

With eloquence and humanity?

Human Factors / Ergonomics in sustainable human development

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Précis. This paper considers the emerging field of Human Factors / Ergonomics in Sustainable Development, and our potential associated roles as HFE professionals. It is based on a keynote address given by Dave Moore at the 18th Congress of the International Ergonomics Association in Recife, Brazil, in February 2012.

Abstract

This paper is based on a keynote presentation given at the 18th Congress of the International Ergonomics Association in Recife, Brazil, February 2012. It considers new, and not so new, approaches and practical roles for us as a professional grouping in the emerging field of Human Factors / Ergonomics (HFE) in Sustainable Development (SD). The material for this paper was largely drawn from the literature in the fields of human development, sustainability, climate change mitigation and adaptation, and social / environmental impact assessment.

Identifying the role of HFE in SD is not a simple one; and from the outset is complicated by the widely differing ideas in the sustainability literature about what exactly it is we are hoping to sustain. Is it: individual companies, business models, cultures or the carrying capacity of our planet? Or combinations of these? However, for the purposes of this paper, certain assumptions made, and various emerging opportunities and responsibilities associated with our changing world of work are introduced. Firstly there are new versions of traditional tasks for us, such as working with the people and companies in the renewable energy sectors. Beyond this however, it is suggested that there are emerging roles for HFE professionals in transdisciplinary work where we might play our part, for example, in tackling the twinned issues of climate change and human development in areas of significant poverty. In particular we have the tools and capabilities to help define and measure what groups have reason to value, and wish to sustain. It is suggested, that to do this effectively however will require a philosophical shift, or perhaps just a philosophical restatement at collective level, regarding who and what we ultimately serve.

Keywords: sustainability, sustainable human development, HFE in sustainable development, future of HFE

1. INTRODUCTION

“The future is already here, it’s just not equally distributed.”

This quote from American science fiction writer William Gibson appeared in an interview he did for *The Economist* in December 2003. Our future problems are already here, and biting, somewhere on earth; but so too, in all likelihood are the seeds of the answers. This has relevance when considering how we build understanding of our opportunities and responsibilities as a discipline and profession in relation to sustainable human development, and how we might best shape a response. It’s not a blank page. There are green shoots, both in SD and in HFE, but they are not necessarily where we would expect to look. This paper considers emerging opportunities for us which are really in many ways just business as usual but in new clothes. We can apply largely the same tools, work with the same people, write reports in the same language, publish in the same journals and magazines and get cheques from the same sort of places.

Beyond this though, there appear to be other quite different roles for us including ones in transdisciplinary teams addressing sustainable human development. This is not business as usual, but instead moves towards the type of potential HFE functions outlined by Neville Moray in his 2000 paper *Culture, Politics and Ergonomics*. The tools we need have to be modified or supplemented by imports from other field, for example social impact assessment; the team composition changes - providing collisions of world views; the readers of our reports include groups not directly written for previously; and the debates on where, when and if, to publish the work start on day one. Most significantly perhaps is the question of who pays us for this. If we added up all the paycheques ever written for HFE services in the world, the lion’s share of the cash would probably have come from: military, aviation/aerospace, petrochemical, information technology, automotive, heavy industry etc. Places with expensive systems, and expensively trained people to protect. Human development work in places threatened by climate change and debilitated by poverty, tends not to include the protection of expensive systems or expensively trained people. There is natural funder for our efforts therefore. Stand far enough back and look at our impact on raising the quality of human life around the globe, and philosophically, we are still just hired guns.

At the International Ergonomics Association Congress in Recife earlier this year a position paper by the IEA Future of Ergonomics Committee was presented (Dul et al. 2012). It proposed a strategy for the global development of HFE, led by IEA, that would enhance both uptake of our services and the quality of our work. This is an important initiative, which provides a vehicle for just such a philosophical advance.

2. WHAT ARE WE TRYING TO SUSTAIN?

The literature is heavy with papers that have Sustainability as a keyword, but as Andrew Thatcher (2012) has recently set out, there are clearly very different ideas in the heads of both authors and readers about what the word is referring to even though their definitions of Sustainability (where given) are generally aligned.

