

ETHICAL and ECONOMIC ASPECTS OF
SUSTAINABLE DEVELOPMENT

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Ian Hore-Lacy, a mining industry executive, delivered the final talk in this year's series to the November SCEG meeting. The text of his talk, reprinted below, is a substantially revised version of a paper entitled, 'Sustainable Stewardship: A Minerals Industry Perspective', published as Zadok Series 1 paper, S48, September 1990

In a recent 'New Scientist' article, Colin Tudge, an advocate for the green movement, asserted; "the economics that impels all modern successful societies is based on two interwoven ideas: that the wealth of society as a whole should increase, and that each individual within it should also grow progressively richer. If we are to halt the decay of the planet, we have to abandon both these dreams." This is a popular viewpoint, fairly prevalent in parts of the green movement here, but for the same reasons as it has proved to be false since the Reverend Thomas Malthus first asserted it at the end of the 18th century, it is still fundamentally wrong today.

Later on in his article, Colin Tudge makes a second assertion, with which I have more sympathy: "if we want recycling and wind power to work, then we have to commit ourselves to them because they are good. If we try simply to argue the economic case, then we lose." This doesn't quite add up to a despair of economics as such on the part of the author, for he concludes by advocating the establishment of departments of green economics in universities, apparently to overcome a problem he perceives in that "the various green parties of the world (are) embryonic and unelectable. Development of green economics, then, in close-worked detail is the priority of our age." That is perhaps a good starting point for consideration of today's topic in the context of part A of the Oxford Declaration. I'll leave it to you to decide whether green economics has any objective substance or not, I will confine my comments to the notion that in some respects ethics may transcend economics, and to talking about sustainable development.

Sustainable development is certainly a major issue of today. One problem is that a lot of different people are attempting to define it in different ways. We have the conservation movement insisting on ecologically sustainable development, and the Commonwealth Government bending in this direction with the title of its recent discussion paper on the subject, while others feel that such an adjective is tautologous and are concerned that economic sustainability of any development receives due emphasis. One could be excused for exclaiming: well of course any development must be sustainable! How on earth can we reconcile anything else with our stewardship of the world and its resources? If developments degrade capacity to feed, clothe and house future generations, or if they unduly degrade the environment, then who wants them?

The 1987 Brundtland Report "Our Common Future" defines sustainable development as being an approach to progress which "meets the needs of the present without compromising the ability of future generations to meet their own needs". A UK (Pearce) report talks about ensuring that the next generation inherits a stock of wealth, comprising both man made and environmental assets, no less than the stock inherited by the previous generation.

The application of this in areas such as forestry, agriculture and fisheries is fairly straightforward. With each of these, the concept is of growing and harvesting a crop without compromising the capacity of the land or waters to provide future crops on a continuing basis. That is to say, nutrients should not be exhausted faster than they are replenished, and pollution should not impair the productive capacity.

What then does sustainability in relation to mineral resources mean? The materials themselves are certainly non-renewable (unless recycled), but compared with the renewable materials such as wood and food, the amount actually in the earth's crust is vast. But I hesitate to use the analogy of a huge warehouse for reasons which will become apparent. In fact, we need to talk about mineral resources in terms of what is known and usable,

which means that resources in this sense are far more of an economic concept than a physical one. Sustainability of these mineral resources then depends on the interaction of three things, which enable usable resources effectively to be created.

- Geological Knowledge

Whatever minerals are in the earth, they cannot be considered resources unless they are known. Therefore there must be a constant input of time, money and effort to find out what is there. This mineral exploration endeavour is not merely fossicking or doing aerial magnetic surveys, but must eventually extend to proving up ore bodies so that they can be defined in terms of location, quantity and grade. That is the first aspect of creating a resource.

