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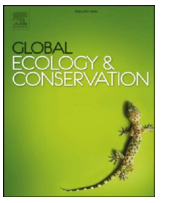

Integrating Capabilities and Ecosystem Services Approaches to evaluate Indigenous connections with nature in a global biodiversity hotspot of Western Ghats, India

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ABSTRACT

To incorporate Indigenous and local communities connections with nature for policy decision making, we integrate Ecosystem Services (ES) and Capability Approaches to develop a cohesive framework for assisting policy makers to better comprehend nature's values that are vital for Indigenous/tribal well-being. Sen's Capability Approach, when applied using the lens of ES, helps to realise well-being from a multi-dimensional perspective. Our proposed framework includes ES in the context of peoples' *capabilities, functionings, utilities,* and *freedom* to access and use natural resources. We further applied this framework to two case studies, tribal communities of Soliga and Kattunayaka located in a global biodiversity hotspot in the Western Ghats of India, to investigate how ES enable people to lead their lives as they want. This study, the first of its kind in India, explains how tribal communities' *well-being* is affected by the access and rights to their local forest resources. This study offers a tool for policy makers to appropriately comprehend Indigenous/tribal communities' connections with their lands, and highlights concerns for mainstreaming them into contemporary economies. An integrated understanding of multi-dimensional aspects of well-being and nature's values can enhance both Indigenous well-being and conservation outcomes at the local, regional and global scales.

1. Introduction

Many Indigenous and local communities across the globe depend on natural systems for a range of Ecosystem Services (ES)—the benefits people obtain from ecosystems—to support their livelihoods, cultural and spiritual lives (Millennium Ecosystem Assessment, 2005; de Groot and Ramakrishnan, 2005; Costanza et al., 2007, 2014; Summers et al., 2012; Reytar and Veit, 2017; Notess et al., 2018; Sangha et al., 2019a). In 2003, the United Nations Millennium Ecosystem Assessment (MA) program developed the first of its kind of framework linking ES with people's well-being (MA 2003, 2005). That framework offered a multi-dimensional perspective of human well-being i.e. freedom and choice; basic material for good life; health; good social relations; and security, in relation to four ES categories, i.e. provisioning, regulating, supporting, and cultural. It provided an integrated socio-economic and ecological view for better understanding the role of nature in human well-being (Cruz-

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Garcia et al., 2017). Recently, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) proposed a similar framework but using different terminology, i.e. Nature's Contributions to People (NCP) instead of ES and nature in lieu of ecosystems (Díaz et al., 2015; IPBES, 2020). However, both these globally well-known frameworks omit to explicitly describe the conceptual and methodological issues regarding the associations between ES and human well-being (Carpenter et al., 2009; Summers et al, 2012; Costanza et al., 2014; Sangha and Russell-Smith, 2017; Sangha et al., 2019a), particularly the role of people's '*Capabilities*' which are critical for Indigenous/tribal communities to obtain any services from nature, as explored in this paper.

Well-being is often classified into 'objective' and 'subjective' categories (Diener and Suh, 1997; Diener and Tay, 2015; Axford et al., 2014). In the context of ES, most of the studies to date have investigated 'objective' human well-being (i.e. materials resources and/or social attributes) to highlight the monetary value of ES (e.g. Chopra and Dasgupta, 2008; Chopra et al., 1997; Costanza et al., 1997 and 2014; Ninan and Kontoleon, 2016; Verma et al., 2017; Sangha et al., 2015a, 2015b, 2019a). Only a few studies have analysed 'subjective' well-being which is measured by life satisfaction, happiness, or for enabling people to lead their lives in their ways. For example, Aguado et al. (2018) suggested a greater influence of ES on life satisfaction of Kichwa people in the high Andes of Ecuador. Likewise, Costanza et al. (2007) proposed a Quality of Life index integrating subjective and objective measures of well-being to underline the role of natural systems in fulfilling human needs. There is no doubt that ES enhance both subjective and objective well-being of Indigenous/tribal peoples. But peoples' knowledges and skills—*capabilities*—that enable people to derive well-being benefits play a key role, yet often omitted. We postulate in here that to obtain, particularly objective well-being from nature, people's *capabilities* are essential to appropriately realise and value nature's services. These ES-related *capabilities,* which form a vital aspect of Indigenous (tribal) well-being, are largely missing in the well-known MA-ES and IPBES-NCP approaches. In this paper, we describe how people's *capabilities* in relation to natural systems can be integrated with ES to develop an integrated and cohesive ES approach.

