Human Ecology: Bringing the Principles down to Earth

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1. Civilisation runs on Natural Capital.

1.1 The Contradiction and The Challenge

Over 50 years ago the eminent British ecologist Sir Frank Fraser Darling saw a paradox in the position of the so-called civilised or developed societies of the world:

> "...The phenomenon of accelerating devastation and increasing population has, in effect, been inevitable from the moment man began to break ecological climaxes and upset equilibria without allowing them to rebuild... Most of us are not prepared to defer to this final logic, that the very achievement of humanness dooms us, and that civilisation is an ultimate contradiction."

{More than a quarter of a century later} the Brundtland Commission expressed its concern not just about local climaxes but about serious global impacts:

> "Humanity's inability to fit its doings into this (nature's) pattern is changing planetary systems, fundamentally."

{It went on to draw attention to the urgency of the situation and to the need for fresh thinking}:

> "The next few decades are crucial. The time has come to break out of past patterns. Attempts to maintain social and ecological stability through old approaches to development and environmental protection will increase instability. Security must be sought through change."

These quotes put bluntly the predicament we are in: poverty and ecological degradation, largely caused by unprecedented human/social and economic development,.

[So we will ask, what is the nature of that contradiction? It is] The accumulated wealth of the biosphere [that] has provided the means for human development. But in the process of development this capital wealth has been squandered and civilisations have died.

The Historical Record
There is a close correlation between the development of civilisations and ecological degradation, as records show. The long history has been well documented. Even studies of pre-history show how mankind has almost always been the exterminator: large slow eatable animals have been harvested to extinction.

[Box: Examples of civilisations and degradation]

Maybe/{In contrast} some cultures which have not developed large enterprises have an intuitive understanding of nature that enables them, perhaps unknowingly, to live in symbiotic relations with their environments.

[Box: Examples of cultures living in harmony with nature – are/were there any?]

To be able to do likewise in a modern and crowded world we have much to learn. This becomes clear when, with the help of science, we review the [changes in the scale of] the impacts that human/social and economic development have had on the natural world over the last 100-200 years???.

[Box or boxes: Human Impacts on the Natural World – graphs?
longish time span in contrast with next para and box -the oil interlude??]

The Current Crisis

Our civilisation is in a unique phase – which has been called "the oil interlude". The planet is in the most dramatic period it has ever been in, as a result of the activities of one species.

[Another box – deepening crisis?]

However, this most dramatic period is still not widely recognised for what it is. International conventions, local actions, efforts towards sustainability are still very minor activities in spite of global conferences like Rio 1992 and Johannesburg 2002.

[Box: sustainability
including brief notes on Rio and Jo'burg

Blindness?

Yet] We are conscious beings, aware of some/many of our actions {and their consequences/implications??}, and potentially capable of regulating our activities to fit the realities of the biosphere. Are we also blind? One is, horrifyingly, tempted to compare our blindness to the reality of the planet's situation with that which failed to recognise the depths of the social and economic divisions that have led to international terrorism.

So it appears that continued development is [necessarily] leading in the wrong direction - towards greater degradation and exploitation. Both the ways of living that work and those that do not, like ours, need to be studied and understood. Human ecology is a required approach in both cases.

[Box: Human Ecology]

We will try to bring together some of the ways to approach the issues as we perceive them/{highlighted above} to try to see if Fraser Darling's contradiction can be resolved. We will ask: What is the nature of that contradiction? What did the Brundtland Commission consider should change? What are the features of humankind that must evolve into something better?

Humankind is yet young in her endeavours, like a rebellious teenager. With greater maturity civilisation might become a part of the process of creating the wealth of the biosphere. The rest of this book explores the options and constraints for civilisation to mature.

1.2 Natural Capital

What is the capital of nature? It is not only, or even mainly, the resources of timber, minerals, fossil fuels, soils, etc. These are the products accumulated over time - which civilisations have sought and plundered. The real capital of nature, the basis of the assets on which we live, is ***the potential to go on re-producing all these resources***.

