

Failure of mainstream well-being measures to appropriately reflect the well-being of Indigenous and local communities and its implications for welfare policies

Kamaljit K. Sangha

Darwin Centre for Bushfire Research,

Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, NT 0810

Email: Kamaljit.Sangha@cdu.edu.au

Abstract

Most current well-being measures ignore the contributions of natural systems in people's well-being. Evaluating the role of natural resources in well-being is particularly important for many Indigenous and local communities to appropriately reflect their well-being and to inform future welfare policies. It is well acknowledged that Indigenous and peoples' values and customs are well integrated with natural systems, and inclusion of these nature-related attributes into well-being measures is required to accurately measure Indigenous/local well-being. This study reviews the available well-being frameworks from global as well as from local—Australian perspectives; and proposes a holistic approach to assess the role of natural systems for human well-being using how Indigenous and local peoples' social, economic and ecological values, and capabilities relate to natural systems, that can inform broader human well-being attributes. Both, Capability and the Millennium Assessment Approaches are analysed and applied to develop an integrated framework. This paper emphasises the importance of each connection that people may have with nature to consider for developing better-informed policies on Indigenous and local peoples' well-being as well as on the use and management of natural systems.

Keywords: Ecosystem services, Well-being, Indigenous, Millennium Assessment, Socio-economic-ecological framework, Ecosystems and Natural Resources.

1. Introduction

Globally, many Indigenous and local communities are well connected to nature (Posey and Oxford Centre for the Environment, Ethics and Society 1999; Maffi 2001; Sangha et al. 2018), yet the attributes typically applied to measure the well-being of Indigenous and local communities across the globe fail to incorporate nature-related attributes. Costanza et al. (2014) highlights the role of nature towards human well-being while emphasising the need to update current human well-being and development measures for including nature-related attributes.

Indigenous and local peoples' nature-related values and traditions offer valuable insights to develop a fresh perspective on well-being measures that could be useful for wider public (Altman et al. 2011; Sangha et al. 2011 and 2018). By analysing the role of nature and its resources towards Indigenous and local peoples' well-being and evaluating each such link affords a much-needed in-depth knowledge to guide the future well-being measures not just for Indigenous and local communities but also the broader community, policy decisions on well-being as well the use and management of natural resources.

This paper reviews the basic concepts of human well-being that are typically applied across the globe. Indigenous communities in Australia are used as an exemplar for this study because of being one of the oldest peoples on earth (Rasmussen et al. 2011; Malaspinas et al. 2016), who have retained their well-established connections with nature for various cultural, identity and spiritual values (Rose 1995; Sangha et al. 2011 and 2018; many others). It reports key global initiatives, mainly originating from nature/ecology and economics related disciplines, where attempts have been made to develop a well-being framework incorporating nature-related services i.e. ecosystem services (ES; services and benefits that people receive from the natural systems). Such global initiatives can prove useful to

develop appropriate well-being measures by including non-monetary (intangible) attributes and underlining their importance for modern economy and development programs.

2. Review of human well-being concepts and current measures

The well-being topic is widely researched. Well-being literally means living happily or leading a satisfying life. Different approaches (Millennium Assessment (MA) 2003; Prescott-Allen 2001) have led to several definitions and conceptualisations of well-being (as reviewed by Alkire 2002a). As OECD (Organisation for Economic Co-operation and Development 2011) states, there is no single definition of human well-being because the term includes several facets with complex interactions and the respective importance of each aspect is difficult to identify.

However, there is a basic agreement that “well-being” includes satisfactions of material needs, the experience of freedom, health, personal security, good social relations and healthy natural environment (Alkire 2002b; Sen 1993 and 1999a). Three main philosophical approaches used in well-being are outlines below (Diener and Suh 1997):

1. Economics (choice utility) approach considers that people select things and activities that enhance their utility within the constraints of resources they possess (utilitarianism). This approach is based upon levels of satisfaction that a person achieves from consuming a good/service.
2. Sociological (normative ideal) approach is based upon cultural, religious, philosophical or other norms and ideals considered important for well-being. Optimal levels of health, income and other economic resources are determined, and well-being is measured relative to those reference points.
3. Behaviour/Psychological Sciences (subjective experience) approach believes that different people have different value systems, so personal characteristics determine the type of attributes important to people. Hence the values of well-being will be different for different people.

There are concerns with the above-mentioned approaches for the kind of attributes, focus on subjective and/or objective attributes and for the overlap of concepts such as human welfare/quality of life/development (Busch et al. 2012). However, most of the work reported so far on human well-being by the socio-economic institutions is focussed on utility-based approach which primarily reflects the economic well-being. Typically, the economic resources are, more or less, considered as the basis to have a ‘good life’ as the economists view holds well-being as ‘developing options for people to have choices by increasing utility or consumerism’ (Human Development Report 1990). Therefore, the attributes that are generally used to measure well-being are based upon economic resources and ignore any connections that Indigenous and local peoples’ may have with their natural systems.

Historically, GDP (Gross Domestic Product)/GNP (Gross National Product) are used to measure human development which is based upon income related measures. Recently, many ecological economists (Costanza et al. 2014; Daly 2013 and others) have promoted the idea of moving away from GDP to achieve sustainable growth. In the last 5-10 years, there are significant advances on global scale for including environment or sustainability related attributes into economic welfare measures, such as ENNP (Environmental Net National Product) or SEEA (System of Environmental Economic Accounts), SNI (Sustainable National Income), ISEW (Index of Sustainable Economic Welfare), GPI (Genuine Progress Indicator), Inclusive Wealth measures or related indices (UNU-IHDP and UNEP 2014) that have a strong focus on economic welfare with some degree of sustainability component and these have been applied by some developed (OECD) countries (Costanza et al. 2007; Kubiszewski et al. 2013). In most of these sustainability indices, there is an attempt to adjust income as sustainable income by including pollution cost, depreciation/loss of natural capital or value of non-marketable services as the contributing factors towards environmental sustainability. Among, all Inclusive Wealth measures seems more promising for including human, produced and natural capitals. Whereas, some other indices on human development such as HDI or

Human Needs Assessment focus on human needs perspective, or the Quality of Life (QOL) indices mainly focus on subjective and objective well-being of people. The QOL index developed by The Economist Intelligence Unit (2005) includes subjective and objective measures such as health, family/community life, material well-being (GDP/person), political stability and security, job security, etc. but fails to incorporate ecological attributes except for climate and geography. Similarly, Human Development Index (HDI; Human Development Reports 1990 and onwards) focuses on three attributes of human development i.e. health, education and income. Whereas, some environment related indices such as ESI (Environmental Sustainability Index) which is a composite index of 21 attributes on environmental sustainability includes pollution levels, environmental management efforts, natural resource endowments, etc. but excludes integration to human well-being.

