PACE-Net

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Apinun olgeta

Good evening one and all! Thank you for the honour of giving this address to such a distinguished group of professionals.

PACE-Net and a Sustainable Pacific

Introduction

Perhaps the one thing that we have in common tonight is that at some time in our lives, we have been students at a university. The word university as we are aware comes from the Latin - *universitas magistrorum et scholarium,* which means, essentially, a community of teachers and scholars. This is a wonderful and apt description, which captures the spirit of universities from the earliest days.

Some of us present may be dedicated higher degree scholars. Some are committed as university teachers and researchers. An important number of us are professional researchers, research leaders and research administrators. In most cases our university experience has given us skills in being analytical, skeptical and critical and we can be expected to be ethical, articulate and rigorous in our scientific methodology and thinking.

In many, our professional stance will have be influenced by Karl Popper's scientific paradigm P1-> H1->Expt. 1 and if not explained on to P2->H2 and ->Expt. 2 etc in terms of testing Null hypotheses. This has led to incremental advances towards a stronger understanding of facts and the explanation of natural and physical phenomena and processes. Occasionally, within the existing status of scientific knowledge and understanding, too many internal contradictions accumulate and the existing paradigm is overturned i.e. what Kuhn calls scientific revolutions (Hynes 1979). Some present may not agree with this position. For many of us however, the overall experience has given us a level of realistic optimism that we apply to our everyday lives.

In the Middle Ages in what is now the historical and contemporary hub of the Western World, no matter where in Europe people originated they would have been able to communicate in universities. But it would have been in *Latin*. Presently the international language of science is English. This may change; Spanish has been identified as the most rapidly expanding language worldwide. You may not agree!

Whatever the language we use, it will and does to a degree influence the way we think. *(**By the way, a university degree was called a degree, because it was meant to be just a step or degree, on the path to becoming a fully qualified master or perhaps more recently mistress!)***

I live and work in a country - Papua New Guinea, which has over 840 linguistically distinct languages. The official languages are Motu, Tok Pisin and English. Be that as it may, I can assure you all that it is extremely challenging to think scientifically and analytically about your field records and their interpretation, while living on the side of a mountain at 8,000' in the second week of working with 15 field assistants who only speak Tok Pisin and Tok Ples. We shape our houses and thereafter they shape us. We shape our languages and thereafter they influence us.

The nature and scale of our sustainability and resource management problems

Notwithstanding this, will our current scientific methodologies or the specific languages we use - be up to the challenges *Homo sapiens* is facing and will increasingly be asked to face in the 21st century.

Why is this the case?

I shall start with a quote from Martin Luther King Jr.:
"Human progress is neither automatic nor inevitable. We are faced now with the fact that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history there is such a thing as being too late…We may cry out desperately from time to time to pause in her passage, but time is deaf to every plea and rushes on. Over the bleached bones and jumbled residues of numerous civilizations are written the pathetic words: Too Late."

1. ***The economic model used by international capitalism is immature in that it has only usually been driven by market forces that respond to selling prices and profits based on supply and demand. This economic framework has seldom recognized and paid the additional component costs of ecological services, option, bequest and intrinsic values, which make up the full price of goods and services. In this setting capitalism has been cannibalizing the resources of our planet. This is the first constraint contributing to current global economic turbulence and environmental uncertainty.***

2. ***The second constraint more recently relates directly to a breakdown in good governance in those more loosely regulated financial providers i.e. certain - insurance companies, loan agencies offering sub-prime loan options, derivative finance brokers etc, operating at the edge or outside the big internationally regulated financial institutions i.e. most of the big banks. In the more marginal institutions the quality of transparency, accountability and ownership of necessary regulations within their management systems (****particularly in the big US financial markets****) had by 2008 been eroded to a point where financial risk management had been discarded or ignored. The consequences have resulted in uneven but very serious turbulences in the global economy. This situation has not yet really stabilized (Hynes 2009)!***