This potential depends on, for example:

- the hierarchical order of the biosphere, the huge diversity of living things, including the fungi and micro-organisms which we tend to forget - they work for us, but we mostly do not notice
- the complexities and diversities that stretch from the micro scale to the global scale and that fit into, and function as, the living ecosystems of the planet.

It is these that have created:

- the systems of energy and nutrient flows
  the cycles of water by evapo-transpiration, even of weather
- the maintenance of stability and sustainability, the homeostasis and control of the environment.
- the age range of living things; often very long time scales created the potentials that we draw on to-day.
- the stability of the planet as a whole.

All these features of the biosphere constitute underlying assets or capital which provide the continuing services on which we depend - the renewable resources of the earth {{continuing? – do we need a box here?}} {Yet we seem to be unaware of their importance to us.} Maybe our minds are so made that we tend to take what is readily available for granted, rather than respect its full potential – surprising actually, because humans are not just mechanics but also artists.

[Box: nature's income and nature's capital
renewable resources and continuing resources]

We need to stress that it is not just that the immediate resources that civilisations have sought and used. In doing so they have also destroyed the productive capital. As a result renewability itself has been lost; renewable resources/potential? have become depleted. {As a species} we seek out environments that seem to offer the potential for development. Like other animals, we can sense what makes an environment valuable for us. We can see the potential in healthy, living deep rich soil. Such soil has taken thousands and hundreds of years to build up; it is not the resource itself, it is the potential to grow crops or to rapidly re-establish a complex ecosystem that constitutes its value. Every farmer knows that. Why then is soil erosion still one of the world's greatest problems?

Boxes
continuing/renewable
ecosystems – stocks and flows
cycles - examples
age ranges - redwoods, etc
soils
soil erosion
homeostasis

1.3 Civilisation

Nearly all civilisations have developed urban or urbanised societies, in which people have developed a range of pursuits rarely found in agricultural societies, especially those at subsistence level. In the ancient city of Ur, 5000 years ago, the richer classes lived in the city and the lower classes of society were hired for the production of food. Even then it was established that so-called "civilised" people lived away from the land and engaged in higher activities like/ {such as law, administration and} philosophy.

{As civilisations developed, towns and cities came to dominate the surrounding countryside, annexing larger and large areas for their own purposes and imposing their footprint on it {unnecessary jargon ??}. More and more people were separated from close contact with nature, losing first-hand knowledge of the natural world and its processes, and becoming forgetful of or oblivious to their dependence on the productivity of the biosphere.

[Box: (needed? or is it in the way?) Ecological Footprints]

{As urban societies provided more and more economic niches in which people were able to service increasingly refined and specialised needs, indulging the whims of prestigious patrons and satisfying the cultural ambitions of those in trade or commerce, they effectively gave more and more encouragement to those prepared/able to exploit, tame or improve the natural world.} Today much of our science is still applied with <u>that same</u> /{a very similar} approach to nature – seeking to understand her in such a way that she can be overcome, avoided, conquered. {For too many people, unaware of the extent of their dependence on the natural world}, the degree of separation and independence from nature remains a measure of the success of development of/or? civilisation.

Social structures of law and governance and of exchange systems like money were invented because they are/were immediately useful, and mostly local in scale. Yet, considered on the wider arena and over longer time scales, the forms of social organisation that we have developed [by using our instincts and applying our intelligence to our needs], have become the source of grave trouble. {Important parts of} our social heritage are no longer appropriate.

In effect, our so-called 'developed world' still lives by hunter-gathering {, helping ourselves in an opportunistic way to what nature provides}. We have not progressed nearly as much as we imagine. {Perhaps we have not progressed at all, for pre-industrial hunter gatherers imposed no stress on the natural world.} Instead of harvesting the plants and animals and minerals <u>directly</u>, we now harvest the capacity of the biosphere to continue to produce the yields that we harvest to meet our needs. Logging companies continue to move from one old growth forest to another, leaving long-term degradation behind. In doing so, they show less wisdom than 'primitive' nomads who know when to move on if the land is to support them on their return. Similarly, through our agriculture and most forestry practices we continue to degrade soils and always to simplify ecosystems. Even in harvesting {extracting??} [non-living] minerals, we still destroy the ordered structure {of the surface ??} of the earth, scattering the products, both the so-called waste and the sought-after metal, rock, lime etc, everywhere.