Some other studies have attempted to include natural systems as a capital such as National Well-being Index (NWI; by Vemuri & Costanza 2006) that includes built and human capital (as in HDI), social (as freedom to press) and natural capital (as the value of ES/km²). There are issues with NWI for estimating the value of ES on a national scale when there are often flaws in measuring the type of ecosystems, area and the type of services that ecosystems provide, and also for excluding the context specific well-being on how people perceive value of their ecosystems. None of these measures include natural systems or their services as a foundation of human well-being, as claimed by Daly (1996; 2013) and others. It is still a challenge to develop an integrated measure of well-being that includes socio-economic and ecological perspectives.

Another major issue in existing indices is failure to incorporate many intangible services of natural systems that are particularly important for Indigenous and local communities. There are many benefits of ecosystems (e.g. spirituality) that are beyond any price tag. To date, the intangible ES are often ignored in policy decisions mainly due to the nature of these ES (e.g. cultural/spiritual/identity services), imperfect markets, or for considering these as 'free' of cost since these services were available in plenty in the past (Satz et al. 2013). The sustainability and other indices (as mentioned above) may have included the value of tangible but not of intangible services that play a vital role in human well-being, for example many spiritual and cultural services are particularly vital for Indigenous and local communities.

In Australia, the Australian Bureau of Statistics (ABS 2001: 6) defines well-being as 'a state of health or sufficiency in all aspects of life'. Well-being is measured applying a socio-economic approach for all Australians (some recent advances on Indigenous specified well-being framework are discussed in the next section). The ABS (2001) uses socio-economic characteristics such as economic resources, work, education and training, health, housing, family and community, crime and justice and, culture and leisure. The ABS also measures 'is life in Australia getting better?' focussing on social aspirations (Measures of Australia's Progress; ABS 2005 & 2010a). Apart from the ABS, a private organisation, the Australian Unity (Cummins et al. 2003), also measures well-being applying a ranking technique for subjective measures of well-being such as how satisfied you are with life, standard of living, health, personal relationships, etc. The other social organisations in developed countries such as OECD use a similar list of social-economic indicators (health, education and learning, employment and quality of working life (*cf* the economic resources used by the ABS), physical environment (*cf* housing in the ABS list), social environment (*cf* family and community in the ABS list) and personal safety (*cf* crime and justice in the ABS list). Income is a very important attribute in these measures that is further nested with housing, work, and education and training. There is no consideration of nature-related attributes that may be important for Indigenous well-being. Hence, the current ABS socio-economic framework (2001) fails to incorporate Indigenous needs and aspirations in relation to natural systems.

In contrast to the above-mentioned measures, Sen (1993; 1999a&b) proposed a Capability Approach that emphasises human capabilities (ability to do/achieve i.e. doings and beings) such as freedom, inequality and rights that are important in the well-being of an individual and focuses on people's

ability to lead lives which are valuable for them. For example, health and knowledge are two capabilities that contribute to an individual's well-being, and from 1990s onwards, these attributes were adopted by the United Nations Development Programme (UNDP) to calculate HDI worldwide. Sen's Capability Approach is examined in here applying Indigenous perspectives.

According to Sen (1999b) the basic objective for development is to create an enabling environment for people where they can enjoy long, healthy and creative lives; however, this is often forgotten in accumulation of commodities and financial wealth when measuring development of people. It is important to note that in Australia where income and related attributes are largely applied in the socio-economic attributes, income *per se* may not hold completely true to reveal well-being in the present time, particularly when the minimum threshold of income is reached. Given that people have a threshold level of income, well-being should ideally depend upon other well-being attributes such as people's capabilities to make use of their income. One may have a higher level of income but may not know how to use it properly, whereas, someone with a low level of income may be able to use it efficiently (Sen 1999a). As Sen (1999a&b) states that no doubt income is a good proxy but it is a means to reflect well-being of people, not the end. Moreover, income and related attributes may not suit to many Indigenous people as the emphasis of economic well-being approaches is largely on utility (tangible values), not on the intangible values that Indigenous people may have for the natural environment.

This paper argues that when income is not a major issue, given the access and security of basic necessities for living (i.e. income, health and education), then developing peoples' capabilities such as improved knowledge and skills and making use of those capabilities seems to be the major aspects for enhancing people's well-being. It is important to note that capabilities include connections with land and spiritual or cultural knowledge that make people feel well.

This idea of development, in terms of enhancing capabilities for long, healthy and creative lives requires thorough re-examination in developed countries (Sen 1999b), especially for Indigenous communities. If development is ought to be achieved, then it is worth examining whether people have appropriate opportunities to develop and use their capabilities in a productive way to lead meaningful and creative lives. Many Indigenous and local peoples afford values that are beyond the materials or financial wealth but are an integral part of well-being (as discussed in the next section).

Currently there is a broader recognition that the natural environment plays a vital role for human well-being. In 2001, the United Nations commenced first of its kind programme —Millennium Ecosystem Assessment (MA), that highlighted the role of natural systems for human well-being. The MA (2003) defined human well-being as having 'multiple constituents, including basic materials for a good life, freedom of choice, health, good social relations and security' that directly link to natural resources and their ES; thus providing an innovative perspective compared to the earlier socio-economic concepts of well-being.