For example we could be trying to sustain:

- a particular company or industry,
- a business model – such as single species plantation forestry,
- access to buildings, transport or services,
- the usability of a product,
- our jobs or discipline,
- a community or nation,
- the carrying capacity of the planet sufficient to maintain humanity as we know it

To progress our understanding and improve clarity I would urge all of us writing about Sustainability to get beyond trotting out the standard Brundtland Report (Our Common Future 1987) definition of ‘meeting the human needs of current, as well as of future generations’, and instead to make it very clear what exactly is being addressed as our unit of interest - what specifically is that we are trying to sustain?

3. TRADITIONAL ROLES – NEW TASKS.

As the world changes so our roles as HFE professionals evolve, or they should if we are remain relevant. Margaret Hanson in her 2010 Donald Broadbent Lecture in the UK (2010) and subsequently through her work with the Green Ergonomics Special Interest Group of the IEHF, has highlighted a number of emerging areas of activity for us including: work with new types of jobs being created in the renewable energy and recycling industries; greener products; system design and user behaviour in low energy buildings; information design to better inform and influence consumer choices; enhanced business communication to reduce travel demand

In addition to these technology-linked opportunities though there are other changes afoot that create new roles for us.

Expanding labour pools to help older workers and their employers

Demographic changes in many parts of the world are resulting in an aging of the populations available for work. Compounding this for the primary industries, in places with choice of jobs, is a growing reluctance of young people to take on work with heavy manual elements, or factors involving constraints on social life such as long hours, early starts, and shiftwork. The service and IT industries based in town are often more appealing.

HFE expertise can assist by redesigning the jobs traditionally the domain of strong young men so that willing workers from a wider range of ages and abilities can do them. This expansion of the pool of potential employees clearly benefits the older workers; but it also helps the company. Most manual tasks these days also have a quality control element such as inspection; and the person best at achieving quality targets often isn't the physically strongest. Financial performance is hit far harder by rejection of container loads of their products once on foreign soil, than by slow stacking in their own warehouse, and so given the choice employers may well prefer to select on the basis of quality control ahead of speed. Whoever does this best should not be excluded by design of the job, be they 16 year old women or 70 year old men.

Whole value-network approaches

Trade between continents predated the modern concept of nation states as useful natural resources extracted or grown such as tin, iron ore, copper, hardwoods, wool and the skills to work them have never been equally distributed geographically. What is more recent is the ease with which complex operations such as the design and assembly of high value products can be distributed across an international network of partners.

Similarly, unacceptably high risk tasks can be exported far more easily to places where such practices are tolerated, creating even greater potential for abusive working conditions amongst local populations. A partial foil to this though is the growing sense of responsibility, or perhaps just awareness, amongst purchasers for their personal impact on the quality of life of those in supplier countries.

HFE practitioners and theoreticians clearly have some new aspects to their roles here; firstly, by working in combination across the countries involved in the network for the usual performance and wellbeing reasons. Secondly there is a crucial function emerging as interpreters and auditors of local standards and aspirations. Overarching statements about raising working conditions throughout the chain from the purchasing or consumer end chain require transformation into meaningful local measures in the supplier countries.

The imagery of a purchaser-influenced supply chain linking responsible shopper and smiling grower is actually far more compelling when viewed from the top end than it is from the other. For example, one European supermarket may buy from one offshore supply company, but they in turn buy from hundreds of farms, who in turn employ tens of thousands of people as regular, casual or seasonal staff over the course of the year. They also buy in services and contract out tasks to individual traders and other small firms. So from the country of origin perspective a supply chain can actually look more like a very fat mooring rope that has been unpicked from the distal end into its many thousand constituent strands. To extend the imagery, some of these strands are actually not joined at all, given the reliance on undocumented workers to meet peak demands at times like harvesting.

International attempts to improve conditions all the way down from consumer to picker, like the ILO Decent Work Programme, generally limit their ambitions to a stage just inside the border, for example at processing plants – before the exponential fraying really kicks in.