To consider people's *capabilities*, we follow Sen's Capability Approach (Sen, 1993, 1999; the Nobel Laureate in Economics) proposing that *capabilities*, *functionings* (or achievements) and *freedoms* comprise key components of people's well-being. Each of these components link well with the use and/or management of natural resources. For example, a person with specific knowledge of collecting and processing a certain type of bush food/medicine (*capability*) may feel happy or satisfied for consuming it (*achievement*). Without having a certain set of skills and knowledge, he/she can not use the resource to achieve satisfaction. We contend that to appropriately understand connections between ES and human well-being, people's *capabilities* are central (Polishchuk and Rauschmayer, 2012; Sangha et al., 2015a, 2015b, 2019b; Sangha and Russell-Smith, 2017). Understanding links between ES–*Capabilities*–Well-being can directly inform policies at the local, regional and global scales (Sangha et al., 2015a, 2019b). This is particularly applicable for many Indigenous/tribal and local peoples from developing countries across the globe who depend on nature's resources to support their livelihoods. Without an adequate set of *capabilities* and *freedoms,* it is not feasible for them to derive optimal well-being benefits (i.e. *functionings*) from their natural systems. This multi-dimensional yet foundational aspect of human well-being embracing the role of *capabilities, functionings,* and *freedoms* in relation to natural systems, has not been addressed to date. This paper fills this important gap by integrating ES and Capability Approaches, and applying the same to two Indigenous tribal communities from the Western Ghats in India. Understanding the importance of *capabilities* for enabling people to achieve and enhance well-being in relation to use and management of natural resources can inform the policy decision makers to develop cohesive policies, both for enhancing people's well-being and improving the management of natural resources.

In this paper, we first discuss Sen's Capability Approach from an ES perspective, assuming that the readers are already familiar with the MA and IPBES frameworks (for details see MA 2003&2005, and IPBES, 2020). We then propose a framework integrating ES with people's *capabilities*, *functioning* and *freedoms*, which is further applied to two case studies from tribal communities in the Western Ghats of India i.e. Soliga tribal community in Karnataka, and Kattunayaka tribal community in Tamil Nadu.

2. Capability Approach from an ES perspective

Sen (1993; 1999) developed the Capability Approach for providing a deeper and alternative meaning to development by underlining the role of individual's *capabilities* (and related *opportunities*) that enable them to lead the lives they have reason to value. This approach has been extensively discussed in relation to welfare and utilitarian aspects of economics in the 1980–90s, with application largely in the field of development, justice, human rights and moral concerns. It has been further developed and extended conceptually and methodologically by many social scientists including Nussbaum (1988, 1992, 2003, 2006), Robeyns (2003a,b, 2006, 2017), Alkire (2002) and Berry (2017).

The Capability Approach presents human well-being using two key concepts i.e. *functionings* and *capabilities*. The *functionings* refer to various things a person may value 'doing or being', for instance being adequately nourished or taking part in political affairs of a community (Sen, 1999). The second concept *capability* refers to substantive freedom to achieve alternative *functioning* combinations of lifestyles or a set of valuable functionings that an individual have real access to, reflecting both instrumental opportunity and intrinsic freedom of choice (Sen, 1999; Nussbaum, 2006; Robeyns, 2003b). For example, being *formally* educated (in a school/university) is a *capability*, and working in the education sector is a *functioning* i.e. an achievement.

From an ES perspective, to evaluate people's connections with nature for local and Indigenous/tribal communities Sen's Capability Approach is highly applicable, as described later in this paper (Sangha et al., 2015b, 2019b; Sangha and Russell-Smith, 2017). Recognising that the natural environment contributes to human well-being, Sen (2013) argues that the lenses of '*freedom*' can be

implied to educate and enable people including the policy makers to understand sustainability issues. He further suggests that the intrinsic value of freedom contributes instrumentally to the accomplishment of environmental sustainability. For example, encouraging women's participation and freedom in land rights/management can enhance their happiness of life with positive spillover effects on the environment and its management, or encouraging education for women reduces fertility rate that results in less pressure on natural resources (Sen, 2013). The Capability Approach poses the question of how the links between human well-being and ES can be realised, and what mechanisms/changes are required to improve those links.

Only a few studies have investigated coupling the ES and Capability Approaches to date. For instance, Sangha et al. (2015b) and Sangha and Russell-Smith (2017) applied the Capability Approach to understand the role of ES for the well-being of Indigenous peoples in Australia. They describe how Indigenous peoples' connections with land contribute to building peoples' *capabilities* (as land managers—Rangers) that are utilized under a right set of 'opportunities' for achieving well-being. Currently > 650 Indigenous peoples across northern Australia utilize their land/fire management-related *capabilities* under '*Working on Country*' program funded by the Australian Government to gain employment (as Rangers) that contributes to enhancing peoples' *functioning* and well-being. That study provides a conceptual perspective but lacks evidence. However, it may help decision-makers in India and elsewhere to understand the importance of valuing Indigenous capabilities and related opportunities.

To enhance policy understanding of these complex connections, we propose a framework where *capabilities* form an integral part of Indigenous/tribal peoples' connections with land through a two-way 'people-nature' relationship (following Sangha and Russell-Smith, 2017), in addition to offering empirical evidence from two case studies in the Western Ghats of India. To appropriately evaluate the role of ES in people's well-being where people's livelihoods are directly impacted by their use, management, and access to natural resources (Shiva 2016; Posey, 1999; Ramakrishnan et al., 2005; Notess et al., 2018; Sangha et al., 2018, 2019b), we need to fully understand the links between ES and peoples' *capabilities,* applying socio-economic, political and geographical context.