The mining industry has, over the last decade, proved up massive orebodies of mineral sands in Western Victoria, diamonds at Argyle in NW Australia, lead-zinc at Admiral Bay in NW Australia, zinc in NW Queensland, uranium in NW Australia and others overseas. Measured resources of minerals in Australia are increasing much faster than they are being used, and simply on geological grounds there is no reason to suppose that this trend will not continue. Current stocks are more than we inherited.¹

The corollary of this is that access for mineral exploration should be open virtually everywhere in Australia, including national parks. To take the view that we shouldn't know what resources exist is, as Senator Walsh put it, "to make a declaration for ignorance and against knowledge. It is tantamount to book burning."²

¹ Gibbons, D & O'Neill, D "Sustaining Our Mineral Development" in AMIC Mining Review, July 1990

² Senator Peter Walsh, Aust. Financial Review, 19 June 1990

- Technology: new uses, lower costs and greater efficiency

"Nothing is a resource until someone has thought of a way to use it" is quite true, but its implications are seldom thought through by those who harp on the 'finite resources' fallacy. In this sense, human ingenuity quite literally creates resources, historically, currently and prospectively. That is the most fundamental level at which technology creates resources.

More particularly, if a known mineral deposit cannot be mined, processed and marketed economically, it does not constitute a resource in any practical sense. Many factors determine whether a particular mineral deposit can be considered a usable resource, - the scale of mining and processing, the technological expertise involved, its location in relation to markets, etc. The application of human ingenuity, through technology, alters the significance of all these factors and is thus a second means of creating resources. A further aspect of this is at the manufacturing and consumer level, where technology can make a given amount of resources go further through more efficient use.

Perhaps the best Australian example of this application of technology to create resources is in the Pilbara region of WA. Until the 1960s the vast iron ore deposits here were simply geological curiosities, despite their very high grade. Australia had been perceived as short of iron ore. With modern large-scale mining technology and the advent of heavy duty railways and bulk shipping which could economically get the iron ore from the mine well inland through the port of Dampier and to Japan, these became one of the nation's main mineral resources. For the last 25 years Hamersley Iron, Mount Newman and others have been at the forefront of Australia's mineral exporters, drawing upon two of these 'new' orebodies, and creating much wealth for all Australians.

There are many other examples one can give of how technological developments effectively create resources, or make what we have go much further.

Just over hundred years ago aluminium was a precious metal, not because it was scarce, but because it was almost impossible to reduce the oxide to the metal, which was therefore fantastically expensive. With the discovery of the Hall-Heroult process in 1886, the cost of producing aluminium plummeted to about one twentieth of what it had been and that metal has steadily become more commonplace. It now competes with iron in many applications, as well as having its own widespread uses in every aspect of our lives. Not only has a virtually new material been provided for people's use by this technological breakthrough, but enormous quantities of bauxite worldwide progressively became a valuable resource.

CRA's development of Hismelt technology which will be able to utilize otherwise non useable or uneconomic iron ore fines is another good example of creating resources. Incremental improvements in processing technology at all plants are less obvious but nevertheless very significant also. Over many years they are probably as important as the historic technological breakthroughs.

Improved energy efficiency in metal smelters has resulted in large savings of energy and this is another very important aspect of making resources go further.

At the level of manufacturing, Comalco's research into making more cans from each kilogram of aluminium is a means of stretching resources and making what we have go further.³ Recycling of aluminium is another aspect of this, principally to respect to energy efficiency.

To achieve sustainability, the combined effects of mineral exploration and the development of technology need to be creating resources at least as fast as they are being used. There is no question that in respect to the minerals

³ *Gibbons & O'Neill note that aluminium can mass was reduced by 21% 1972-88, and motor cars each use about 30% less steel than 30 years ago.*

industry this is generally so. Recycling also helps, though generally its effect is not great.

- Economics: higher prices mean more resources

Whether a particular mineral deposit is sensibly available as a resource will depend on the market price of the mineral concerned. If it costs more to get it out of the ground than its value warrants, it can hardly be classified as a resource (unless there is some major market distortion due to government subsidies of some kind). Therefore the resources available will depend on the market price, which in turn depends on world demand for the particular mineral and the costs of supplying that demand. The dynamic equilibrium between supply and demand also gives rise to substitution of other materials when scarcity looms (or the price is artificially elevated). This then is the third aspect of creating resources.⁴

The best known example of the interaction of markets with resource availability is in the oil industry. When in 1972 OPEC suddenly increased the price of oil fourfold several things happened at both producer and consumer levels.