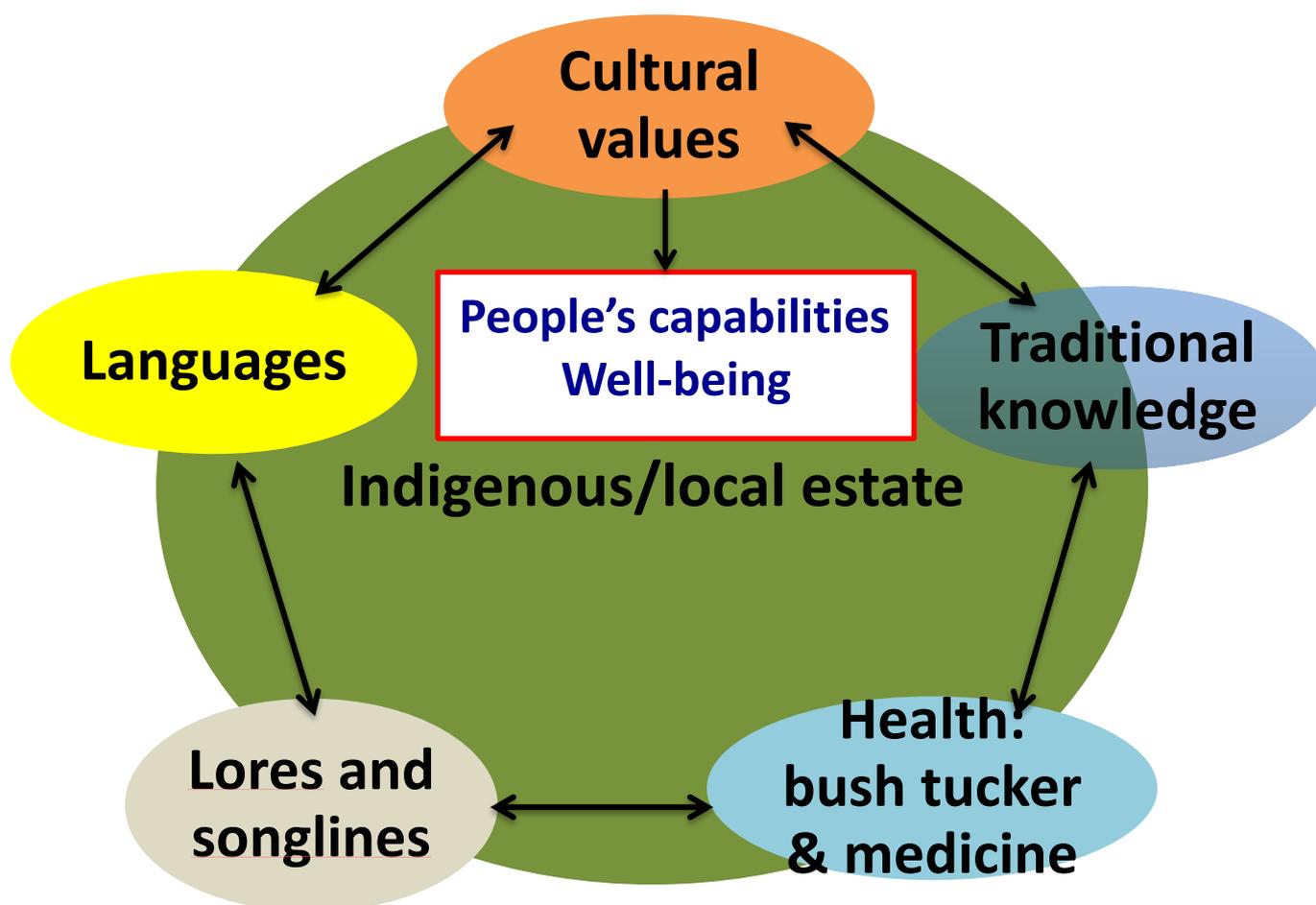
3. Demonstrating Indigenous and local communities' connections with nature: an Australian Example

Worldwide, many Indigenous and local communities are directly connected to their surrounding ecosystems for their living, and it also as reflected by their knowledge of plants and animals (Posey and Oxford Centre for the Environment, Ethics and Society 1999; Maffi 2001). In Australia, there is a significant literature suggesting people's social, spiritual and cultural connections with nature (e.g. the Australian Institute of Aboriginal and Torres Strait Islander Studies 1994; Altman 1987 & 2004; Bunya Mountains Elders Council and Burnett Mary Regional Group plan 2010; Dodson 1997; Kaur 2006 & 2007; Keen 2004; Queensland Murray Darling Committee 2008-2011; Sangha et al. 2011; the Wet Tropics Aboriginal Plan Project Team 2005). Rose (1995) suggested that land defines identity for people, elders and future generations. Traditions, history and people's relationship with sites are

passed on from one generation to another and are of paramount importance in the well-being of an Indigenous society. These reports indicate that people’s traditional relationship to land is profoundly spiritual. Land provided people ceremonial objects, the sacred names, the kinship, and languages, demonstrating that diverse connections with land are central for the well-being of Indigenous communities.

Indigenous ‘closeness’ with nature is clearly evident from the intricate relationships between people’s physical, spiritual and human worlds and from the values that people have about their traditional system for bush food, rituals, totems and the kinship system that involved responsibility to care about different components of nature (Altman 2004; Bunya Mountains Elders Council and Burnett Mary Regional Group plan 2010; Queensland Murray Darling Committee 2008-2011). From an ecological perspective, many of these values represent the ES that people obtain from their ecosystems. These relationships are described in an integrated model suggesting how various components of Indigenous life i.e. social, economic and cultural aspects are linked to the natural ecosystem (Fig. 1). There is a mutual exchange between the ecosystems and the Indigenous economy, social and cultural worlds. For example, people developed lore and rules on sustainable use of bush food, or totems to take care of a particular component of an ecosystem. There was a ‘belonging to’ kind of relationship with the ecosystems as people being a part of the whole ecosystem/nature. We acknowledge that to date, some Indigenous people may not be fortunate to live on their land, but they are still connected with land for their traditions, culture and identity (as evident from the ABS 2012a report and above-mentioned reports).