Given this reality, and the need for greater cooperative efforts between HFE professionals in different countries, it would make sense for HFE education to also look at ways of going global. Not only to facilitate useful professional friendships, build cultural knowledge, and to encourage us to acquire other skills and languages, but also to learn formally about key elements in global trade such as differences in employment law frameworks and how distributed manufacturing systems really operate. A further benefit could be the increased accessibility of world class teaching through intelligent use of internet. In Africa where the IEA has still barely troubled the cartographers, what other option do we realistically have?

4. BEYOND BUSINESS AS USUAL

The previous examples have been of naturally evolving HFE roles. These are part of the expected responses to ‘normal change’ - new technologies and demographic shifts with time. Providing HFE benefits to groups in non-standard employment seems to require something extra from us – a conscious change in our collective approach. Similarly contributing to the problems associated with addressing climate change twinned with the addressing of severe poverty. Normal adaptation isn’t working, or not quickly enough.

Better strategies and methods to help those in non-standard work

As alluded to in the previous section, the non-standard work sector remains a significant and overlooked issue for HFE as a discipline. Our approaches and methods in HFE evolved in an era of single income households and sole employers. De regulation of the labour market in many countries in the last twenty years has made increasing casualisation more possible and more attractive for employers. We now have fewer households with a single earner in a standard job, and more with multiple adults in multiple precarious jobs. In the UK, the social science literature has for a number of years been identifying the growing inequality as one of the major issues of the 21st century ... “the divisions between the haves, the have nots, and the never will haves.” (UK Commission on Vulnerable Employment, 2008)

The long term social costs of this greater flexibility for companies are high because of the compounding of risks for individuals and their families. But we don't know how high, partly because their transience weakens the surveillance data to such a degree. There are quite possibly also much more far reaching impacts of the growing inequity in income and social mobility. Epidemiological evidence is pointing to more equal societies performing better in many ways some say, and not only for the poorer but also for the wealthier in them (Wilkinson and Pickett 2009). Does HFE as a profession overall help narrow this gap, or widen it?

We also know though that the illegal and/or undocumented working migrant, the most elusive of all from a research standpoint, plays an essential part in most economies with sizeable peaks and troughs in labour demand. Growers around the world seasonally require large workforces for very short periods in thinly populated areas.

The business models and associated methods we take as default as HFE professionals working in industry struggle to (or often simply don't) accommodate people in non-standard work. When we encounter a group of 50 people for example that have 150 employers each week between them, who should we really send the final report and the bill to? We will continue to have minimal impact on the quality of life of these populations until our approaches, anticipated business models and tools evolve sufficiently to fit their lived reality.

Collectively don't we also need to be prioritising and internationally coordinating work with these populations in order to narrow the inequality that follows naturally from simply leaving our engagement to market forces? This would represent a step beyond business as usual.

Sustained human development, consistent with required climate change actions

The overwhelming evidence of the need to respond to climate change is matched by the underwhelming response in most countries. I am not qualified to set out a scientific argument of what will or may happen, but for the purposes of this paper we can accept that the changes will include an increase in extreme natural events. (Lord) Nick Stern of the UK suggested recently during a lecture tour here in New Zealand that these events will be probably costing the USA an extra US\$85 billion by 2015. He concludes that with such high stakes it is 'simply reckless to ignore it'. (Stern 2010)

However, even if all the wealthier countries that are responsible for most of the damage so far were to make the required changes to mitigate further impact this would still only partly address the matter. The problem would remain of the new sources of significant damage emerging from developing economies as they take up the environmentally unsustainable industries and appetites that western consumers have enjoyed in recent decades. Rapid human development amongst these populations is desirable and entirely fair, but it can't be at the expense of the environment as we enjoyed in the West. Stern therefore links the two aims 'we will succeed or fail on these challenges together'.

Earlier we asked the question, what is it we are really trying to sustain when we talk about sustainability and HFE? At the highest level, it could be argued that rather than simply raising the quality of human life, 'contributing to human development consistent with the necessary action on climate change' could be a more fitting overall aim at this point.