[Box: (necessary?) clear felling and long-term degradation]

[Box Minerals - dispersal of both sought after minerals and wastes (tailing, plumes, etc)]

The resilience of our environment is being compromised and made more fragile. The sources of the <u>organisation of life</u> are being weakened. In all these cases, the capital assets of order, of organisation for productivity and of <u>concentration</u> [?] have

been lost. If {a readiness to contemplate} such losses constitutes a part of what we are proud to call civilisation, there is clearly a long way to go.

[Box: resilience]

[Box: organisation of life]

We {in the West/North ??} regard civilisation as an advanced state of human development in which, we like to think, we have resolved many of the problems which still afflict primitive or less developed societies. Yet if we continue to live off the natural assets of the planet, destroying them in the process, we have to question what we mean by civilisation. {Can we seriously claim to have highly developed material resources when we are consuming the potential which alone can ensure their long-term availability? Let alone highly developed spiritual resources when we deny the intrinsic value of the natural world and its processes. And is complexity the key criterion in assessing our social organisation.}

[Box: Definition of civilisation
"a human society that has highly developed material and spiritual resources and a complex cultural, political and legal organisation; an advanced state of human development."
reference]

Doomed?

Are we therefore doomed because of our nature, as Fraser Darling implies? Is it simply that we have failed to place sufficient value on the ability to foresee long-term consequences? After all, any philosopher of old, while pondering the future, risked having his cattle and wealth stolen. Philosophy seems not to have paid off - while violence and opportunism have. Put another way, is it inevitable that an intelligent, tool-making animal will create trouble { - for ecosystems and other species - } precisely because of its power and success? There may be much wrong with human nature, but did we have to set up social structures that bring out the worst? As a farmer said recently, Man has been too clever, yet not clever enough.

Nowhere else to go

Nearly all ways of organising society - ancient and modern alike - have inexorably led to the degradation of the natural world; and then left for elsewhere or died out. Now there is nowhere else to go. The question is whether any revision or modification can be sufficient to change direction or whether deeper and more drastic revolutions in thinking and action are needed.

1.4 The value of ecosystem services

One of the indications that our social heritage is no longer appropriate is that {in reviewing our economic performance} we fail to consider the value of nature's services. Very few corporations and governments include in their annual accounts any appraisal of the continuing availability of the natural resources they depend on or any evidence of the state of health of ecosystem services. For example, the commons in the form of natural capital are not accounted for within any of our economic systems. {{range of economic systems being considered?}}

[Box: Valuing nature's services
'natural accounting'
resource accounting
valuing natural capital]

[Box: The commons]

[Cut this sentence – best kept till 1.5, page 9b ?? - The tragedy of the commons has become a global one.} The money economy does not and probably cannot measure the values of the eco-sphere. And since most transactions, local, national and international, are financial ones, at least in the sense that decisions are taken on financial grounds, the capital of the means of production can be used up, squandered, without accounting.. No business can afford {to eat into its capital} for long. And time is running out for governments and corporations which have ignored natural capital, happy to regard it as in some way an "external" factor in economic activity. Omitting such externalities as economists [would] call them (see box), amounts to criminal negligence.

[Box: Externalities]

Yet, putting a money value on natural resources seems /{may seem} even more absurd than not doing so. {{Discuss absurdity ??}}

Box: [necessary, appropriate]? The Absurdity of putting a money value on natural resources/capital (Is the latter the appropriate term here?)
references to other examples (e.g. from U of Stirling economist(s): value of an observation post in a forest is greater than the value of the forest itself, I seem to remember) and highlighting some of the key issues of valuation ??

Many years ago Frederich Vester made an attempt, tongue-in-cheek, to assess the monetary value of beech forests to the Austrian economy. He guessed values for amenity, wild life conservation, soil improvement, water management, climate amelioration, and many other such factors, of which timber value was a minor one. He arrived at some £2000 per annum per tree; or 7 times the Austrian GDP for all of the country's beech woods!