This study analyses and integrates both Capability and ES Approaches, along with empirical evidence. In the absence of theoretical and empirical studies on ES and Capability Approach in Indian context where tribal people's dependence on natural systems is relatively high, it offers a multi-dimensional perspective of various links between people and their natural systems that can directly inform policy decision making. Such a holistic understanding can help enhance the well-being of local tribal communities as well as afford better management of rapidly depleting natural resources.

3. Materials and methods

To examine the multi-dimensional aspect of well-being in relation to ES, two tribal communities, Soliga tribe in Karnataka and Kattunayaka in Nilgiri Hills in Tamil Nadu, were selected in the Western Ghats of India (Fig. 1). The central theme of the study was to analyse the relationship between ES and human well-being using Sen's Capability Approach in terms of *capabilities, functionings,* and *freedom* for how people access and utilize ES, and what are key issues that affect people's day-to-day life. We applied the MA framework to evaluate ES-well-being links from *capabilities, functionings,* and *utility* perspectives, as outlined in Tables 1 and 2.

The Western Ghats are one of the world's eight hotspots of biodiversity for its high level of biodiversity and endemism (https://whc.unesco.org/en/list/1342/). The Ghats support a range of diverse habitats including grasslands, temperate forests, and a range of mountains that run for more than 1600 km along India's southwestern coast. Nilgiri Hills with mountain peaks rising to 2400 m are separated from the eastern Western Ghat range in Karnataka by Noyar River—the natural barrier supporting unique diversity on these hills.

3.1. Soliga tribe, Western Ghats, Karnataka

Soliga is an Indigenous tribe located in Biligiri Rangasamy Temple Wildlife Sanctuary (BRTWLS), in the eastern parts of the Western Ghats in the district of Chamarajnagar in Karnataka (Fig. 1). Total area of BRTWLS is over 575 km^2, serving as a corridor between the Western Ghats and Eastern Ghats in Karnataka. Four types of forests i.e. evergreen (10.3% by area), dry deciduous (36.1%), scrub (28.5%) and moist deciduous (25%), occur in the sanctuary (Ramesh 1989).

There are more than 1000 tribal families living within and nearby the sanctuary, comprising ~12,500 Soliga people. More than 60% of the tribal population is dependent on non-timber forest products for their livelihoods and income (Sindhu et al., 2019). Annual income from non-timber forest products for a tribal household is about Rs 10,000–12,000 (Balasubramanian, 2020). In modern days, people are also engaging in traditional agriculture, livestock raring, labour work, and in trading non-timber forest products (Bawa et al., 2007; Madegowda and Rao, 2013). Non-timber forest products are usually sold in the nearly main cities, Bangaluru and Mysore. An NGO, Vivekananda Girijana Kalyana Kendra, helps the tribe to market their harvest.

The Soliga tribe has preserved the '*Adivasi*' (tribal) culture, and is one of the main ethnic tribes in the region despite the constant political pressure that continues to disturb their traditional lifestyles. In early 2011, the BRTWL sactuary was declared a Tiger Reserve without proper consultation with the tribe, despite Soligas having ancestral rights over that land. In October 2011, Soligas won a landmark case against the Indian Government to be the first tribe to live inside the core area of a Tiger Reserve. This win came with re-assurance of Soliga forest rights including the right to access, and proprietorship of non-timber forest produce, fishing, grazing and cultural practice rights, besides the right to conserve and manage the forest.