The producers dramatically increased their exploration effort, and applied ways to boost oil recovery from previously "exhausted" or uneconomic wells. At the consumer end, increased prices meant massive substitution of other fuels and greatly increased capital expenditure in more efficient plant. As a result of the former activities, oil resources increased dramatically. As a result of the latter, oil use fell slightly to 1975 and in the longer perspective did not increase globally from 1973 to 1986. Forecasts in 1972 had generally predicted a doubling of oil consumption in ten years.

⁴ *Asserting the importance of an option value of resources for some time in the future tends to ignore the dynamics of the economic process sketched here, and presupposes too much regarding future demand for particular commodities.*

Oil will certainly become scarce one day, probably before most other mineral resources, which will drive its price up. As in the 1970s, this will in turn cause increased substitution for oil and bring about greater efficiencies in its use as equilibrium between supply and demand is maintained by the market mechanism. Certainly oil will never run out in any absolute sense - it will simply become too expensive to use as liberally as we now do.

Another example is provided by aluminium. During World War II, Germany and Japan recovered aluminium from kaolinite, a common clay, at slightly greater cost than it could be obtained from bauxite⁵, because the exigencies of wartime demand coupled with denial of supply had increased the price.

Economic factors also mean that resources may become redundant in time. What is a valuable resource today may be worth very little in the future when different technologies have evolved or new materials are available.

Due to the operation of these factors the world's Economically Demonstrated Resources of most minerals have risen faster than the increased rate of usage over the last 40 years, so that more are available now, notwithstanding liberal usage. This is largely due to the effects of mineral exploration and the fact that new discoveries have exceeded consumption. The real prices of most minerals have actually fallen over this period. The fact that we have more non-renewable resources than a generation ago is a major consideration in relation to intergenerational equity.

From a detached viewpoint all this may look like mere technological optimism. But to anyone closer to the ground, so to speak, it is obvious and

⁵ Gibbons, D & O'Neill, D "Sustaining Our Mineral Development" in *AMIC Mining Review*, July 1990

demonstratable. Furthermore it is illustrated by the history of mankind's use of the earth's mineral resources.

Abundance, scarcity, substitution, increasing efficiency of use, technological breakthroughs in discovery, recovery and use, sustained incremental improvements in mineral recovery and energy efficiency, - all these comprise the history of minerals and mankind. The story is fascinating. What is surprising is that so few seem to be aware of it.

Economic Sustainability

There is a further economic aspect which is sometimes overlooked in discussion about sustainable development. If we degrade our economy, as some countries have done at various times in the last century or so, then this will affect all the above factors. Mineral exploration will be less affordable, technological innovation will diminish, and domestic markets will certainly weaken. In other words the amount of mineral (or other) resources available becomes fairly academic if there is not a thriving economy which can utilise them. It would be a very peculiar reading of the concept of sustainable development which countenanced the possibility of our handing on to future generations a run-down economy, huge debts, and reduced standard of living, whatever resources happened to be in the larder.

As John Ralph said to a recent conference in WA: 'Our inheritance should also include an accumulation of community wealth, generated by environmentally acceptable economic growth. Succeeding generations should expect to inherit knowledge gained through education and technological development, and physical infrastructure which includes hospitals, schools, transport facilities and other community resources. They are also entitled to a thriving economy - not one saddled with high levels of debt which they, not us, will have to repay'.⁶ Later he put this more strongly: "We have the dubious distinction of being likely to pass on to the

⁶ *Ralph, John T., Sir Charles Court oration to Aust. Society of Accountants, 6/4/90 and at AMIC Minerals Industry Seminar, May 1990.*

next generation, for the first time in Australia's modern history, a standard of living lower than that which the current generation enjoyed. At best this is an unfortunate legacy: it might also be considered an unethical bequest".

Perhaps our own tendency to take for granted the community wealth which we collectively have inherited makes us prone to overlook this rather fundamental aspect of 'intergenerational equity'. A greater consciousness of the enormous debt we owe our forbears for the culture, the education, the capital stock - both publically and privately owned which we have the benefit of would help us be more aware of what we can most usefully hand on to our grandchildren.