More recently Bob Costanza and colleagues assessed the values of the earth's ecosystem services, on the basis of what it would cost if our economy had to pay to provide them. The total came to at least as much and perhaps three times as much, as the whole of the world's total GNP /{as the total of the GNP of every country in the world}. In his conclusions, Bob pointed out that some growth of GNP probably already results from the need to replace failing natural services with artificial ones – [it is] money spent {on mitigation or} amelioration of {an example?}, with no gain in living standards. Conversely one could argue, but he did not, that expenses could be reduced by ecological restoration, and so improved living standards {could be}achieved at lower cost and with a reduction in GNP.

[Box Replacing failing natural services]

Actually, such calculations are not as absurd as they seem – it is the economic system we work on that is spurious. It depends on explicit and implied assumptions, confined to/{which are valid only for} limited scales of time and space. It could not survive any rigorous scrutiny in a scientific frame. Look at Garret

Hardin's simple example: Judas's 30 shekels, invested at 5% per annum, would weigh as much, in gold, as the earth by the time the great cathedrals that honour his master were built. And that after a period of time that is only a third of the life of a Pacific redwood tree.

While all such calculations are somewhat unreal, maybe they serve to show just how far from a true civilisation we are, and how [simple]/{important ??} it would be to achieve something better. The calculation of the value of the earth's ecosystem services had to be made, precisely because the economic system fails and has to fail, to respond to signals about the state of natural capital. Something different is needed in the way we structure and handle our economy. There are plenty of new[er] ideas, but the conventional/ {older ways} remains [the] dominant.

[Box: (here or in next section or later still – give page reference)
new ideas on structuring our economy

What is it then that has to change? To look deeper into that, we should note that those things /{developments} that stand out as most successful {in the history of our species - some such phrase? ??}, especially the growth of population and improvements in standards of living (at least for some), are also [those that have been] the causes of the greatest degradation and the most unsustainable life-styles. They therefore challenge us to question most keenly the assumption[s on which they are based] /{that they are successes ??}. In effect, we have scaled up the many earlier trials of civilisation into a giant global experiment, one that no ethical or scientific committee would allow, and we have yet to {agree on the relevant criteria by which to assess it, let alone} draw proper conclusions [from it].

{{questioning of assumptions on which MSOL/economic system based might follow in next section? I don't think it does, in fact.}}
{{What about assumptions underlying attitudes to population growth?}}

1.5 Economic and social structures / {The economic system}

{Since the beginnings of commerce, there has always been, it seems, [a built-in continued] exploitation of nature and [continued] creation of poverty. Nothing seems to 'succeed' like economic power, especially in a system which, like ours since the Middle Ages, allows and indeed encourages lending at interest - usury. Even small differences in wealth seems to mean that over time the rich get richer while the poor get poorer.

Calls for redistribution of wealth, at a national or international level, are relatively recent. They seem to correlate with an increasingly narrow view of wealth - as adequately measured by financial or monetary acquisitions rather than by a range of factors which determine quality of life. Actual attempts at redistribution have been largely ineffectual - either token efforts, or too modest, or if more ambitious too threatening, and too easily subverted by vested interests of different kinds.

[Box: wealth]

The social systems we have inherited and the economic structures that arose from them have shaped economic developments over the last century and especially the last 50 years. These have resulted in phenomenal monetary and/or material gain for less than one-third of the world, an increase in relative as well as absolute poverty - mostly in the other two-thirds of the world, and continued steady losses of natural capital, upon which the whole show ultimately depends.

These inherited systems and structures became concentrated in recent times in the two major world powers. There was nothing to choose between them, from the point of view of living off their capital. But the collapse of the one has opened the way to domination by the other through market forces, throughout a world driven by unprecedented economic growth. This has meant, among other things, that the remaining super-power can bargain to buy some of the natural capital of the other, in the form of carbon credits. It has also deprived the greater part of the world, the developing world with roughly two-thirds of the global population, of the kind of 'bargaining power' they could use during the Cold War.