Fig. 1. Indigenous and local peoples’ estate (land and water systems) supporting peoples’ culture, traditional knowledge, health, lores (cultural regulations/obligations/beliefs) and languages. The knowledges and skills for each of these elements further builds peoples’ capabilities and contribute to their well-being.



These connections do not account into well-being measures used for Indigenous Australians. Demographically, according to 2016 census, the Indigenous population represents 2.8% of total Australian population (649,200; ABS 2016 and 2012b), but there is no specific well-being framework that addresses Indigenous people's connections to nature. Indigenous well-being is measured applying a socio-economic framework (ABS 2001) that is applied to all populations in Australia which suits mainly non-Indigenous people, but not the Indigenous people (Taylor 2008). Taylor (2008) suggested that there is a need for a recognition space to incorporate Indigenous people's connections to land to properly measure their well-being. Grieves (2007) proposed a framework on Aboriginal cultural activities suggesting that well-being has a much broader meaning for Aboriginal communities than what is often perceived just from health perspectives in the Australian Government policies.

Apart from lack of appropriate Indigenous well-being measures, another concern is that well-being of Indigenous Australians is much below that of the non-Indigenous people despite many Government initiatives over the last 20-30 years (ABS 2012b). This is also evident from the HDI values where all Australians rank second in the world list (0.968) while Indigenous Australians rank 105th (0.737; Yap et al. 2010). This is also contributed to lack of access to land and country that Indigenous people belonged to before European occupation and that has contributed to various aspects of Indigenous lives (Altman, 2004).

Recently, there are advances by the Australian Institute of Health and Welfare (2011) to highlight connections between Indigenous health (one aspect of well-being) and land. Altman *et al.* (2011) also emphasized the importance of natural resources in Indigenous people's socio-economic lives. To address this, the ABS Indigenous Policy and Engagement Group (ABS 2010b) developed a framework for Indigenous Australians that represented interactions of Indigenous people with their socio-cultural and economic environments (figure 3). However, it fails to incorporate any direct connections that Indigenous people have with their natural environment. It focuses on social and cultural aspects to a greater extent compared to the ABS (2001) socio-economic well-being framework, as an additional domain. However, in this framework (ABS 2010b), there is no mention of the kind of connections between people and land or homeland (access/security) or related services that people derive from such connections. It only highlights that people identifies themselves with cultural groups, but it does not explain how people are connected to their homeland/country or other natural resources. Moreover, it has not been applied to the wider public.

The Australian Institute of Health and Welfare (2011) also reported a framework on the links between health and the natural environment. In this framework, the global and natural ecosystems influence human health (i.e. one aspect of human well-being) but as over compassing environments that are connected to well-being. On the contrary, we believe that Indigenous people have intricate connections with their ecosystems that represent actually the foundation of people's well-being and form the basis of other components of socio-economic well-being (as also suggested by Daly 2005 and others).

Apart from the two frameworks as mentioned above, the Australian Council for Educational Research (ACER 2012) also publishes a report on Overcoming Indigenous Disadvantages (OID) highlighting the performance of Australian governments in overcoming Indigenous disadvantage. The OID report is intended to inform governments about whether or not their policies are improving outcomes for Indigenous people. The report is meant to help government address Indigenous disadvantages. Conversely, if there is lack of understanding for what is valued by the Indigenous people, then OID or similar government reports can lead to inappropriate policies as happened in the past. Hence, these have not proved fully effective to overcome Indigenous disadvantages as evident from well-being levels as well as from the HDI values for Indigenous Australians (ABS 2012b; Yap et al. 2010).

None of these frameworks actually incorporate natural systems that are vital for Indigenous well-being which is primarily required for Indigenous communities in order to execute right policy decisions. Indigenous perspectives on land and water systems could help to integrate natural systems and their ES with the well-being of people by providing evidences (such as for cultural values, lores or developing languages) (Kaur 2006 & 2007; Sangha et al. 2011). It is important to note that its not only Indigenous people's values rather its their capabilities such as traditional knowledge or language, in relation to natural resources that are connected to people's well-being. For example, Indigenous people have traditional knowledge of plants (food) that directly enhances their health and overall well-being. Similarly, materials for dance and art from nature help people to perform their activities (achieve their 'being and doing') that further help them to lead creative lives.

Example:

Natural Resources → ES (e.g. Bush Food) → Capabilities (e.g. Traditional Knowledge) → Well-being (e.g. Good Health)

To assess the role of natural resources in terms of people's capabilities, the MA and Capability Approach are integrated applying socio-economic and ecological attributes as shown in Fig. 2 by Sangha and Russell-Smith (2017). The proposed framework incorporated the role of natural systems into well-being constituents such as biophysical, socio-cultural and capabilities benefits, following MA (2003) and Sen (1999a&b). For a more detailed updated framework illustrating various components of well-being and related methodologies, see Sangha et al. (2018).

It suggests that to enhance Indigenous and local communities' well-being, people's capabilities (e.g. traditional knowledge on bush food for health benefits; freedom to use natural resources for cultural activities) along with socio-cultural and livelihood benefits should be the focus for welfare or development policy. It advocates for a shift from monetary or income-oriented measures (as currently applied by the ABS 2001) to intangible and capabilities measures. For policy perspective and to enhance well-being, people's values need to be assessed in terms of their capabilities that directly relate to well-being.