Climate Change, consumers, HFE and un-freedoms

As mentioned earlier, one of the areas of focus amongst the Green Ergonomics community is the design of systems that help consumers, who so wish, to use less power in their homes and at work. There are some very fundamental ways in which our knowledge can assist in this. And it's nothing new. As Colin Drury pointed out at a recent IEHF conference (Moore, Drury & Zink 2011) any text on Human Control Models from the 1950s onwards would provide the necessary framework. People need to be able to build an accurate mental model of where savings can come from, and to then have the control and feedback to achieve these.

Smartmeter systems being introduced in some countries now enable both consumers and suppliers to monitor real-time usage. The customer can learn to link power usage to specific actions with specific appliances; and each individual plug is monitored in some systems.

Why have HFE professionals not been consistently involved in this kind of consumer system work in the past around the world? I suspect simply because in most countries no one has offered to pay us to do it. Power companies may like the prospect of better managed peaks of demand but have certainly have not had reason under normal market conditions to encourage lower usage overall. The opportunities for us in this area seem to be limited at present, but there is no reason why consumer demand in other parts of the world outside the EU should not push this on. Deregulation of power industries has led to a proliferation of providers, and greater mobility of customers. Such metering and learning could be attractive to end users and our discipline is well placed to advertise the benefits.

The complexity of such metering looks set to grow. Distributed power generation systems providing locally owned, produced and employed electricity which feeding surpluses back into the grid have multiple potential benefits regarding local control, efficiency and infrastructural resilience. But to achieve real gains the systems need quality HFE input. Recognition of this at Ministerial level of Government is essential if HFE services are to be built in at the right stage in planning and design. We can leave it to chance that someone from the HFE community has moved into a position of such influence and retained an HFE advocacy role, or consciously prioritise lobbying as a collective force.

If the discipline has a socio-political function then promotion and facilitation of such systems perhaps sit within it. The advertising industry here in New Zealand like to defend their place in the world by saying that they provide individual people with the freedom to choose. HFE has a stronger claim to this I suggest. We have the capability though to actively intercede in cases where information asymmetry is diverting people from a desired path i.e. people want to use less power, but the systems are designed to discourage it by making it difficult to develop accurate mental models. This could be seen simply as removing an 'un-freedom' to live the lives we choose to value, as Amartya Sen (1999) might put it.

HFE in extreme natural events



Field ergonomists around the world work with those who do their job in extreme environments; at altitude, under thermal stress, in dust or even all of the above simultaneously. There have been suggestions in the literature and the media that the impacts of climate change on our working lives may be most noticeable in increased personal risks for those labouring in the hotter, drier, windier or wetter conditions that climate change are expected to bring. This may turn out to be true, and if so we will again be well equipped to help.

Figure 1. Earthquake damage. Christchurch, New Zealand 2011. Photo by Dave Moore

Another interpretation is that underlying demographic shifts brought about by changing markets and altered perceptions of risk by re-insurers will actually impact lives far more.

A handwritten note thanking neighbours was left wired to the gate of a house demolished in 2011 in Sumner, Christchurch after their big earthquakes. The spirit of mutual help, determination and optimism that are commonly exhibited at such times of crisis came through very clearly in the message.

...buildings don't make good times, they don't make families and they don't make communities. People do and we live in an awesome community. Go Sumner, Go Christchurch, Go Canterbury. Thanks New Zealand.

This was an earthquake with widespread liquefaction, not a storm event or normal flooding potentially exacerbated by climate change. We mention it here because the more long lasting damage in the Canterbury region of New Zealand is not to infrastructure, but to community resilience and confidence through the multiple effects of severe social dislocation and disruption. As is too often the case after water inundation, over a year later many residents of this area are still waiting for insurance payouts to repair or demolish properties. Some have lost jobs or whole businesses, and others have children traumatised by the thousands of aftershocks. For those wanting to rebuild in the city, there are multiple uncertainties including: the increased costs of borrowing; future demand for services; population drift; tourist numbers; family willingness to remain and values of assets.

There are identified factors which make things worse after natural disasters. Low levels of resilience (in the various forms) amongst the population; poor central preparedness; slow reinstatement of utilities, schools, communications and transport; slow and/or unhelpful insurance service providers. Communities especially vulnerable through having a combination of these are more susceptible to panic buying/selling, rises in crime, and ill-health related overcrowding, stress and fatigue.