[Box: market forces]

[Box: carbon credits]

Other developments since the end of the Cold War – deregulation, free movement of capital, free market policies, the growth of 'consumerism', recent GATT agreements, the WTO, globalisation – have helped to bring about the unprecedented economic growth and with it, monetary gains for the relatively few, greater economic hardship for the many and the consumption of natural capital.

During the last two decades of spectacular gains for the rich simple observation, of the kind practised by any natural historian, has shown that the claim that economic growth alleviates poverty is false – in our prevailing social and political systems, at least. Economic initiatives based on it have failed not only to reduce poverty but also to prevent its increase. Our economic system not only creates poverty but seems to depend on it for its spectacular 'successes'.

[Box: Economic growth alleviates poverty?
Intro + If the IMF encourages all coffee producers throughout the Third World to grow more coffee for export, the price will fall, the rich countries will get cheaper coffee, and the poorer countries' ability to pay back debts and interest is reduced. As a result the poor pay back their loans about four times over, and poverty inevitably increases.]

The words of one commentator (reference) sum up the situation aptly: "The world is ruled by the well-off (including those in poor countries) who believe they can ring-fence their prosperity and resist scientific and other arguments that demand change."

As a result all the intertwined structures of governance are leading inexorably [further] to more and more unsustainable life styles. Market incentives, the media culture that depends on advertising, and the very mechanism of finance that creates money without wealth, can only continue these unsustainable ways.

[Box: structures of governance
These include, e.g.
the tools – and the assumptions on which they are based - of economic measurement, statistics, analysis, planning (e.g. cost benefit analysis, indices, GDP, GNP (includes costs of growth), etc)
the system of resource accounting
banking and accounting systems
international finance and the aid system
systems of regulations and liberalisation agreements affecting trade
political systems and institutions
social and cultural norms
the mechanism of finance]

{Simple observation over the last two decades also casts doubt on arguments for the expansion of trade as a way of benefiting the people of the Third World - as the example of the expansion of coffee production suggests (see box above). ??} Trade is surely good when the parties involved benefit both materially and from improved quality of life. But it does not follow that more trade is necessarily better or automatically leads to a healthier society and ecological responsibility. Recent moves to extend free trade have failed to provide evidence that Adam Smith's invisible hand operates in the world at large or that Ricardo's comparative advantage still applies.

[Box: Recent moves to extend free trade
(avoid overlap with two preceding boxes)]

[Box: Adam Smith's invisible hand and Ricardo's comparative advantage}

When economic forces operate not just in local markets but extend across the world, there is an escalation of the divisions between rich and poor. Globalisation of trade promotes the exploitation of the poor by concentrating the benefits and diffusing the costs - cheaper resources and lower labour costs are sought everywhere, and the benefits are concentrated among the rich. It also promotes the exploitation of natural capital by encouraging people to think of natural assets as simply commodities. The market assumes that the commons of nature, natural capital as well as income, are there for the taking. ["The environment", whatever that is, is regarded as the base from which we act.] In these ways, the tragedy of the commons has become absolute and planetary.

[Box: The tragedy of the commons]

We are now stuck within this economic system {even more firmly than before since the advent of the WTO and the latest GATT rounds}. {These have effectively undermined individual nations' powers to control their own economies. They have also made it more difficult for nations to band together to regulate the international market in ways which protect the poor and the natural world.} {And for individual corporations to pursue more enlightened policies and remain competitive}: "Corporations take their signals from the regulations and from the market. We cannot move faster – it is part of the system we are in." (Mark Hope, Shell)

Meanwhile the continuing health of the national economy, and the material well-being of the individual citizen, depend, we are told, on continued spending, shopping, material and service flows, irrespective of human need or ecological reality. {However}, there is little or no feedback about whether these activities fulfil any human need, or whether they might or might not be sustainable, or what effect they might have on the other economies of the world, perhaps far distant ones.

{We inhabit an economic world dominated by powerful and deep-rooted myths – free trade, market forces, economic growth. It is precisely these myths that ecological modernisation, the next phase of civilisation, must overcome. ??}

1.6 Sustainability - The taboo

Individually, people recognize these lethal trends, yet talking constructively about the implications and what to do has become a taboo. Ideas about reducing consumption cannot be tolerated when the [very existence of ??] the economic system depends on continuous economic growth. The idea of reducing population - that is, reducing total numbers and not merely slowing rates of growth - is similarly taboo.