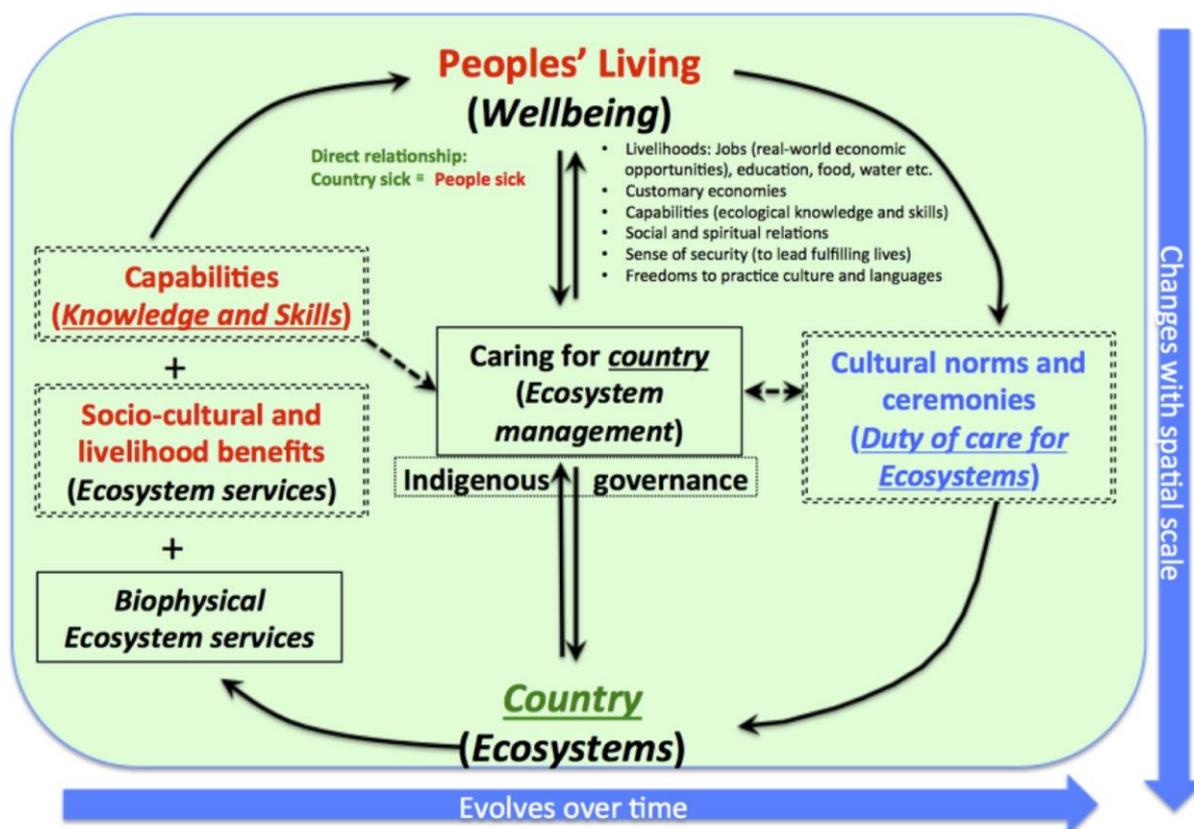


Fig. 2. The role of natural systems in the well-being of local and Indigenous communities (using an example of Indigenous people in Australia) (Source Sangha and Russell-Smith 2017).

This framework emphasizes the need to consider the local scale studies to appropriately address the diversity in the natural and cultural landscapes and to correctly reflect Indigenous well-being. The advantages of this framework are that it focuses on ES or connections that are directly linked to people’s values and capabilities, and it could be easily applied by the ecologists, natural resource scientists and social scientists to evaluate the role of natural resources in people’s well-being.

4. International initiatives linking natural systems as a domain of human well-being

Significant decline in natural capital in recent times has raised concerns all over the world in terms of people’s access and security for provision of food, a good environment to live in, good air to breathe, and for many of nature’s other benefits (MA 2005a-c). Many researchers have emphasized the need to consider natural capital in human development (Daly 2005 & 2013; Costanza et al. 2014; MA 2005a-c). The MA and later the Sub-Global Assessment Network (SGA Network 2013; a global initiative to extend the MA research) conducted about 70 case studies globally since 2003 applying the MA framework (de Groot et al. 2010 on developing ES indicators; Kaur 2006 & 2007 and Sangha et al. 2011 on ES and well-being of Indigenous communities in north Queensland; Smith et al. 2013 on relating ES to domains of human well-being, and many others), and recently IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services 2019 – for proposing Nature’s Contributions to People (NCP) to underline the role of nature for people’s well-being). These initiatives can assist to develop locally specific frameworks for enhanced effectiveness and accuracy from policy development and implementation perspectives.

5. Discussion and conclusion

Ecosystems inevitably play a vital role in human well-being. Both humans and ecosystems are intricately linked and affect each other significantly. Due to lack of a holistic view particularly due to western approaches for focused and isolated thinking, such linkages have often been exploitative from human perspective, mainly to maximize the benefits without realizing the impacts on well-being. The importance of natural systems (and their ES) in human well-being has been ignored in the past mainly due to their abundance and human penchant to take these benefits for guaranteed. An additional issue is the human attitude to value a good or service only when there is a scarcity or a monetary tag attached to it (Costanza et al. 1997).

There are advances in the recent 10-20 years since the MA research. The MA concept suggests ES connections to human well-being, but without tools it fails to influence the policy decisions (ICSU-UNESCO-UNU 2008). There is a significant progress to understand the status of ecosystems but not much on how to integrate ES and well-being of people (ICSU-UNESCO-UNU 2008). Recently, IPBES has been working with 132 States across the globe to influence policy decision making.

In the past, many Indigenous communities survived by learning and incorporating nature or natural components in their living. Knowledge gained from association of Indigenous Australians with nature for the past 40-60,000 years could be highly valuable to develop a holistic view of well-being that is currently lacking (as shown in figure 2). Indigenous people's values and capabilities such as traditional knowledge, languages and lore are well connected to their natural systems. The proposed framework in the present study (Fig. 2) focuses on people's capabilities in relation to services from an ecosystem incorporating diversity at a local scale. It can help to communicate the importance of natural resources to the policy-decision-making on well-being.