The Brundtland Report makes it clear that economic growth is an essential part of sustainable development. Economic growth means that not only is technology constantly developed to make more efficient use of resources, but also a wider range of choices regarding both development and environment become available.

Environmental Sustainability

Pearce and others argue for a weighting in decision making to avoid irreversibilities. If there is a question about developing a mine in a wilderness area, the dice should be loaded in the direction of preservation. To concede this too readily however would be to ignore the economic aspect of sustainability. Certainly we should never get into a position where our large undisturbed natural areas are so few and far between that we really need to make an issue of a couple of undistinguished square kilometres with proven mineral potential. Having well over 5% of the country in parks and reserves however seems to take us well clear of that possibility. The more pressing consideration then may be the rarity at any particular time of proven orebodies able to be developed economically.

From the inception of the Australian mining industry in the 1840s, the bulk of production of most minerals has come from relatively few mines, often less than half a dozen at any particular time (exceptions are gold and coal). If several of these had been prevented from

operating on environmental grounds, Australia's resources inventory could have changed significantly. In other words, environmental constraints can remove minerals from availability so that we thereby lose them as effectively as if they were removed from the face of the earth. This clearly affects the sustainability equation. My point is not to argue that this sterilization of resources should never happen, but rather that it should not occur without due consideration by the owners of the minerals and the potential future beneficiaries of them - the citizens.

There is also a question of landholders rights versus mineral rights, especially when the landholders are traditional peoples who maintain that their land is incommensurable in financial terms. Ultimately this is an ethical question, which needs to be reflected in the laws of the land, though most of the concern regarding it is social, and much of the debate in particular instances is environmental! In Australia one cannot generalize regarding Aboriginal attitudes to mining on their land, but John Harris⁷ writes: "It was the control of bauxite resources which led to the now well-known dispute over mining at Yirrkala, NT. To any who were prepared to listen to Aboriginal people, it was evident that they were not opposed to mining as such, but wanted to be involved in decision-making about when and where mining would take place on the lands where they had always lived. A geological discovery had suddenly made these lands economically valuable, but such economic considerations should not be allowed to change the ethics of a situation. The ethics don't change just because you discover the minerals". Nor, of course, does the legal expression of these, whereby the minerals belong to all the citizens of the state or Territory without regard to traditional or other land rights.

In respect to mining versus leaving land undisturbed, the idea of "irreversibility" itself must be questioned. Certainly the minerals, once mined, are no longer there in the earth - they are in circulation, serving some human want or other and usually able to be recycled for some other role. Certainly the land surface is to some extent "destroyed", but usually

7 *Personal communication*

not permanently. The mining industry's well honed rehabilitation expertise can and does restore most of the land disturbed by mining. If only the same could be said of other human activities, especially the urban sprawl. This rehabilitation is thus an important ancillary to the sustainable development debate.

This raises the question of environmental degradation by pollution, outside of the immediate area of land disturbance. Some mining operations in Australia have caused pollution and some of the effects of that pollution have endured: Captains Flat, NSW and Rum Jungle, NT are two examples (since rehabilitated). Where smelting takes place, the potential for pollution is increased - Queenstown in Tasmania is the outstanding example here, from the early part of the century. But for all those operations where there has been a measure of past environmental degradation by pollution, there are many other mines and smelters where this has been avoided. To this extent, development has been sustainable in that environmental damage has been prevented by the application of technology and procedures. The cost of this pollution control has been accepted as part of running expenses of the operations, rather than being an environmental cost to the wider community. Because mining operations are usually geographically discrete, governments have generally ensured that environmental and social costs are not externalised, but are borne by the operations to a greater extent than in any other industry.

In the normal course of events, this is precisely how any industry or individual should function if the principles of sustainability are taken seriously. If a particular project necessarily involves environmental degradation beyond its site, then this needs to be addressed at the outset so that the wider cost is fully understood and seen to be adequately balanced by the benefits, just as with any other land use decision.