Sustainability may have become an accepted concept, but its significance is well outside most decision-makers' visions. The need to reduce human impacts appears only reluctantly on political agendas. Activists who try to clarify the problem and popularise reinforcing sustainability in the public may feel overwhelmed or paralyzed by the magnitude of the task. We [reach a paradox of inability to act] /{ are faced with a double bind ??}: we are either overwhelmed by public and political inability to recognize the problem, or overwhelmed by the magnitude {and complexity} of the problematique itself, once recognized.

[Box: the problematique]

[cut?, though I remember the lecture
I am reminded of Nick Humphrey's BBC Bronowski lecture many years ago, on the nuclear arms race. He described the uselessness of visiting your neighbour, to announce that the world is on the edge of an abyss – I thought you might like to know! And he asked, in the face of all the evidence and argument, why don't we all scream? We have as much need to scream now as we had then (and in fact still do).

{Sensing the collective denial, the media are reluctant to investigate the issues, discuss the choices and present examples of the way forward.} [To drive the point home,] Consider how globalisation has become a boring topic. Compare the reporting of the WTO conferences at Seattle or Genoa with media coverage of a football match. The game is described in detail with analyses of moves and evaluation of the players and their potential. In contrast, the long-studied and well-researched arguments of the demonstrators against globalisation have never been properly presented in the media – only the rioting is reported. If there were no violent confrontations, would the official conferences, let alone the alternative ones, be reported and analysed as thoroughly as sports events?

{Box: Examples of reporting?

Need for holistic thinking
Yet, there are many who think differently { - who believe } [that the environment is in fact being cleaned up]/{that cleaning up the environment will suffice and that that is happening}; that human ingenuity has always overcome problems and can do so again and again; that the market economy will always provide the signals for action. [This is]/ {Such people represent ??} a vocal and powerful body of opinion, [cut this sentence? I will not here argue how wrong I think they are, but only ask, how is it that one can have such wholly opposed evaluation{s} of the state of the planet and how we live in it?] It derives its force from arguing point by point, when the issue is one of multiplicity, inter-connections and inter-relations. My answer is that human ingenuity indeed can overcome the problems – [that that ingenuity now]/{provided it is focussed on recognising the feed-backs of nature, the interactions of ecosystems, on fitting in {bringing human activities into harmony with ?? }with ecological processes.

[Box: Using human ingenuity - some examples of where different approaches lead
the concept of the adequate response

1.7 { The Challenge to Human Ingenuity: The loss of natural capital throughout civilisation:} The examples of forestry and the development of agriculture

{{ N.B. I now think this section might fit better if placed immediately after section 1.3 **??}}**

{{{or use the following introductory para here: Over the millennia we have raided the natural world without much recognition of the need to set limits or prevent degradation, as illustrated by the examples of forestry and agriculture – two of the most important engines of civilisation or human development.}}

Forests have been cleared for thousands of years, for their timber and for agriculture. {Almost 2500 years ago} Plato [already] appreciated the devastating effects of deforestation, leaving the land as an emaciated skeleton, fit only for bees. Old growth forests are still being cut, [as] in Siberia, Canada, Chile, Argentina as well as the tropics.

Ideas for sustainable forestry have developed over the past few hundred years in Europe, {but} scarcely at all in UK or in USA, nor generally internationally. True sustainable forestry is difficult to conceive, because the multiple values of forests are easily destroyed, even if trees remain standing. [Even] The Rio Summit failed to create a forestry convention, {to place alongside the one on biodiversity}. One wonders how a convention on biodiversity can be sustained if forests go on being lost! Now that there is so much degraded land of all sorts everywhere, there is no excuse whatever for continued cutting of virgin old forests anywhere. Restoration of forests would [also] help to restore soils and fresh water, and {so} re-build some of the capital lost over the past four millennia.

[boxes on the Rio conventions, salination – but how do we fit it all in?]