And any natural disaster site where the financial markets believe the same thing could happen again will have similarities in this regard. Historically we have dramatic examples of this. John Steinbeck's powerful and famous novel the Grapes of Wrath was set in the USA in the 1930's; the characters were those caught up in the mass internal migration of people from Dust Bowl farming communities pressured into looking for casual work in California. People are always on the move, hoping to improve their circumstances, but it is the scale and timing of enforced large internal migrations that lead to extreme social costs borne by regions at large.

To professionals who are seeking ultimately to improve quality of human life, mass social dislocations and the damage that follows represent immense setbacks. Decision making under conditions of trauma and dislocation is more short term and desperate, with ensuing accelerated loss of various forms of capital: economic, natural/environmental, human health, social and physical.

Figure 2 sets out five areas of HFE engagement to minimise the impacts of extreme natural events exacerbated or prompted by climate change

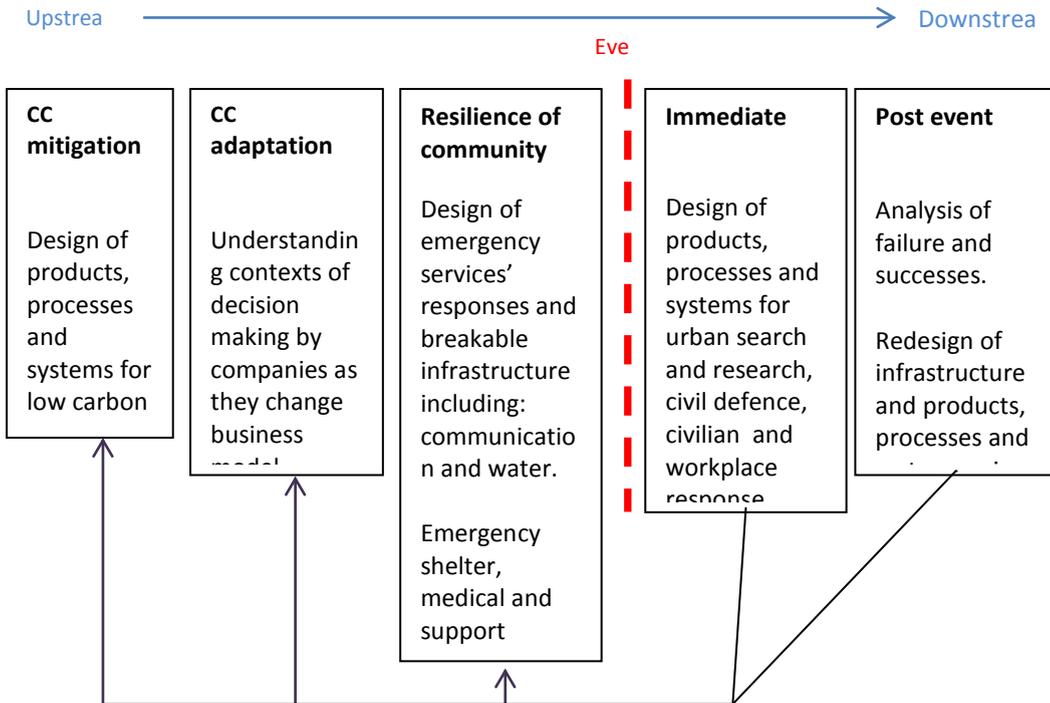


Figure 2. Extreme natural events and examples of growing HFE roles

The first is mitigation, the ways in which we can help slow and reverse the mechanisms causing the changes. Downstream from this there are roles for us assisting adaptation to a changed climate, and beyond that readying populations by helping build resilience within communities and services.

In the immediate aftermath of an event there are clearly many emergency services areas where HFE expertise has assisted in the past and can continue, especially as new technology emerges to coordinate and aid search and rescue efforts. The fifth and final section is perhaps overlooked. There is clearly need to learn from past weak performances, but in many situations the infrequency of event makes de-briefs by Councils and the other bodies less effective. As a discipline we have a rich history of evaluating system performance, especially in stressful contexts such as combat or extreme physiological or emotional duress. We can anticipate where weaknesses are likely to be, and can help develop in advance systems for objectively and unobtrusively gauging performance that will offer clues on how to reduce the gross trauma next time.