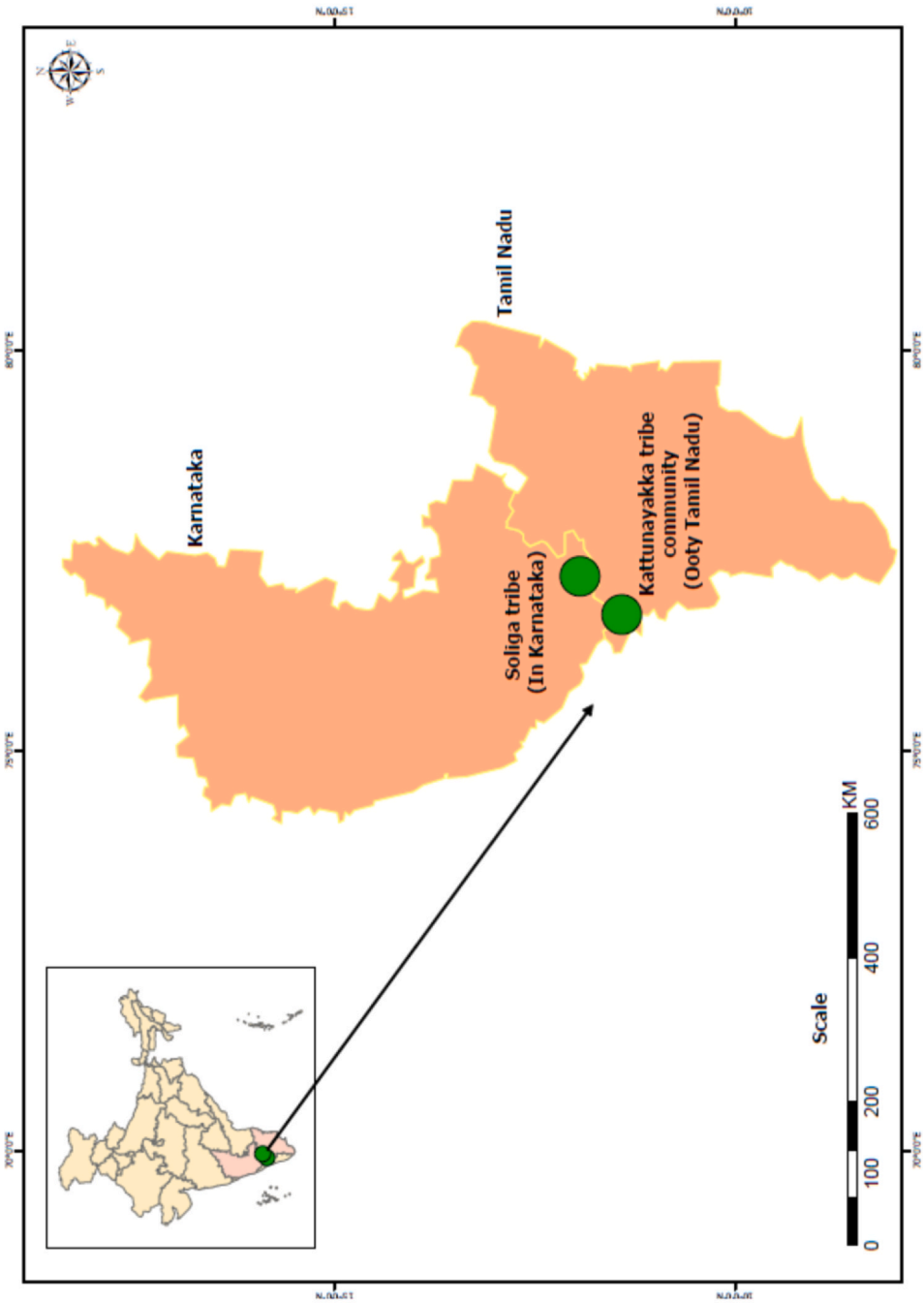

Fig. 1. Location of selected Indigenous tribal communities, Soliga and Kattunayakka, in the Western Ghats of India.

Table 1
Linking indicators of Ecosystem Services with Capability Approach.

Ecosystem goods and services	Functioning	Utility	Well-being
Provisioning services (food, raw materials, freshwater and medicinal resources)	1. Food and nutrition including fruits and vegetables 2. Water 3. Energy (fuel wood) 4. Housing materials (raw material for house construction) 5. Traditional medicinal resources (good health)	Desire fulfilment (based on resource availability around the households or away from households)	Physical and mental satisfaction or pleasure (short term)
Regulating services (local climate and air quality, moderation of extreme events, waste-water treatment, soil erosion prevention, pollination and biological control)	1. Feeling good air quality 2. Less possibility from natural calamities 3. Pollination services 4. Irrigation and drought prevention 5. Natural water purification	Non-material benefits; desire fulfilment (based on individual and household utility)	Physical and mental happiness or pleasure (short and long term)
Cultural Services (recreation, tourism, aesthetic appreciation & inspiration for cultural, art and design, spiritual experience)	1. Good relaxation 2. Facilitate social relation 3. Learning new ideas 4. Cultural and spiritual activities	Non-material benefits; individual and household participation and utility	Physical & mental satisfaction (short and long term)

Table 2
Peoples' functioning ('being and doing') in relation to various ES.

Provisioning Services	Regulating Services	Cultural Services
1. Ability to live in an environmentally clean and safe shelter 2. Ability to access resources to earn income and gain a livelihood 3. Ability to adequately nourish 4. Ability to free from avoidable diseases 5. Ability to have adequate and clean drinking water	1. Ability to reduce vulnerability to ecological shocks and stress 2. Ability to have clean air 3. Ability to have energy to keep warm and cool	1. Opportunity to express aesthetic recreation values associated with ecosystems 2. Opportunity to observe, study and lean about ecosystems. 3. Opportunity to express cultural and spiritual values associated with ecosystems. 4. Ability to apply knowledge to social activities and spiritual values in relation to nature

Soligas are called '*the children of Bamboo*' meaning they have originated from Bamboo. They usually practice hunting and shifting agriculture, and worship trees and animals. As one of the Elder says, "We could easily identify over 50 different plant varieties in just one square foot of land." To date, they have hardly had any incidents of conflict with the Tigers. In fact, the Soligas worship tiger as *Huliverappa*. Since 2011, the number of Tigers has improved in the wildlife sanctuary (Appendix A, Images 1 and 2).

For this study, we selected 160 households as participants on a random basis to conduct surveys and semi-structured interviews to understand what are the main ES that people obtain from their forest lands, and how those services enable people to live the way of life that they want to lead (see Appendix A).