[Box: multiple values of forests

{{ Generalise this para. to apply to UK, not just Scotland ??}}

Scotland of course has practically no forest. The absurdity of growing trees for only some 50 years and then clearing the lot, has nothing to do with forestry as such; the policy is dictated by the economics of discounting the future [see box]. Reforesting Scotland is now the major task. SNH (Scottish Natural Heritage) should be renamed SNR - Scottish Natural Regeneration.

The desire for sustainable hardwood timber for the new Scottish Parliament building is thwarted by the procurement methods, which do not allow for planning ahead. A small token prestigious batch of oak will be Scottish, and sawn and machined locally; {but} the rest [comes from]/{was grown in} the Appalachians, and machined in SE Asia. All this time, hundreds of tons of prime oak have been exported from [all over– not much from the northern and/or higher areas, from what I can gather] Scotland, to England, Germany and Japan.

[Box: discounting the future

[same? Box: Wood for the new Scottish Parliament Building

how the social and economic infrastructure is what prevents local sustainable development.

Agriculture developed probably independently on three continents. It has always been an abuse of the environment. It has to be, by definition: the idea is to grow food where other things grew before. But if that abuse is within the elasticity of the ecological systems, it can be tolerated and continued. In practice it has not been. [China is the best documented, and perhaps only, example of sustained agriculture for 4000 years.]/{China has a well documented history of agriculture sustained for 4000 years. ??} Yet, {like other agricultural systems ??} it [also] depended on continued deforestation, for fuel, fodder and building. All other civilisations have degraded their land – Ur, Greece, Rome, Europe and Russia, and now USA. [And] The impacts [of these

'developed' societies on agriculture world-wide have {led to} increased yields but threatened and degraded forests and soils throughout. Malthus has been proved wrong only by eating up nature's capital. {{I need a refresher on Malthus. Did he say that the land could only support a limited number of people. Do we want to bring him in here, as he takes us away from agriculture to population issues? perhaps we should omit this last sentence ??}}

[Box: Examples of degradation caused by agriculture?]

{{Cut - strong element of repetition here.
[Agriculture depended in its expansion in large part on de-forestation. Farming has always necessarily aimed at over-coming the constraints of nature – that was the whole idea.] ??}}

The increasing ability {to overcome the constraints of nature} [to do that] and the increasing productivity that resulted has led to the present large global population. [It was] /{Agriculture has been} a success. But the costs [are also] /{have been} high. The first, 10000 years ago, was lowered health and stature: farming did not improve on the healthy diet of the hunter-gatherer. Then it led to salination, as it still does. Then it led to loss of biodiversity, as it still does. Then it led to such concentration of cultivation, through rich feeding with fertilisers, that pests and diseases increased, as they still do. [Seen overall, a crude judgement has to be, that]/{So}farming has been, {and continues to be}, both a great success {in providing food for more and more people ??} and a driving force in spending, not enhancing, natural capital. No-one [now] can claim that modern farming is sustainable, although much effort is going into trying to make it so.

Meanwhile, it is clear that there has to be a change in direction. The question is: what kind of change? One option is to continue along the path of clever interventions in natural processes which have been so successful. [Such extrapolation of] /{Further} development along {using} old mind-sets however, is [equally] likely to lead to similar problems of loss and degradation.

The alternative mind-set or approach, now dubbed organic farming, [is what] grew out of concerns about the effects of [more] industrial farming on health, soils and crop and animal health in the 1920s. [This has hardly started yet –] However, the options for various sustainable farming methods are only now becoming recognised, all over the world. A more thorough, rigorous biological science would [indicate that we would be wise to ??] study more how things work than how we can short-circuit them (see pages later on). [I will look at this in more detail in later talks].

[Box: Further developments using old mind-sets
genetic engineering technologies applied to agriculture – they continue a path of domination that never was a good long-term one. GM (better named GE) is tackling one of the profoundest aspects of the structure of life – the separation between species.