There are some crucial strengths we bring to this that make HFE particularly suited to assist.

- systems approach
- drive to understand human differences
- desire to create
- willingness to work in teams of specialists

Human Development: people as both the beneficiaries and drivers of change

As mentioned earlier, there is a compelling argument being made now that the issues of Development and of Climate Change are critically linked. Development historically was taken to mean economic development (latterly Gross Domestic Product - GDP) as it was assumed that everything else flowed from that, but in the last twenty years there have been significant changes in the way Human Development is understood, and measured. While money is clearly important, it is not the only variable controlling progress, nor is it the only asset valued by populations.

Playing a central role in this change has been the United Nations Human Development Report (HDR) produced each year by the UN Development Programme under the subtitle 'The Real Wealth of Nations'. The first report opened with the line 'people are the real wealth of nations'. The international community of contributors generates and interprets multiple values relating to economics, health and education and a growing list of other areas, to track progress (mostly) and decline (sometimes) annually across the globe. The first report was applauded as, 'with eloquence and humanity it put people at the centre'. (UNDP 2010)

And eloquent it has been. The definition of Human Development used by UNDP has evolved over this time but invariably has had real resonance, I believe, with our values and approaches in HFE.

Human Development is...

The expansion of people's freedoms to live long, healthy and creative lives; to advance other goals they have reason to value; and to engage actively in shaping the development equitably and sustainably on a shared planet.

People are both the beneficiaries and the drivers of human development, as individuals and in groups.

(UNDP 2010)

Transdisciplinary work in New Zealand

An example of such a transdisciplinary study with HFE input was one conducted in New Zealand in 2011-12 (Porou et al 2012). The project called for estimations of the socioeconomic impacts of historic environmental actions. To do this it was necessary to develop a set of measures against which past and future impact could be gauged. These measures clearly needed to reflect the collective world view of the people concerned, and it is to be expected that that would differ from that of the predominantly European population. Beyond this world view, very specific social and cultural aspirations needed to be grasped and expressed as measurable indicators. The contribution of the HFE specialist was in the development of these indicators. The participation of indigenous groups in such exercises in New Zealand has generally been low (Jollands and Harmsworth, 2007).

The study area was in the eastern part of the North Island of New Zealand, and its catchment area has substantial environmental and related social problems – not uncommon in remote rural areas around the world. Mostly steep and bush covered at the time of European settler arrivals, 70% of the native cover was cleared for farming between 1890 and 1920. This resulted in massive erosion, formation of gullies, sedimentation of waterways and loss of biodiversity including traditional food sources. Physical scientists estimate it will take between 60-100 years at best to repair the damaged environment.

Predictably there has been extensive migration of population out of the area related to the reduced carrying capacity, two world wars and the normal urban drift of younger people for education and wider opportunities. There are less people there now than were supported by the land prior to European contact and the severe decrement in land condition attracts scientists from around the world wishing to observe erosion damage at advanced states.

Despite large scale centralised efforts by Government to establish plantation forestry to both slow erosion and create jobs, the level of socio-economic deprivation in the area remains one of the highest in the country and accelerated erosion continues. The purpose of the study was to describe the social, cultural and economic dimensions of erosion in the catchment as it related to the local tribe (iwi) in order to inform future policy. The team included specialists from planning, social anthropology, economics, physical sciences and HFE. It built on previous work, some of which (including Jollands and Harmsworth 2007), but not all, had been publically reported.

Findings from these had made it clear that for many the fact that the erosion had been allowed to become so bad was symptomatic of wider weaknesses in community engagement by decision-makers, notably lack of autonomy and insufficient recognition of their rights in local governance (mana motuhake). The imposition of an externally

derived solution, to what was perceived to be an externally created problem, had failed to engender the support of local people. Furthermore, the solution itself failed to acknowledge or accommodate the assets held within the community.