3.2. Kattunayaka tribe, Nilgiri Hills, Tamil Nadu

The Kattunayaka tribal community is located in the beautiful range of Nilgiri Hills reaching a height of 2400 m, near Ooty in Tamil Nadu (Fig. 1). Nilgiri Hills are part of the Nilgiri Biosphere Reserve. The word '*Nil*' means blue colour that occurs when *Strobilanthes kunthiana* shrub blossoms, giving the entire range an appearance of blue mountains. These hills support > 1300 flowering plant species, apart from a unique diversity of fauna including > 100 species of mammals such as Bengal Tiger, Indian elephant, leopard, and black panther. Traditionally, Kattunayakans were hunters and gatherers. At present, they are involved in diverse livelihood occupations like non-timber forest products, especially honey collection, fish and crab catching, agriculture and horticulture, and labour work on wage basis. Kattunayakans have a strong belief in spiritual beings. Their faith is tribal religion with elements of spirit worship, sorcery-magic and priesthood prediction of survival. These days Kattunayakans cultivate land by adapting various traditional agricultural activities for crops such as paddy, and others as coffee, tea, chinchona, pepper, garlic, glues, cardamom, radish, carrot, beet root, cabbage and cauliflower. Overall, 30% of the Kattunayakan families use land for agricultural activities. They have rich traditional knowledge in the context of people's health and forest resources. Kattunayakan tribal communities are also highly involved in forest conservation along with local forest department.

Kattunayaka tribe is relatively large tribe with total population of > 50,000 across south India, and ~2500 people residing in the Nilgiri Hills (Indian Census Data 2011; Narain 2019). The word Kattunayaka means '*chiefs of the forests*', and they are believed to be one of the earlier inhabitants of south India. Most of the members still prefer to live deep in forests.

For this study, 40 random households were selected from this community as participants to explore what key ES people obtain from their forest lands, and how these help them to lead their lives the way they want (Appendix A, Images 2 and 3).

Same questions were asked to Slogas and Kattunayaka people, on a scale from strongly agree, agree, disagree to strongly disagree. For example, respondents were asked to rank provisioning services of obtaining livelihoods and clean water: Does your forest land enable you to earn income and gain a livelihood? Does your forest provide you clean and adequate amount of water? Similarly, questions relating to regulating services included: Does your forest reduce your vulnerability to ecological shocks and stress, offers you warmth in winter and coolness in summer? In relation to cultural services, the questions focused on: Does your forest provide you an opportunity to learn about the forest systems? Do you believe that forest enables you to perform social activities and enjoy spiritual connections? (other questions mentioned in Appendix A). In addition to questionnaire survey, experience of working with these tribes over the past few years, informal interviews with tribal members, and general observations also informed our study on how people are connected to their forest lands in both Soliga and Kattunayaka tribes.

For both of the selected tribes, there is minimal public transport or schooling or any other mainstream economic activities. Hence there is little influence of the outside world. People practice their rituals, ceremonies, and pass on their culture and practices to the future generation by holding tribal activities, rituals, and ceremonies, almost on a daily-basis. We observed that Kattunayak tribe is much more connected with their traditional lifestyle than the Soliga tribe.

3.3. Governance in Soliga and Kattunayaka tribal communities

The Indian Government has implemented various forest policies, Acts and regulations over the last 2–3 decades at the local and national level. For instance, after declaring the BRTWS as a wildlife sanctuary in 1974 and Tiger Reserve in 2011, livelihoods of Soliga tribe are seriously impacted. The Forest Rights Act (2006) provides some livelihood support for the groups including access rights for non-timber forest products under restrictions such as collection boundary, distance, amount of the product, etc. (Chemmencheri 2013). Non-timber forest products provide major livelihoods such as honey, tubers, roots, leaves, and deer horns as well as fishing, crab catching, basketry, agriculture, horticulture and labour work (Tribal Research Centre 2013). But, there are serious problems such as relocation of people, political pressure for development, and restricted access to resources to fulfil people's basic needs.

The government and non-government organisations such as Tribal Research Institute, Large-Scale Adivasi Multi-Purpose Societies, Vivekananda Girijan Kalyan Kendra in the region, through various programmes, have been contributing to improve tribal welfare mainly via introducing mainstream economic activities. These includes income generation through tea plantation, non-timber forest products, workforce labour in the nearby towns, rural housing, and children's education. The local government in collaboration with the Tribal Research Institute provides training and instruments for starting small scale industries like poultry production, establishing shops for non-timber forest products in Kattunayakan tribal community in Ooty, Tamil Nadu. Local governments also provide some livelihood options through Hill Area Development Programme in both the tribal communities. However, the present institutional settings in both these communities prioritise conservation of forest over the access and rights of people to use resources (Alex et al., 2016; Chemmencheri, 2013).

4. Proposing an integrated framework linking Capability and ES Approaches

Before reporting our case studies results, we propose a framework here linking tribal peoples' capabilities and ES. This framework lays the foundation for our data analysis.

From an Indigenous context, ES form a vital part of the Capability Approach from two aspects: i. ES are essential inputs for generating *capabilities* and sustaining many of the functionings that are required for human development at least in tribal context; and ii. An efficient and sustainable use of resources is required to support people's *capabilities* in the long-term because of high-level of dependence of people on natural resources. Based on this broader understanding and empirical experience, our framework links these two aspects.