{{Make the following into a box – multiple benefits? Perhaps combine in some way with suggested box (above) on multiple benefits of forestry? as concluding example (in this chapter) of the alternative? ??}}
And what can we do in Scotland? Almost all the vegetables that Edinburgh {a large city}needs can be grown locally – for instance, 5m cabbages on some 200 ha using modern sustainable agriculture techniques {{we need to jazz this up a bit The green future will surely offer us a more varied diet than cabbage, cabbage and cabbage}}. The fertiliser can come from biological treatment of domestic sewage, growing [using} 100 different [treatment] species, which are then composted. Thereby agriculture is supported, health improved, local sewage plants become near {similar} to botanic gardens in appearance and value. Many external costs, like pollution and waste treatment, are avoided. Idealistic perhaps, but also perfectly realistic. The hang-ups are not technical.

1.8 Conclusions / {The Challenge ??}

The question we have to tackle is whether we can conceive of a newer civilisation that remains true to the meaning of that word [– that is 'civilised' as opposed to 'wild'] and is mature enough to understand the biosphere and live within income and not off the capital. Can modern society move towards that goal fast enough?

{We need a civilisation which gives key importance, in its striving for the highest achievements of humankind, to the deepest {ecological ??} understanding of nature, and to {devising and implementing ??} those means of living that integrate humanity with the biosphere. ??} A culture of/or society, in other words, that recognizes how the striving to overcome nature's constraints must be improved, not merely balanced, by self-regulation {humankind's regulation of its own activities ??} in the place of nature's regulators. Then we would see that there is a long way to go. However, we would have the satisfaction of knowing that we had resolved Fraser Darling's contradiction, which would be seen as a self-evident contradiction {only valid when ??}applied to past civilisations.

[Box: (necessary or appropriate at this stage?) integrating humanity with the biosphere]

[Box: Regulation 'in place of' nature's regulators (disease, carrying capacity, other limiting factors?]

[To do that]/{To achieve such a society we will have to turn} our assumptions upside down. Instead of assuming the {availability ??} of the commons and building civilisation on the apparently readily available natural capital, the only real options are {to learn} how to live from/ {off} the 'income' the natural world provides for us. It will become necessary to re-model social structures, economics and modes of living, starting/{basing} the design from/{on} ecological realities, [which are necessarily linked to social equity] /{, and taking into account the issue of social equity which they highlight. ??}

[Box: 'income' from the natural world and/or
Box: Empty/Full World – limits. 'sustainable yields ??]

[Box: 'necessity' of equity as in Dutch FoE?]

At last, even while the pressures of unsustainable globalisation become more pervasive, there are some visible signs that things are moving. So many NGOs, and new ones, are being taken seriously. {{make this ending slightly more upbeat ??}}

[make para below into box on movements in the right direction

after years of small groups like the CHE struggling with such issues

Recently here in Edinburgh, I participated in a workshop run by the New Renaissance Group, which produced a hard-hitting statement, Beyond Sustainable Development, introduced with a paper by Michell Batisse – "The Road Ahead." Similarly, Mathis Wackernagel is proposing a "Sustainability Academy" for training for leaders. CHE itself is working along such lines, as are many others. The New Economics Foundation is working on exactly that. We might well reflect back to Conrad Waddington, whose work in science and society, the human future, the tools for thought, led him to found CHE ("The School of the man-made Future") almost thirty years ago.

[make para below into more detailed guide to rest of book?
My other talks will examine some aspects of these big questions and pose further possible ways forward.

Where?

[???The question is whether any revision or modification can be sufficient to change direction or whether deeper and more drastic revolutions in thinking and action are needed.

Bits left out

Maybe our minds are so made that we see only *things* rather than *potentials* – surprising actually, because humans are, not just mechanics, but also artists.

Put another way, civilisations have searched for and found low entropy in nature (see next lecture). They have almost always increased it to disordered chaos, and then left for elsewhere or died out. Now there is nowhere else to go.

NOTES

1.1 Sir Frank Fraser Darling wrote in his introduction to his American Journal in 1950, (quoted in Morton Boyd, 1986)

Brundtland Report ref

records of link between development of civilisations and ecological degradation.

1.3
ref for definition of civilisation

They do not disappear, copper remains copper, it's just scattered in such a way that it cannot easily be retrieved.