleys access. After the earthquake there were effectively no services (other than what was being provided by aid agencies). There were also significant issues of how to manage the rubble given the narrow winding alleys and lanes. As a result, the urban shelter response was much slower and rural solutions were already considering “recovery” t shelter solutions when the urban response was still essentially emergency/camp based shelter.

Because the rural shelter response moved ahead of the urban one, there was a much earlier need for structural input in the development of design criteria for t shelters. Such criteria were published by the shelter cluster in April 2010 and hence structural input was probably needed the month before. The design criteria (Table 1) included designing for a 100 mph wind, using certain minimum roof slopes and interestingly recognition of seismic design requirements.

A t shelter TWiG (Technical Working Group) on the 17 September 2010 highlighted that agencies were extending the 3 year life of the structural parts of the t shelter to 15+ years. The strategy was to retain the structure and essentially to replace the cladding using more permanent materials such as mud and stones or concrete block. Apparently driven by strategic planning for more permanent shelters emerging from the initial rural t shelter response, this was being done by up to 8 of the 14 agencies surveyed for the September TWiG. However, this approach called for higher wind loads and the inclusion of seismic loads into the design because of longer term/permanent nature of the shelter. However, agencies missed this requirement and did not apply the appropriate loads.

Meanwhile, the educational clusters were developing so-called “transitional” school designs using permanent materials. These buildings were longer term/permanent buildings for schools that typically had limited funding. A check of Save the Children’s “transitional” school design highlighted that the work of the shelter cluster has reached beyond solely shelter. Although the school design had significant issues, it highlights the direct linkages to other clusters that ought to happen in the emergency phase and would have a positive outcome for beneficiaries.

Finally, in November 2010, the shelter cluster in November received its first example of permanent shelter and hence despite its “emergency” name was dealing with all 3 shelter phases, emergency (tents), recovery (t shelter) and reconstruction (permanent housing and schools) at the time of the handover.

The importance of inputs from structural engineers at the emergency stage is demonstrated by the design and hurricane wind scales taken from the American Society for Civil Engineers. The t shelters had a design wind speed of 100mph. This is confusing. It was not clear whether this was in the expectation of only category 1 hurricanes or whether it was to be measured at a specific height (eaves height, top of roof, 3, 5, 10 metres or higher), what type of wind (sustained, gust or 3 second gust), what type of terrain (water, open land, farm land or city) and what type of loading (working load or limit state). These
difficulties led to the t shelters being designed for categories 1, 2 and 3 hurricanes with rumours of a category 4 design. This led to over spending and constructional time delays.

Different national procedures and weighting in different national wind codes were not apparently picked up by agencies on the ground in Haiti or designers working in their home countries from information provided by aid agencies in the field. UNOPS provided a valuable service in standardizing the base wind speed to a 3 sec gust wind speed of 108 mph which covered a category 1 hurricane. However, agencies then did not pick up the subtle design load changes required if their design life was extended beyond the specified 3 years and the not so subtle increased wind loads from building sites being in ravines or on hill sides\(^1\). Such sources of confusion arise from the many different countries of origin of donors and agencies. Despite the best intentions, optimal solutions do not arise in such situations.

**Structural load paths in t shelters designed for hurricane wind loads?**

It is import to design shelters who take the loads placed upon them by winds and other forces. Comparing the practices of different agencies (Table 2) reveals several problems. Other aspects of the t shelter design (both within the t shelter specification and as part of the general design process) were identified as being significant and these were compared across the 11 t shelter designs on the shelter cluster web page. The important features are:

- The presence of a “horizontal” structure: This structural system transfers lateral loads (such as wind and seismic) through the building to the vertical structure which takes it to the foundations. It is usually located in a horizontal plane such as the ceiling or roof.

- Foundations: Reviewed the relationship or compatibility between the foundations with/to the vertical structures used.