Nature's resources in the context of generating income, wealth and commodities are the essential *means* for people's well-being from Indigenous/tribal perspectives (Fig. 2). These resources form the basis for people to maintain, use (consumptive and non-consumptive), or develop their *capabilities* to achieve a set of *functionings* that they have real access to for obtaining satisfaction i.e. *utility*. However, such *functionings* and *utilities* depend upon the availability of resources and related knowledges and skills. To continue obtaining benefits from natural systems, consideration of peoples' *capabilities* as *tools* (key) to enhance well-being is vital for policy making, as shown in Fig. 2.

Freedom comprises an important element of all the three components i.e. *capabilities*, *functionings*, and *utility*, in the overall framework (Fig. 2). A certain degree of freedom is necessary to obtain the kind of *capabilities* one would like, depending upon the access and availability of human and natural resources. Similarly, once an individual develops a set of *capabilities*, *freedom* is important for him/her to choose the right set of opportunities suiting his/her *capabilities* to achieve *functionings* which can enhance his/her *utility* or well-being. We explain this further using examples described in Table 3.

Utility concept within the Capability Approach represents the 'state of affairs' such as meaningful and fulness of human lives, violation/protection of rights and duties, and happiness, desire fulfilment, and choice (Sen, 1999; 1985). Sen's argument on *utility* includes a comprehensive range of valuable well-being aspects, implying a person's physical as well as mental state (Clark 2007); and ES deliver both physical as well as mental/spiritual well-being from *utility* perspective.

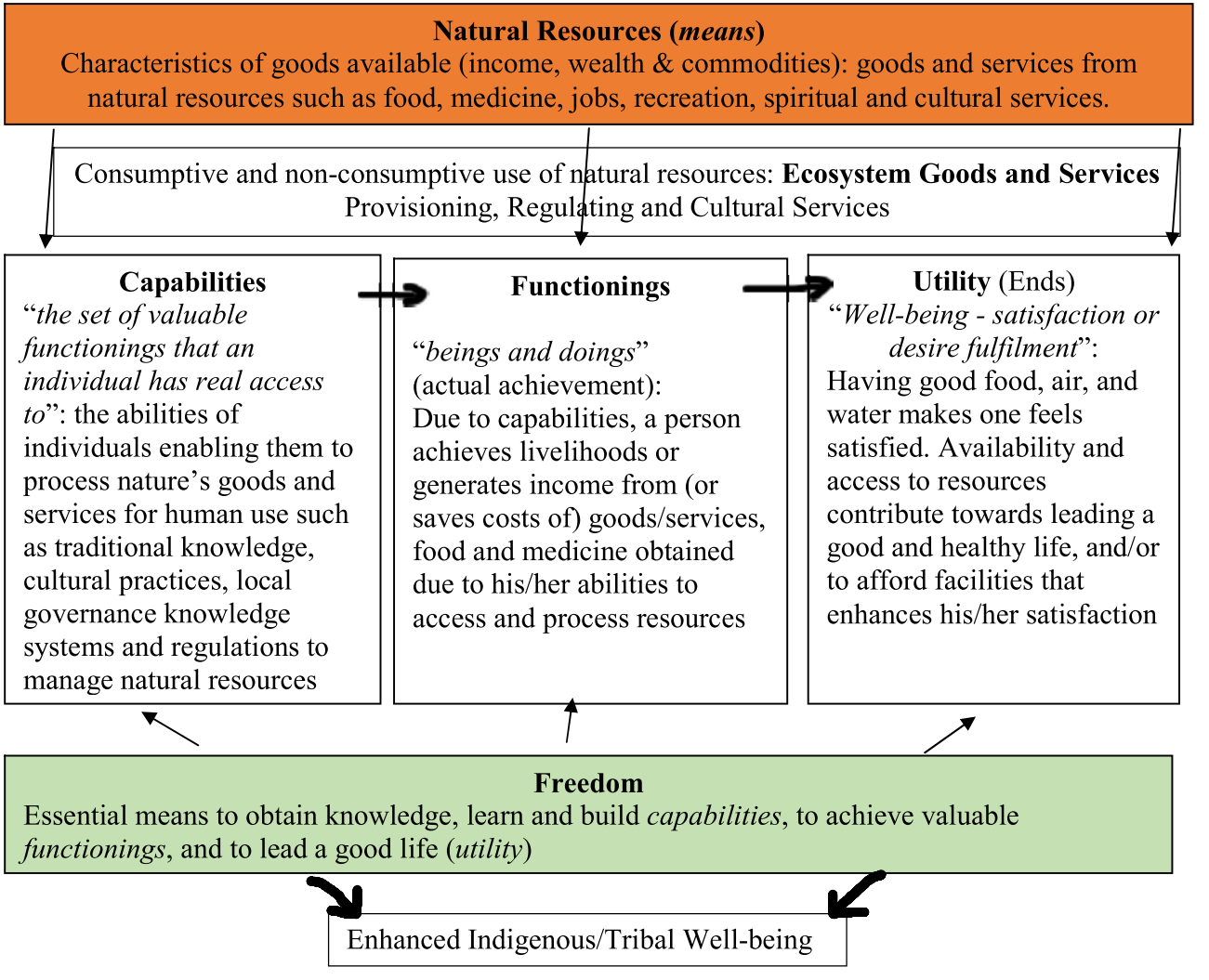

Fig. 2. A framework linking natural resources and their ES with peoples' capabilities, functionings, and utilities (ends).