A number of tools for establishing and monitoring community assets and aspirations were employed that reflected a familiar systems approach, but which are not normally seen in HFE projects.

Sustainable livelihoods framework. For example, the Sustainable Livelihoods Framework (SLF) comprises five forms of Capital or livelihoods asset types: Human, Natural, Financial, Physical and Social. The SLF is a valuable template in that it provides a workably comprehensive and balanced starting point for assessing, or tracking, the health and resilience of a population and their vulnerability to shock events.

Within each of these asset areas indicators are needed to measure state. These indicators must reflect genuine values held by the population in question. For example, in this study the ability to feed themselves entirely from the land again, and for the catchment area to provide employment for all iwi members were two aspirational indicators.

Functional Evaluation Framework. Another valuable model is the Functional Evaluation Framework (FEF) shown in figure 3 (Slootweg, Vanclay and van Shooten, 2001). The FEF presents community aspirations as the Demand Side, and the Natural Environment as Supply. Mismatches between the two, such as carrying function – for example inability to provide enough food for the population, or an infrastructure too often damaged by slips and erosion to support business, these trigger intervention design at an institutional/policy level.

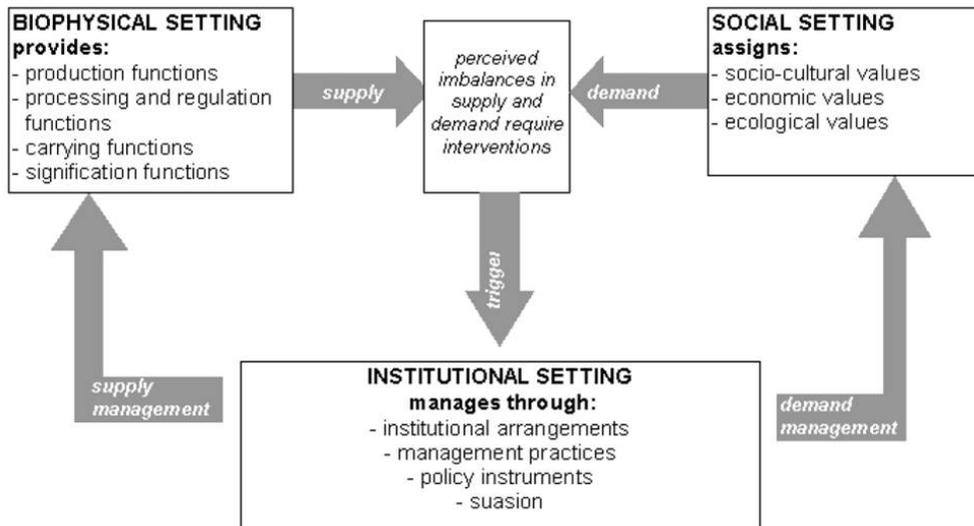


Figure 3. Functional Evaluation Framework (Slootweg, Vanclay and van Shooten, 2001)

These indicators may then be plotted as criteria on a Functional Evaluation table that integrates community aspirations with biophysical states, as shown in table 1.

Table 1: Iwi criteria set within a conceptual Functional Evaluation table that integrates community aspirations with biophysical states.

Demand Side - aspirations		Supply Side – what the environment provides			
Slootweg model category	Iwi	Production Functions [of useful products for humanity]	Processing and Regulation Functions [maintenance of ecosystem services]	Carrying Functions [ability to accommodate human demands – habitation]	Significance Functions [as a host for ascribed human aesthetic and spiritual values]
Socio-cultural values	<i>Iwi are never hungry and can feed themselves and their whanau from the land.</i>	Strong evidence of decline in traditional food sources and degradation of productive land (Maara) to support the community.	An area of significant mismatch. Resources diminished by inability of environment to recover from shocks – erosion, forest clearance and extreme weather events.	Considerable reduction in carrying capacity.	'If the river is sick the people are sick'. Inability of the land to support Iwi presumably reflects symbiotically and negatively on Iwi.
	<i>All iwi members have suitable job opportunities in the catchment area.</i>	Diversity of products (and employment opportunities) from catchment has decreased for a variety of reasons including inappropriate decisions over land use and a decline in environmental quality. More local economic activity needed (e.g. Manuka honey) to provide a range of locally owned businesses and jobs	Resources needed to support economic activity, and employment generation, are diminished by an inability of the environment to recover from shocks – erosion, introduction of exotic and pest species, forest clearance and extreme weather events.	Erosion increases damage to infrastructure and the costs associated with establishing and maintaining employment generating activity.	The creation of job opportunities for iwi within the catchment is closely linked to cultural identity and the restoration of the relationship of the people to the land and the river, including the return of iwi who have left the region. Lack of employment opportunities, leading to no in-migration of iwi, poverty, and continued out-migration further undermines cultural identity.