- Gable end bracing: This is where braces are required to prop gable ends back to a horizontal structure

- Roof slope: pitched roof were advised to be +30° and mono sloped roofs 12-14°. This was done to minimise the up lift loads on shelters

Lack of a horizontal structure or suitable foundations constitutes a systemic issue while the gable aspect would be localised. Thus, at least 6 agencies had systemic issues and 9 localised issues and given that these 11 are probably better examples, this summary supports the need for earlier structural input. It is particularly difficult to explain these issues to programme managers when they effectively underway. Agencies will not enjoy being questioned given that they have in some instances constructed many hundreds of their t shelters. These questions needed to be formulated earlier and hence the need for earlier structural input.

**Best practice t shelter details from the shelter cluster web site**

The need for structural input can also be seen in best practice details shown on the shelter cluster web site. Details from the “best Practice” section (Figure 1) unfortunately, in reality, are not best practice and most/all would result in premature failure.

Building details are not something that can be done remotely. They reflect the building practice have to be resolved in country by talking to local contractors and suppliers.

**The “yellow” building strategy**

Late in November 2010 the driver for the shelter response seemed to be based around the graph (Figure 2) with the goal being to decongest and reduce camp numbers (red line) by t shelter construction (green line) and repairs to yellow buildings (buildings that have been damaged but which can be repaired and made safe) (yellow line).

In September 2010 there were 306,445 families in camps, 13,513 in t shelters and 324 in yellow houses in the forecast numbers a year later were 130,918, 117,608 and 71,755 respectively.

The key issue is that this strategy was put together with minimal consultation with the Haitian people. House repairs do not give a building greater earthquake resilience. The planned retrofitting to
improve such resilience would run into difficulties as moved back into their relatively weak houses. Even though the chance of another earthquake in the next 20 years is much higher than it was prior to January 12th there is the fear that retrofitting may never be done.

The real need seems to be to retrofit the houses now rather than repair them and expect the retrofitting to be done later. People favouring repairs only would claim that retrofitting is too expensive and that existing houses are made of such poor weak materials that in reality retrofitting is
not feasible. Such arguments were heard in Aceh, Indonesia and in Kashmir after their earthquakes, but detailed structural evidence are need to support them. The need is to retrofit to protect life (rather than the building) which is different from what structural engineers might do in their home context. Although injury could occur with building failure, the retrofit would ensure life safety, which is the real need in Haiti and after other earthquake disasters.

**Conclusion**

Three key lessons, on early structural input, on adequate assessment of structural safety of both designed emergency shelter and buildings for retrofitting, and assessing how design and building safety could be improved in future, were learnt in Haiti. The early deployment of structural assistance is rarely seen as significant, because the emergency phase is about “tents” and not structures. However, it is imperative that preparations for the recovery and reconstruction phases involve the emergency technical coordinator in appropriate planning and preparation. Although this was particularly noticeable in the Haiti situation, it has been evident in past earthquake disasters. One of the lessons of human ecology is that there is much to be learnt from the affected communities and from experience elsewhere. In this case that experience has been over looked for various reasons.

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1 91% of informal housing in Port au Prince is on hillsides or Ravines.
CHEC Mission Statement:

Human Ecology embraces the principles of natural and moral philosophy. It draws on knowledge and understanding from the sciences and humanities, to develop and promote holistic, integrative, sustainable initiatives, ideas and developmental projects to enhance and strengthen people’s relationships with each other and the natural and built environment on which they depend.

Human Ecology operates at all levels of human co-operation, from families and communities to global initiatives such as those of the United Nations agencies. Human Ecology emphasises the contribution of the individual, the sharing of skills and experiences, and the dignity and insight of social and cultural and religious experiences. From this standpoint, human ecology works to create sustainable, lasting improvements in people’s lives by fostering projects that engage and enhance the skills of local communities, involve all sectors of society, improve livelihoods and maintain environmental benefits.

Human Ecology is a philosophy and a process, constantly learning and adapting, but educating, encouraging and stimulating others. It has become an academic field of enquiry, a developmental philosophy, an approach to sustainability, and a new means of unifying political, economic and social endeavours to provide a meaningful future for rural and urban people everywhere.
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