Table 3
Examples of ES derived from tribal/Indigenous lands and a related set of *capabilities*, *functionings*, and *utilities* (adapted from Sangha and Russell-Smith, 2017).

ES derived from Indigenous/tribal *lands*	Materials/items	Capability	Functioning	Utility
Food/medicine	Bush food and medicine	Knowledge of native plants and animals, what, where, how, and when to eat and skills to process.	Having a diverse range of nutritious food/medicine available from natural resources	Good health and overall satisfaction.
Language	Many words and concepts originate from knowing and being on *tribal lands* and are exclusive to a particular tribal region	Knowledge of a particular language and ability to pass on that knowledge contribute to the core of many Indigenous/tribal cultures – enabling people to learn norms and practices.	Understanding and performing cultural ceremonies, governance structures, teaching young generations about the tribal/ Indigenous cultures.	Leading creative and fulfilling livesby learning and practicing language, maintaining identity, and leading the way one wants to live.
Spiritual	Sacred groves and other ceremonial places across a particularIndigenous/ tribal area	Knowledge of ceremonies—when, where, how and what type of ceremony to be conducted and the purpose of ceremonies to teach the youngsters.	A sense of achievement, and performance of such ceremonies unites the past, present and future generations.	Integrating meaning of life and purpose by connecting with beliefs, values, community, and culture.

There are many tribal/Indigenous communities with *capabilities* to use and process forest resources, knowledge of cultural norms/practices to manage and govern the use of those resources but they are restricted due to modern socio-economic institutional and/or political structures. Understanding the value of people's interactions with their natural resources using *capabilities*, *functionings*, and *utilities* lenses, as shown in our framework, can help the policy makers comprehend a true value of forest resources for Indigenous well-being. We demonstrate this from two case studies, as discussed below.

5. Results: ecosystem services and well-being of Soliga and Kattunayaka tribal communities—two case studies from Western Ghats

This section presents relationships between ES and the well-being of both Soliga and Kattunayaka tribal communities based on household survey responses. Well-being was evaluated in the context of provisioning services such as locals' ability to access resources and earn income, obtain adequate nourishment, availability of potable drinking water; regulating services such as to be free from avoidable diseases for residing in the forest; and cultural services such as to be able to participate in traditional festivals. '*Functionings*' aspect (referring to 'being and doing') included how people are able to access and use goods and services from the forest for supporting their living.

5.1. Soliga tribe

In terms of provisioning services, 28% of respondents from the Soliga tribal community in Karnataka recognised that their forest affords them environmentally clean and safe shelter whereas 72% did not agree/strongly disagree with this service (Fig. 3). 32% of the total respondents agreed/strongly agreed that they were able to access the forest and earn income, whereas 68% of the respondents disagreed, mainly due to various socio-economic and political reasons (Fig. 3). For nutritious food, 31% of the total respondents were able to obtain an adequate amount from their forest resources, but a majority i.e. 69% disagreed to obtaining (or realising the importance of) this ES. Similarly, 32% of the respondents agreed that their forest helps them to be free from avoidable diseases, yet 68% did not. Only 12% of the respondents recognised that they were able to have adequate and clean drinking water but a majority (88%) did not realise/obtain this value.

Regarding regulating services, 81% of the respondents felt vulnerable to ecological shocks and stress (Fig. 4), whereas 19% were able to reduce their vulnerability to such shocks/stress, attributing to accessing the forest. 17% and 16% respondents, each, were able to access clean air and energy to keep them warm in winter and cool in summer, but a majority 83% and 84%, respectively, did not agree with that.

In relation to cultural services, only 32% respondents recognised the opportunity to express the importance of forests for recreation and aesthetic values. 65% respondents were able to observe and learn from natural systems whereas 35% did not have the same opportunity. 49% of the respondents agreed that they were able to participate in their cultural and traditional festival activities in the forest whereas 51% did not agree to have the same opportunity. For social activities and spiritual values, 67% of the respondents were able to apply their knowledge whereas 33% felt otherwise (Fig. 5).

5.2. Kattunayaka tribe

In the Kattunayaka tribal community in Tamil Nadu, provisioning services for 'being able to live in a clean and safe shelter' were recognised (agreed and strongly agreed) by 54% of the respondents, whereas 46% disagreed with this service (Fig. 6). Access to the forest for enabling locals to earn income and gain livelihoods were acknowledged by 75% of the respondents, only 25% did not agree with this service. 80% of the respondents agreed for being able to get food and nutrition from the forest while