NB. This table serves only as an example of the potential use of the framework. The contents are extrapolated from the literature review in Porou et al 2011.

Culture as part of social capital. A strong feature of the studies of this type are the reemphasis of the centrality of traditional culture, including the crucial identification with the land that generates pride and a sense of self and worth in the eyes of others (mana). Policy interventions commonly fail to acknowledge fundamental differences in world views and values.

So, if we are trying to sustain rapid progress in human development consistent with the necessary action on climate change, then cultural factors and the assets held by communities may well be crucial to success. The

UNESCO Declaration on Cultural Diversity states that cultural diversity is as necessary for humankind as biodiversity is for nature (UNESCO 2002). Cultural values may well act as cornerstones of resilience, and also hold intergenerational knowledge on how to thrive in their specific environments through tough times.

In taking a systems approach to Human Development work in any community it appears that there is an important role for specialists who can build understanding about the characteristics of people: including not only their physical and cognitive capabilities and limitations, but also the unique sets of aspirations, knowledge and skills that they have reason to value. Without this understanding the interventions will fail to put the people genuinely at the centre

6. CONCLUSIONS

We need to be far more specific about what we are trying to sustain when discussing sustainability. There are many possibilities, and the debate so far has been muddied unnecessarily.

There are new tasks for us which are really in many cases extensions of traditional roles. A greener economy will generate new jobs, products and processes for us to help design. Demographic changes mean that expanding potential labour pools by making jobs more accessible to help older workers and their employers may well be an increasing focus. Adopting a more internationalist approach to both our education and practice - in keeping with the increasing globalisation of the world of work should be another.

The impact of 20 years of deregulation of labour markets has combined with this and other factors to produce a situation where HFE field approaches and methods that were developed in the predominantly 40hr week/one job per family per household environment of the 1960s onwards, are increasingly questionable. To study and help improve the quality of life of the millions in non-standard work who have a cocktail of jobs, paid and otherwise, we need to refocus once again on the person. This is easier said than done of course, as these are not the people who write the cheques that keep our consultancies and research centres afloat. Again, we need to consciously prioritise what we are trying to sustain.

With increasing urgency we need to address the question of how we may play our part in the massive issues facing us regarding the interlinked issues of climate change, and poverty/inequality in various forms. Reducing the impacts of the projected increase in extreme natural events is one possibility, and designing systems that allow consumer market forces to operate with less distortion in the energy sector could be another. Championing approaches within transdisciplinary teams that place the people at the centre as 'both the beneficiaries and also the drivers of change' (UNDP 2010) would probably be the most valuable but also most demanding.

The findings of the IEA exercise on the Future of HFE (Dul et al 2012) referred to in the introduction to this paper are now being discussed at national level by the IEA federated societies around the world. In doing so, we once again need to ask honestly what it is we are actually trying to sustain.

Hopefully, it is the increasing effectiveness of HFE professionals to help address real world issues.

KEY POINTS

HFE professionals, and others, must be specific when talking about Sustainability. What it is exactly we are trying to sustain?

There are, as usual, changes going on in the world which impact on the types of tasks we are asked to do in HFE. Today these include working with an aging workforce, adapting to globalised methods of working in extended value/supply networks, and changing our approaches to provide a meaningful service to the section of the population in non-standard employment.

The twinned issues of climate change and poverty alleviation probably require us to more formally build a role for HFE in transdisciplinary teams that aim to sustain human development consistent with the necessary action on climate change.

Biographical notes

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