Developing countries in particular may decide to opt for development projects without wanting to pay the extra cost of environmental controls which we would regard as necessary for sustainability. Ultimately that is

their right, which we from our privileged standpoint need to respect, as long as anyone involved from the developed world makes clear to them what is the cost involved. There should never be any question of transferring polluting technology to unsuspecting third world host nations who are left with a surprise legacy of environmental degradation. If there is to be any significant trade off between development and sustainability, those concerned need to know what they are doing.

Energy use in the modern world brings aspects of sustainability into sharp focus: Some fossil fuels are less abundant in the earth's crust than others. All fossil fuels produce carbon dioxide when consumed, which is increasingly a popular concern. Natural gas is itself a powerful greenhouse gas. Fuel for nuclear electricity is abundant but its use is politically contentious. "Renewable" energy sources are severely limited in their application and utility. Energy conservation is increasingly reinforced by economic considerations. It would appear that sustainable energy development will mean increased roles for both nuclear power and renewable energy sources in the medium to long term.

Waste

A fundamental aspect of using the earth's resources, (and even more so of doing so 'sustainably') is avoidance of waste. The ethics of waste have received far too little attention - perhaps the sustainable development debate will see this change. We have authors on religious, ethical and political grounds urging simplicity and sometimes making a major issue of inequity and relativities of resource use. Their works are often contentious economically. But waste is arguably easier to discern and more inimical to good stewardship of the earth and its abundant resources. While there is no question that those resources are provided to be used, rather than merely admired, I believe we need a much stronger ethical awareness of how we can go about this use, while avoiding misuse.

Where do we get to grips with the question of waste? I suggest three areas of concern: resources, time and effort, and money. Before concentrating on the first, I will venture a few

thoughts on the others. The term 'waste' presupposes the possibility of more effective use, and is not here extended to what is humanly unavoidable, such as natural disasters.

Time and effort and the skills involved with both are wasted if they are spent on what is totally frivolous (a value judgement) or if they are frittered away because of poor management, union action, warfare or other reasons which unreasonably hinder development or make it more costly than it might be, for no sensible real benefit to anyone. Waste of money is clearly related, due to inadequate competence in investment decisions, low efficiency, speculation or gambling. There are some value judgements involved of course, but so much waste is obvious and indefensible.

Waste of resources can come about due to lack of managerial or technical skills, or government interference in regulation or tax regimes. In forestry waste occurs when timber from logging is for no good reason not fully used, or when the trees which should comprise future harvests are extensively destroyed in the logging. In the mining industry waste occurs when processing is grossly inefficient or when mines are 'high graded', leaving behind lower grade material which could be mined at the same time but which on its own is never likely to be economic.⁸ This practice can be due to greed on the part of mine owners or to the structure of government royalties and charges. Either way, the result is that short term benefits are maximised at the expense of long term utilization of the resource.

Of course waste can also occur through environmental destruction, or the opposite - conformity to unnecessarily stringent regulations which go beyond what is locally necessary to maintain environmental quality. Usually these questions are argued in purely economic and political terms, whereas fundamentally, they are ethical matters. I suggest that a more basic ethical standpoint needs to be asserted, regardless of whether that has

⁸ *In a major mining project some apparent high grading may be built into the mine plan so as to reduce debt quickly and then proceed with the lower grade material on the basis of lower overheads. The point of this procedure is in fact to increase the amount of ore which is economically recoverable.*

become represented on someone's political agenda and regardless of whether it has economic overtones. 'Sustainable development' as an ethical concept holds some promise that this will occur, as the sustainability is held in creative tension with the development.

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Theological Context

Let me turn to the theological context for all of this. Clearly, the resources of the earth are provided for human use (Dt 8: 7-9) even though (apart from a passing reference to gold) they do not feature in Genesis 1 & 2. More is said in Job 28: 1-11, in the context of seeking wisdom!

The fact of these resources being given and the human dominion from Genesis 1:26 raises the question of human stewardship of creation and its elements. The first point to note is that what is made and subsequently given (Dt 8:10) or entrusted is good. It does not contain creatures or materials which are intrinsically bad. Secondly, our stewardship of all this must have both utilitarian and preservation aspects held in tension. Both are necessary to a Christian concept of stewardship of the earth.