From well-being perspectives, Sen's Capability Approach has been widely adopted in economics (particularly since 1990s, the Human Development Reports by the UN included education and health as human capabilities into development measures that were earlier focused on income) (Human Development Reports 2010 & 2011; Alkire 2002b). It especially emphasizes the importance of the non-monetary values in human well-being that enable people to lead creative and healthy lives. However, this approach had rarely been attempted for assessing the intangible values of natural systems that enhance Indigenous capabilities, as presented in this study. Indigenous perspectives can provide significant insights to link nature related people's capabilities to their well-being. Sangha et al. (2011) applied the modified MA framework in North Queensland to assess the links between various ES and well-being constituents.

Applying Indigenous and local communities' perspectives to integrate natural systems and well-being can provide significant solutions for: understanding ES-well-being links to develop a composite measure; bridging the gap in social, economic and ecological disciplines; and evaluating each such links to include cultural as well as natural diversity.

Firstly, the Indigenous and local communities, those living in contact with nature, can help to develop a unique measure of ES-well-being interface that could be applicable to the wider public for effective policy-decision-making as well as for sustainable use and management of natural resources. There is a need to merge the ES and well-being aspects as a common 'integrated' measure to suggest the significance of ES in human well-being for policy-decision-makers. Some existing frameworks (Sangha et al. 2018, IPBES 2019, MA 2005) can guide to develop locally relevant frameworks.

Secondly, Indigenous and local knowledge can help bridge the current gap in social, economic and ecological disciplines. In modern times, many people are not directly linked to natural systems, so it undermines the value of our ecosystems. As a result, the policy makers may not correctly value some of the ES. Whereas, from an ecological perspective, the ES (and ecosystem functions) are vital for people's (sustainable) living, but regrettably these fail to account towards well-being perspectives.

Indigenous and local system views these social-economic and ecological aspects as a 'unified system' (Altman 1987 & 2004) thus, can help evaluating nature's role towards people's well-being.

Thirdly, the Indigenous perspectives could help to incorporate the cultural and natural diversity that exists in any region to accurately assess the value of nature's services by conducting local scale studies as suggested by Duraiappah (2011). Conducting studies at local scales with Indigenous and local communities could provide detailed insights on ES-well-being links addressing cultural as well as natural diversity.

Scale is also a major issue in the current well-being or development measures as most of the sustainability indices are applied at a national or global scale. When different datasets- social, ecological or economics (e.g. to calculate the indices at a national scale) are integrated, the estimates can be exaggerated that could mislead future policy decisions. For this, the local scale Indigenous and local studies are important particularly to address natural and cultural variations.

The Indigenous and local perceptions of well-being to lead creative and healthy lives rather than accumulation of wealth and commodities could help many of us to re-define well-being. Learning from Indigenous and local societies can contribute to embed our well-being with nature, and to develop integrated tools that can help to comprehend the value of natural systems in our living to better understand the meaning of being 'well' and to use our natural resources in a sustainable way that enhances human well-being for the present and future generations.

References

ABS (The Australian Bureau of Statistics) 2001, *Measuring wellbeing, frameworks for Australian Social Statistics*, ABS catalogue no. 4160.0, Canberra.

ABS 2005, *Measures of Australia's progress: summary indicators, 2005*, ABS catalogue no. 1383.0.55.001, Canberra.

ABS 2010a, *Measures of Australia's Progress, 2010- Is life in Australia getting better?*, ABS Catalogue no. 1370.0, Canberra.

ABS 2010b, *Framework for Measuring Wellbeing: Aboriginal and Torres Strait Islander Peoples, 2010*, ABS catalogue no. 4703.0, Canberra.

ABS 2012a, *Year Book Australia, 2012: Aboriginal and Torres Strait Islander People*. Catalogue no. 1301.0, Canberra.

ABS 2012b, *Aboriginal and Torres Strait Islander Wellbeing: A focus on children and youth, April 2011*, ABS catalogue 4725.0, Canberra.

Australian Council for Educational Research 2012, *Review of the Overcoming Indigenous Disadvantage: Key Indicators report for the Steering Committee for the Review of Government Service Provision*, the Australian Council for Educational Research.

Alkire, S 2002a, 'Dimensions of Human Development', *World Development* 30:191-205.

Alkire, S 2002b, *Valuing Freedoms: Sen's Capability Approach and Poverty Reduction*. Oxford University Press, UK.

Altman, JC 1987, *Hunter-Gathers Today - an aboriginal economy in north Australia*, The Australian Institute of Aboriginal Studies, Canberra.

Altman, JC 2004, 'Economic development and Indigenous Australia: contestations over property, institutions and ideology', *The Australian Journal of Agricultural and Resource Economics* 48:513-534.

Altman, J, Kerins, S, Hunt, J, Ens, E, May, K, Russell, S & Fogarty, B 2011, 'Indigenous cultural and natural resource management futures' *CAPER Topical Issue No. 9/2011*, Australian National University, Canberra.

Australian Institute of Aboriginal and Torres Strait Islander Studies 1994, '*Land, Rights, Laws: Issues of Native Title: Issue paper no. 3*', in Mary Edmunds (ed.), Australian Institute of Aboriginal and Torres Strait Islander Studies, ACT.

Australian Institute of Health and Welfare 2011, '*Health and the environment: a compilation of evidence. Cat. no. PHE 136*', Australian Institute of Health and Welfare, Canberra.

Bunya Mountains Elders Council and Burnett Mary Regional Group 2010, '*Bunya Mountains Aboriginal aspirations and caring for country plan*', Burnett Mary Regional Group, Bundaberg, Qld.

Busch, M, Notte, A La, Laporte, V & Erhard, M 2012, 'Potentials of quantitative and qualitative approaches to assessing ecosystem services', *Ecological Indicators* 21:89-103.