3. ***The third constraint relates to the almost global blindness human society displays regarding the finite*** **resources of the biosphere and the lack of restraint concerning the world's escalating human** ***population. At a fundamental level, a first approximation of Impact on the biosphere = Population X Resource Use + Pollution. A crucial consequence of this complex impact in its various forms - is climate change. A second consequence of this is increasing threats to human health and food security (Hynes 2009).***

4. ***Some examples: Disease e.g. Malaria is spreading into the PNG highlands. Dengue has been recorded in Port Moresby for the first time since post-independence records have been kept! Earlier flowering and fruiting of crops is occurring in the highlands. Coastal erosion on islands and mainland coastlines –has seen the edges of coconut plantations falling into the sea and Sago Palm (Sac Sac) freshwater swamp forests dying because of saltwater intrusion. The sea level, whatever the cause, is rising at about 7mm per year i.e.7cms each decade. More and more Coral atolls are becoming submerged. The list of impacts goes on! A special case is the overfishing of tuna in the Coral Triangle. This fishery is likely to go the way***

of all global tuna fisheries, despite excellent efforts by the various regulatory authorities. It is not so much the registered and monitored boats but the estimated approximately equal number of pirate boats. *(You may have better and more accurate data!)*

5. ***The fourth constraint is the unpredictability of trends in climate change. If the mean increase in global temperature remains below a 2^{o}C rise between 2010 and 2050 then human adaptability is likely to enable us to persist in modified but sustainable human life systems. If the mean temperature rise approaches 4^{o}C, our habitat for life, as we know it is likely to change substantially.*** *(You may not agree!)*

6. ***If sustainability is harvesting the interest rather than exploiting the capital of our resources, we as world citizens will need to act with great intelligence, energy and adaptation to survive. All relevant strategies for renewable energy, resource conservation and recycling; pollution management; and population containment will need to be rapidly implemented to minimize impacts and maximize sustainable processes. Can we do it? Keep in mind that no Millennium Development Goal covers population growth or family planning. Nevertheless population is the key driver of impacts on the biosphere (Hynes 2009).***

7. ***Nevertheless for entrepreneurs, many new business opportunities will arise. New technologies can allow us to leap-frog current technologies. These can help us revolutionize and recreate business environments to proactively contribute as crucial agents of change - to solutions, rather than being perpetrators of the status quo?***

8. ***The complexity involved will demand the highest levels of human cooperation and capacity to understand and apply whole systems approaches to find solutions across scales in space and time. We presently face perhaps the most challenging period in the history of the human species (Hynes 2009).***

9. ***Another dimension of this situation is complex and cultural. What are the value systems of the people addressing these challenges?***

In PNG we live in a very complex cultural setting with changing social values:

- ***Traditional customary values*** **still tend to be the main driver.**
- **The Papua New Guinea interpretation of *Christian ethics* provides another layer of values.**
- ***Good governance*** **more recently has placed much of our work life in a wider national and global setting e.g. values such as transparency and accountability.**
- **The above value streams are complicated by values of people who are opportunistic and exploitive and use '*Kisim Chance*' approaches to life.** (*If something is not secure it is available for relocation for my family's survival.)*
- **This in turn in some instances can be made more difficult by *Sorcery* or *Witchcraft* *or both***
- **And not uncommonly rapidly damaged by violent intimidating *Warrior Behaviour***
- **Finally, these value streams are underpinned by *modern scientific values* and understandings.**

For this reason In PNG it is often very challenging in day to day situations to walk a straight pathway through these value mazes. We usually face situations involving many different values in everyday life. This situation can confound informed decision making (*Hynes 2010 and 2011*). Do similar complexities exist in your own cultures?

As we go forward we need to urgently and seriously note the immaturity of the current international economic financial model and the need to make it more complete.

This economic framework has seldom recognized and paid the additional component costs of ecological services, option, bequest and intrinsic values, which make up the full price of goods and services. In this setting I reiterate capitalism has been cannibalizing the resources of our planet. Consider Figure 1.