While the utilitarian aspect is the main one discussed here, there is also the respect-admire-preserve aspect. This arises both from the fact that creation is the Lord's handiwork, having value by virtue of that, and from the fact that we are biologically part of that web of life over which we have authority and hence for which we are accountable. The character of our dominion is determined by the fact that we are made in God's image - these are linked in Genesis 1:26. "As creatures in the image of God, human persons must

exercise a dominion fashioned on that of God. The image of God carries the highest imaginable set of expectations; namely that one will live in relation to all God's creatures with the love and care that God exercises."⁹ There is an absolute need always to treat creation with respect.

But how does one respect a gift? Do I respect something (which is not purely a work of art) more by using it or avoiding use of it? Which most honours the intention of the giver? We need to tease out the utilitarian aspect of stewardship without violating the preservation/respect aspect.

From another point of view the issue is not simply development versus conservation, the development vandals versus the ecological freedom fighters, but it is the question of what it is to be human, in God's image, in God's world and vis a vis the rest of creation. How can our humanity best express God's image in dealing with his creation as stewards? Is our technological creativity something to be encouraged and rejoiced in, or should we seek to conform more closely to the rest of the animal kingdom and simply accept that we should live within the constraints of our unaltered physical environment, as "flotsam and jetsam on the sea of life" as Sir Gustav Nossal puts it? Is our humanity most appropriately expressed in some sort of "noble savage" model, or should we be frankly utilitarian in our approach to the world, while avoiding careless or unnecessary degradation of it, at the very least out of respect for its Creator? Christians should have more to say on this question, I believe. "What is man that you are mindful of him?" (Psalm 8:4).

Sustaining the Future

No one can assess the needs of future generations. What we must avoid, if we are constrained by the ethics of 'intergenerational equity', is narrowing the range of options available to our successors. This may mean some restraint on the use of certain resources where the prospect of sharply

⁹ Lilburne, Geoff "A Sense of Place - a Christian theology of the land", Abingdon 1989.

increasing prices due to scarcity may be in sight. Some would put oil in this category. It may mean slowing down our use of other resources which seem to be giving rise to long term environmental effects. Some people put carbon based fuels into this category. It certainly means at least maintaining our economic and social infrastructure. It also means avoiding waste, whether in resource use or in destruction of the environment. Every trade off between development and conservation, between economics and environmental quality, needs fresh scrutiny.

The high moral ground does not belong exclusively to the environmental lobby. Others have equal claim to be taken seriously in considering the ethical aspects of resources.

In respect to renewable resources of soil and water, concerned with forestry and agriculture, there is absolutely no good reason for these activities to be conducted other than on a fully sustainable basis. Economically, ecologically and ethically this is generally accepted and the scientific knowledge is mostly available to ensure that it can happen.

Good stewardship of the earth's resources means employing all that we are given for human benefit, equitably, efficiently and gratefully. It means avoiding waste, whether of the resource itself or in environmental degradation (though some environmental change is appropriate - it is a question of kind and degree.) It does not mean indulging in an orgy of sanctimonious ingratitude because we have picked up someone else's anti-development agenda and dressed it up in pious language which disguises its pantheistic basis. Perhaps this theological greening is an over reaction to the criticisms of Christianity as having ignorantly taken the Genesis creation mandate to justify environmental pillage and unsustainable exploitation of resources.

This sort of ideological disease involving wholesale importation of unsubstantiated environmental rhetoric significantly infects even some

high profile theologians such as Moltmann¹⁰. It is not confined to the credulous clergy who do not have time or energy to apply their critical faculties in this direction, nor impressionable laymen who are caught up with the apparently altruistic environmental ethos.

The main secular message of sustainable development is that both economic growth and care for the environment must be integrated. To concentrate on one rather than the other distorts and narrows the concept of 'intergenerational equity', and is arguably bad stewardship. The main theological messages are first, that there are abundant resources for all the people on earth, and any failure at the human level to use or share them properly should not be disguised by rhetoric which effectively denies this provision in creation itself. Secondly, both utilitarian and preservation aspects of stewardship need to be expounded together more fully.

Ian Hore-Lacy

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¹⁰ Moltmann, Jorgen, *"God in Creation"*, SCM Press 1985