Costanza, R, d' Arge, R, de Groot, R, Farber, S, Grasso, M, Hannon, B, Limburg, K, Naeem, S, O'Neill, RV, Paruelo, J, Raskin, RG, Sutton, P & van den Belt, M 1997, 'The value of the world's ecosystem services and natural capital', *Nature* 387: 253-260.

Costanza, R, Fisher, B, Ali, S, Beer, C, Bond, L, Boumans, R, Danigelis, NL, Dickinson, J, Elliott, C, Farley, J, Gayer, DE, Glenn, LM, Hudspeth, T, Mahoney, D, McCahill, L, McIntosh, B, Reed, B, Rizvi, SAT, Rizzo, DM, Simpatico, T & Snapp, R 2007, 'Quality of life: An approach integrating opportunities, human needs, and subjective well-being', *Ecological Economics* 61:267-76.

Costanza, R, Kubiszewski, I, Giovannini, E, Lovins, H, Mcglade, J, Pickett, KE, Vala Ragnarsdóttir, K, Roberts, D, Vogli, RD & Wilkinson, R 2014, 'Development: Time To Leave GDP Behind', *Nature* 505:283-285.

Cummins, RA, Eckersley, R, Pallant, J, van Vugt, J & Misajon, R 2003, 'Developing a national index of subjective wellbeing: The Australian Unity Wellbeing Index', *Social Indicators Research* 64:159-190.

Daly, HE 1996, *Beyond Growth: The Economics of Sustainable Development*, Beacon Press, Boston.

Daly, H 2005, 'Economics in a full world', *Scientific American*:100-107.

Daly, H 2013, 'A further critique of growth economics', *Ecological Economics* 88:20-24.

de Groot, RS, Alkemade, R, Braat, L, Hein, L, & Willemsen, L 2010, 'Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making', *Ecological Complexity* 7(3):260-272. doi: <http://dx.doi.org/10.1016/j.ecocom.2009.10.006>

Diener, E & Suh, E 1997, 'Measuring quality of life: economic, social, and subjective indicators', *Social Indicators Research* 40:189:216.

Dodson, M 1997, 'Land rights and social justice' in Yunupingu G. (ed.), *Our land our life; land rights - past, present and future*, University of Queensland Press, St Lucia, Qld.

Duraiappah, AK 2011, 'Ecosystem services and human well-being: do global findings make any sense?', *BioScience* 61:7-8.

Grieves, V 2007, '*Indigenous wellbeing: a framework for governments' Aboriginal cultural heritage activities*', Minimbah consultants and education providers' report for the NSW department of environment and conservation.

Human Development Report 1990, *Human Development Report 1990*, The United Nations Development Programme, Oxford University Press, UK.

Human Development Report 2010, *The real wealth of nations: Pathways to human development*, The United Nations Development Programme.

Human Development Report 2011, *Sustainability and equity: A better future for all*, The United Nations Development Programme.

ICSU-UNESCO-UNU 2008, *Ecosystem Change and Human Well-being: Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment*, International Council for Science, Paris.

IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services) (2019) 'Intergovernmental Platform on Biodiversity and Ecosystem Services. URL: <http://www.ipbes.net>, accessed on 10 January 2019.

Kaur, K 2006, *The role of ecosystem services from tropical savannas in the well-being of Aboriginal people: A scoping study*, a report for the Tropical Savannas Cooperative Research Centre, Darwin, NT. p. 86.

Kaur, K 2007, 'Linking ecosystem services to well-being: A case study of Aboriginal communities in north Australia', *Australian Aboriginal Studies* 2:145-147.

Keen, I 2004, *Aboriginal Economy and Society*, Oxford Press, UK.

Kubiszewski, I, Costanza, R, Franco, C, Lawn, P, Talberth, J, Jackson, T & Aylmer, C 2013, 'Beyond GDP: Measuring and achieving global genuine progress', *Ecological Economics* 93: 57-68.

Maffi, L 2001, *On biocultural diversity: Linking language, knowledge, and the environment*, Smithsonian Institution, p. 578.

Malaspinas, A-S, Westaway, MC, Muller, C, Sousa, VC, Lao, O, Alves, I, Bergström, A, Athanasiadis, G, Cheng, JY, Crawford, JE, Heupink, TH, Macholdt, E, Peischl, S, Rasmussen, S, Schiffels, S, Subramanian, S, Wright, JL, Albrechtsen, A, Barbieri, C, Dupanloup, I, Eriksson, A, Margaryan, A, Moltke, I, Pugach, I, Korneliusen, TS, Levkivskiy, IP, Moreno-Mayar, JV, Ni, S, Racimo, F, Sikora, M, Xue, Y, Aghakhanian, FA, Brucato, N, Brunak, S, Campos, PF, Clark, W, Ellingvåg, S, Fourmile, G, Gerbault, P, Injie, D, Koki, G, Leavesley, M, Logan, B, Lynch, A, Matisoo-Smith, EA, McAllister, PJ, Mentzer, AJ, Metspalu, M, Migliano, AB, Murgua, L, Phipps, ME, Pomat, W, Reynolds, D, Ricaut, F-X, Siba, P, Thomas, MG, Wales, T, Wall, CMr, Oppenheimer, SJ, Tyler-Smith, C, Durbin, R, Dortch, J, Manica, A, Schierup, MH, Foley, RA, Lahr, MM, Bowern, C, Wall, JD, Mailund, T, Stoneking, M, Nielsen, R, Sandhu, MS, Excoffier, L, Lambert, DM, Willerslev, E, 2016, A genomic history of Aboriginal Australia. *Nature* **538**, 207.

Millennium Ecosystem Assessment, 2003, *Ecosystems and Human Well-being: A Framework for Assessment*, Island Press, Washington, DC.

Millennium Ecosystem Assessment, 2005a, *Ecosystems and human well-being: biodiversity synthesis*, Island press, Washington, DC.