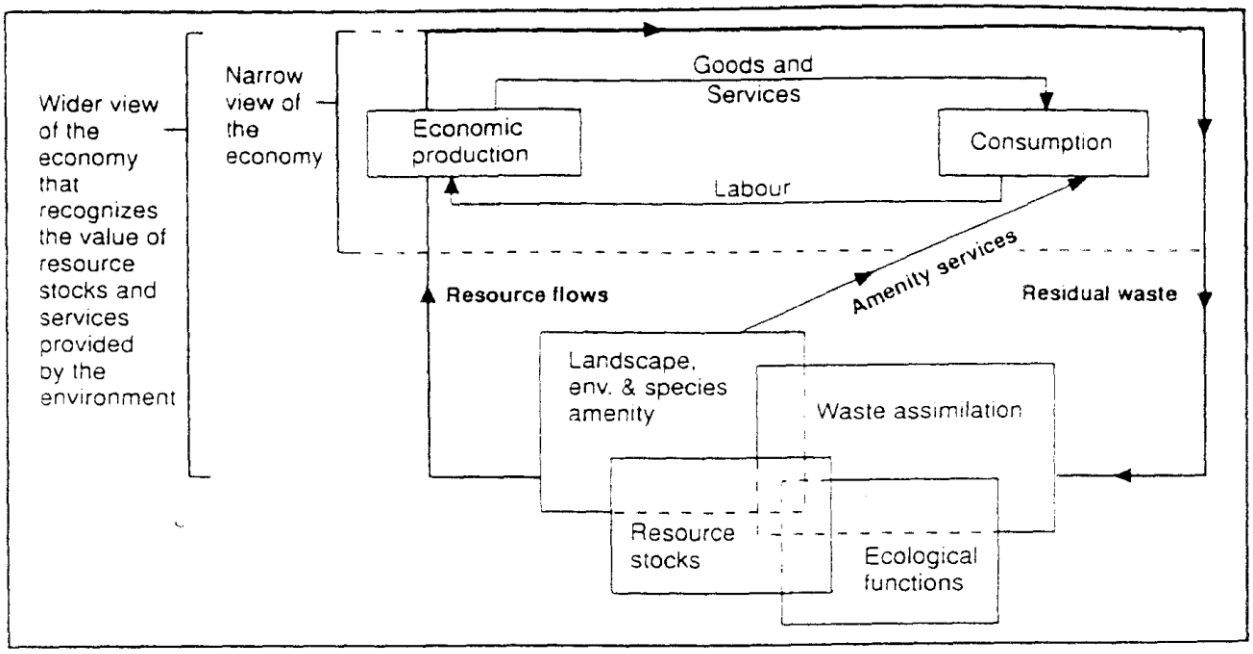

Figure 1, shows resource stocks, flows and the global economy (after Young 1992). Notably there are no direct links between ecological functions and financial values within the broader economy. Resource flows have, during most of our recent history, been assumed to be infinite. Further, bequest, option and intrinsic values have not usually been considered (Hynes & Panetta 1994).

Can sustainable development be explained by linking economics with ecology? Can this in turn contribute to reducing financial turbulences such as the 2008 crisis?

An economist could define sustainable development as a set of ***'development indicators'*** relating to each person's possessions or wellbeing, which should increase overtime. This definition involves ***'feedback'*** where environmental requirements must be met.

This can be assessed in terms of '***non declining wealth'*** that involves equality of wealth from one generation to the next. However, some modification is required in order to allow for irreversible losses of natural assets or compensation for their loss. Another assessment is in terms of ***'non-declining natural wealth'*** in that actions should be taken to ensure each generation should inherit at least a similar natural environment (*Pearce et al., 1989*).

The key question is whether or not human modification and transformation of ecosystems irreversibly affects their cyclic stability and resilience and hence their sustainability.
For managed and natural ecosystems, a system's resilience may differ depending on whether or not the external disturbance is a sudden shock or a cumulative, continuous stress. ***`Stress'*** here might be a regular, sometimes continuous, relatively small and predictable disturbance on productivity over time. ***`Shock'*** might be defined as an irregular, infrequent, relatively large, unpredictable disturbance.

Man-made assets often lack an important feature of natural assets – diversity. Justification using resilience for conserving natural basic stock is based on the principle that diverse ecological and economic systems are more resilient to shocks and stress than are simple systems (*Pearce et al., 1989*). Whereas this is often the case, the magnitude of shock and/or accumulative stress can override this resilience.

Even so diversity must be maintained to avoid irreversible changes. Irreversibility involving man-made assets is rare, but ecological irreversibility is not. Every year natural species become extinct and unique ecosystems are destroyed.

Sustainable development is not about trade-offs between environment and development, but about the blending of economic and ecological values to ensure future generations can live as biological and economic beings in a sustainable environment. Sustainable development begins with the proposition that it is our responsibility, as far as possible, to ensure that the atmosphere, the seas, soils and water, and the diverse populations of plants and animals are maintained and where required, restored. ***Sustainable development is an ongoing process not an end point.***

Conserving our ecosystems is a basic requirement for sustainable resource use. Hard decisions need to be made. The challenge is not a stark choice between preserving the environment and continued economic growth. Rather, we must make decisions that are ecologically right. We need to find new processes and new technologies to provide products and services we want without destroying our environment *(Kelly, 1990*). To achieve this we need to deliver technically sound information to the right people at the right time to enable the right decisions (*Hynes and Mott, 1992*). Only co-operative, creative deep environmental strategies will be able to develop new alternatives that will fulfill these commitments to our future generations.

Sustainable resource use and efficient economic investment: An understanding of the nature of relationships between natural resources and an open market economy highlights the incompleteness of contemporary economic systems concerning achieving total resource accounting. A wider view of resources, not only recognizes use value, but acknowledges that **many renewable resources:**

- **Maintain ecosystem integrity;**
- **Provide ecological services by accommodating wastes; and**
- **Significantly contribute to environmental amenity, aesthetic and cultural values.**

In examining economic value, it is useful to distinguish between actual use value, ecological function value, option value, existence value and bequest value.

Young (1992) defines: **Total Economic Value = Direct Use Value + Ecological Function Value + Option Value[1]+ Existence Value[2]+ Bequest Value[3].**

Ecological Function Value is a fairly new idea that encompasses ecological services and resource functions. Young then uses the ***'marginal opportunity cost'*** concept, viz. that all resources are bought and sold, at least, at their marginal opportunity cost. He states that this is a necessary, but not sufficient, condition for sustainable investment and resource use. Most competitive market prices fail to include lost ecological function, option, existence and bequest values (*Young, 1992*).

The problem for resource ecologists here is the assumption that everything can be adjusted at the margin. The concept of economic alternatives or product substitutes can break down in ecosystems where thresholds are passed and irreversible changes occur. By incorporating both ***`Polluter Pays'*** and ***`Beneficiary Compensates'*** principles, and necessary sustainability constraints to maintain future options and values, into the equation, Young has developed a model for the Sustainable Price for a Resource.

Environmental degradation exposes symptoms of maladaptive resource management and inadequate resource accounting. Only by substantially strengthening sustainability management and resource accounting practices can the impact of resource exploitation be reduced. Proper resource pricing needs to be part of this process. These models summarise key economic components necessary for basic resource accounting. The foregoing has highlighted the complexity of the issues involved in achieving sustainable resource use.

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[1] *`Option value" is the present value of opportunities to utilize the resource at some stage in the future.*

[2] *`Existence value' is the intrinsic value to society of irreversibility, uncertainty and uniqueness of the resource.*

[3] *`Bequest value' is the value that the community collectively places upon its desire to preserve the characteristics of a resource for future generation.*

This is exacerbated by difficulties that relate to achieving effective, efficient information transfer to resource managers. These include problems concerning:

- Information delivery and acceptance;
- Information incorporation;
- Attitudinal change; and
- Management behaviour change (adoption) (*Hynes and Mott, 1992*).

Concluding Remarks – a sustainable future for PACE-Net and the Pacific

Principles for a sustainable society

Court (1990) suggested the following **principles** could assist in clarifying sustainable resource use and maintaining ecologically viable systems and their survival.