Millennium Ecosystem Assessment, 2005b 'Ecosystems and Human well-being: current state and trends, Volume 1', in Hussan R, Scholes, R & Ash, N (ed.) *Findings of the Conditions and Trends working group*, Island Press, Washington, DC, p. 917.

Millennium Ecosystem Assessment, 2005c, *Ecosystems and human well-being: Synthesis*, Island press, Washington, DC.

Organisation for Economic Co-operation and Development (OECD), 2011, *How's Life? Measuring well-being*, DOI:10.1787/9789264121164-en, OECD Publishing.

Posey, D & Oxford Centre for the Environment, Ethics and Society 1999, *Cultural and spiritual values of biodiversity*, Intermediate technology publications and UN Environment Programme, London and Nairobi.

Prescott-Allen, R 2001, *The wellbeing of nations: a country by country index of quality of life and the environment*, Island Press, Washington DC.

Queensland Murray Darling Committee (QMDC) 2008-2011, *The Regional Caring for Country Plan*, Aboriginal Program, Queensland Murray-Darling Committee Inc. Toowoomba, Qld.

Rasmussen, M, Guo, X, Wang, Y, Lohmueller, KE, Rasmussen, S, Albrechtsen, A, Skotte, L, Lindgreen, S, Metspalu, M, Jombart, T, Kivisild, T, Zhai, W, Eriksson, A, Manica, A, Orlando, L, Vega, FMDL, Tridico, S, Metspalu, E, Nielsen, K, Ávila-Arcos, MC, Moreno-Mayar, JV, Muller, C, Dortch, J, Gilbert, MTP, Lund, O, Wesolowska, A, Karmin, M, Weinert, LA, Wang, B, Li, J, Tai, S, Xiao, F, Hanihara, T, Driem, Gv, Jha, AR, Ricaut, F-X, Knijff, Pd, Migliano, AB, Romero, IG, Kristiansen, K, Lambert, DM, Brunak, S, Forster, P, Brinkmann, B, Olaf Nehlich, Bunce, M, Richards, M, Gupta, R, Bustamante, CD, Krogh, A, Foley, RA, Lahr, MM, Balloux, F, Sicheritz-Pontén, T, Villems, R, Nielsen, R, Wang, J, Willerslev, E, 2011, An Aboriginal Australian Genome Reveals Separate Human Dispersals into Asia. *Science* 334, 94-98.

Rose, B 1995, *Land management issues: Attitudes and perceptions amongst Aboriginal people of central Australia*, Central Land Council, Alice Springs.

Sangha, K, Butler, J, Delisle, A & Stanley, O 2011, 'Identifying links between ecosystem services and Aboriginal well-being and livelihoods in north Australia: applying the Millennium Ecosystem Assessment framework', *Journal of Environmental Science and Engineering* 5:381-387.

Sangha, KK, Preece, L, Villarreal-Rosas, J, Kegamba, JJ, Paudyal, K, Warmenhoven, T, RamaKrishnan, PS (2018) An ecosystem services framework to evaluate Indigenous and local peoples' connections with nature. *Ecosystem Services* 31, Part A, 111-125.

Sangha, K, Russell-Smith, J (2017) Towards an Indigenous Ecosystem Services Valuation Framework: A North Australian Example. *Conservation and Society* 15, 255-269.

Sangha, KK, Preece, L, Villarreal-Rosas, J, Kegamba, JJ, Paudyal, K, Warmenhoven, T, RamaKrishnan, PS (2018) An ecosystem services framework to evaluate Indigenous and local peoples' connections with nature. *Ecosystem Services* 31, Part A, 111-125.

Satz, D, Gould, RK, Chan, KMA, Guerry, A, Norton, B, Satterfield, T, Halpern, BS, Levine, J, Woodside, U, Hannahs, N, Basurto, X & Klain, S 2013, 'The Challenges of Incorporating Cultural Ecosystem Services into Environmental Assessment', *Ambio* 42(6): 675-684.

Sen, A 1993, 'Capability and wellbeing', in Nussbaum M & Sen A (eds.), *The Quality of Life*, Clarendon Press, Oxford, UK.

Sen, A 1999a, *Commodities and Capabilities*, Oxford University Press, Oxford, UK.

Sen, A 1999b, *Development as Freedom*, Oxford University Press, Oxford, UK.

Smith, LM, Case, JL, Smith, HM, Harwell, LC & Summers, JK 2013, 'Relating ecosystem services to domains of human well-being: Foundation for a U.S. index', *Ecological Indicators* 28:79-90.

Taylor, J 2008, 'Indigenous peoples and indicators of well-being: Australian perspectives on United Nations global framework', *Social Indicators Research* 87:111-126.

The Economist Intelligence Unit, 2005, *Quality of life index -The World in 2005*, The Economist Intelligence Unit, UK.

UNU-IHDP and UNEP. (2014). Inclusive Wealth Report 2014. Measuring progress toward sustainability. Summary for Decision-Makers. Delhi: UNU-IHDP.

Vemuri, AW & Costanza, R 2006, 'The role of human, social, built, and natural capital in explaining life satisfaction at the country level: Toward a National Well-Being Index (NWI)', *Ecological Economics* 58:119-133.

Wet Tropics Aboriginal Plan Project Team, 2005, *Caring for country and culture - the wet tropics Aboriginal cultural and Natural Resource Management Plan*, Rainforest CRC and FNQ NRM Ltd. Cairns, Qld.

Yap, M, & Biddle, N 2010, 'Gender Gaps in Indigenous Socioeconomic Outcomes: Australian Regional Comparisons and International Possibilities', *The International Indigenous Policy Journal* 1(2):1-29. Retrieved from: <http://ir.lib.uwo.ca/iipj/vol1/iss2/3>

Websites:

IPBES 2019: <http://ipbes.net>, accessed on 15 December, 2018.

SGA network 2018: www.ecosystemassessments.net, accessed on 21 May, 2018.

MA (2018). <https://millenniumassessment.org/en/Framework.html>, accessed various times during 2018.