1. **Sustainable development must grow from within a society. It cannot be superimposed from outside. Cultural integrity needs to be maintained.**
2. **It must maintain and restore biodiversity and employ sustainable resource use practices.**
3. **It must, with equity, provide basic necessities of life and secure living conditions.**
4. **It must foster self-reliance and responsible local control over resources.**
5. **It needs to be peaceful.** (*This is a very difficult condition to satisfy in a presently mainly male dominated world).*
6. **While it must allow for mistakes, these should not endanger the integrity of the ecosystem and its resource base.**

Understanding Environmental Systems and integrating both ecological and economic processes

The above principles need to be linked to ***research and management actions that address and embody the generic nature of sustainable resource management problems***.

- These problems are essentially systems problems. Aspects of behaviour are complex and unpredictable. Causes are multiple**.** ***Interdisciplinary, trans-disciplinary and integrated modes of inquiry are needed for understanding.***

- They are fundamentally non-linear in causation. They demonstrate multi-stable states and discontinuous behaviour in time and space. ***Here useful concepts come from non-linear dynamics and theories of complex systems (Hollings 1993).***

- They are increasingly caused by slow changes reflecting accumulations of human influences on landscapes and seascapes. They can cause sudden changes in environmental variables affecting sustainability. ***Analyses should focus on interactions between slow phenomena and fast ones and monitoring should focus on long to medium term changes in key structural variables of fluctuating environments.***

- Spatial connections are intensifying so that problems are now fundamentally cross-scale in space and time. ***The science needed is not only interdisciplinary but needs to be cross-scale. Multi-level analyses, hierarchical theory, spatial dynamics, event models, network analyses, remote sensing imagery, geographical information systems, parallel processing, can assist in opening new ways to handle effectively - analyses of more than two orders of magnitude. An understanding and application of the mathematics and modeling of emergent properties as a more powerful link between levels of scale above and below the systems investigated is essential.***

We have only usually been able to achieve satisfactorily linkages between two levels of scale up to the present. We must greatly improve on this performance.

- The economical and sociological components, as well as the natural science components, of these problems have an evolutionary character.
  The focus for natural science components relates to the dynamics of environmental and ecological change and is evolutionary, the best approach for economics and organizational theory is learning and innovation; and for policies - the best is adaptive designs that yield understanding as well as products (Hollings 1993, Hynes 1994).

The complexities of issues concerning natural resource sustainability are deliberately reinforced here. It is of no advantage to close this address without a deep recognition of this fact.
We need to think of relationships here in a new way. In the past there has been a tendency to place economy as the major driver. So in a three concentric circle framework Economy would occupy the larger outer circle, Society the middle circle and Environment the inner circle. I suggest this should be reversed - with Environment occupying the outer larger circle and Economy occupying the inner circle. Sustainable resource use practices are components of a critical process, which is concerned with the future survivorship of ecosystems and consequently the future survival of human life as we presently experience it. This is why we rapidly need to reprioritize how we treat our planet for our generations to come. We have little time but all of our human spirit and collective minds and bodies will need to address this challenge and win a future for our species.

To accelerate the development of the essential expertise required, I would like to suggest that a new science of complex analysis be created: A discipline that we might name *Ecologics*. Here economics and ecology are integrated as never before in the service of humankind and the biosphere (*Hynes 2009*).

Climate change threatens the whole human family (*Ban Ki-moon, UNDP Development Report 2007/2008*). Material growth using finite resources as if they have no limits, further threatens the future of our sustainability. Global breakdowns in the good governance of the world's financial systems aggressively erode our integrity and expose societies to extreme socio-economic risk.

Yet these crucial issues also provide an opportunity to come together to forge a collective response to these global problems. *New Wave* business structures and astute sustainable, natural and human systems management can play pivotal roles in these initiatives. These need to be coupled with enlightened attitudes and responsible resource management practices. PACE-Net and hopefully an INCONET project can be key contributors to this process in the Pacific. We need to rise as one to face these challenges. However, *Homo sapiens* as a generalist, has in the past, usually responded more - to major crises rather than having implemented disciplined strategic actions. The prognosis is extremely serious to say the least.
Let us not be too late!

Thank you for listening.
Tenk yu tru.

Ross A. Hynes
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