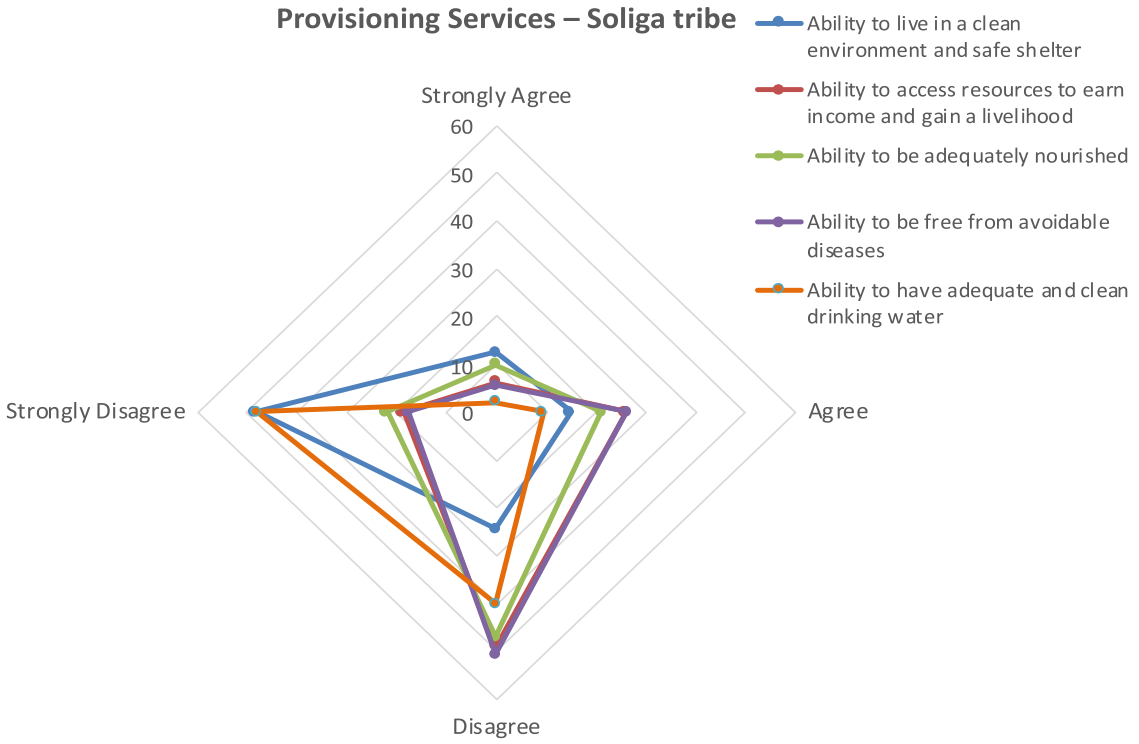

Fig. 3. Provisioning services for Soliga tribal community.

20% disagreed. For staying free from avoidable diseases, and obtaining adequate and clean drinking water, 75% of the respondents, each, agreed or strongly agreed, whereas 25% disagreed (Fig. 6).

For regulating services, protection from ecological shocks and stress was considered important by 60% of respondents who agreed that forests reduce their vulnerability (Fig. 7), whereas 40% disagreed with that. 64% of the respondents agreed/strongly agreed for being able to access clean air—a service attributed to their forest. Ability to keep warm in winter and cool in summer is another indicator of people's well-being where 69% of the respondents agreed for forest services and 31% disagreed.

Regarding cultural services, 79% of the respondents agreed/strongly agreed for forests offering them the opportunity to express recreational and aesthetic values (Fig. 8). 55% respondents agreed to be able to make use of opportunities for observing and learning about forest ecosystems, but 45% disagreed/did not recognise this service (Fig. 8). A large majority, 70% of the respondents, acknowledged the forest for being able to participate in their cultural and traditional festival activities. 66% participants recognised the forest for being able to apply their knowledge for social and spiritual ceremonies, whereas 30–34% did not agree/acknowledge those services (Fig. 8).

In Kattunayaka, on average, ~70% of the respondents agreed/strongly agreed for a range of ES from the forests that link to various aspects of their daily living. Whereas, only 33% respondents in the Soliga community reflected such strong values which indicates that realising the importance of, or accessing available forest resources and related rights, or adhering to the traditional lifestyle among the community, can be important when considering how people value their forests.

6. Interpreting case studies from policy perspectives using the proposed Capability-ES framework

Applying our proposed framework (Fig. 2) for the Soligas and Kattunayaka communities suggests that forest lands act as means for enabling people to access resources, to earn income, and support their livelihoods. These resources also offer locals an opportunity to learn and apply their cultural knowledge, and to perform social, spiritual and traditional cultural activities which enhance peoples' well-being through enabling them to lead lives in their ways. This link is clearly demonstrated by the Kattunayaka community where ~70% respondents, on average, expressed high values for their forest. Although, reflection of such values was less evident among the Soliga community, 33% on average; often realisation of these values/resources (as they are often taken for granted), ability to lead traditional lifestyle, and socio-political restrictions are common factors that impact on people-forest relationships.

Peoples' *capabilities*—knowledge and skills for using and processing forest resources—are pivotal for them to achieve *functionings*—nutritious food, good air and water, income, to manage forest land to be safe from ecological shocks, etc.—and to enhance their *utility*—to feel satisfied and lead life that people want to live. By integrating ES and Capabilities approaches, it becomes easy to understand how natural resources and their ES act as a means for building tribal peoples' *capabilities*, *functionings*, and *freedoms,* hence peoples' well-being.

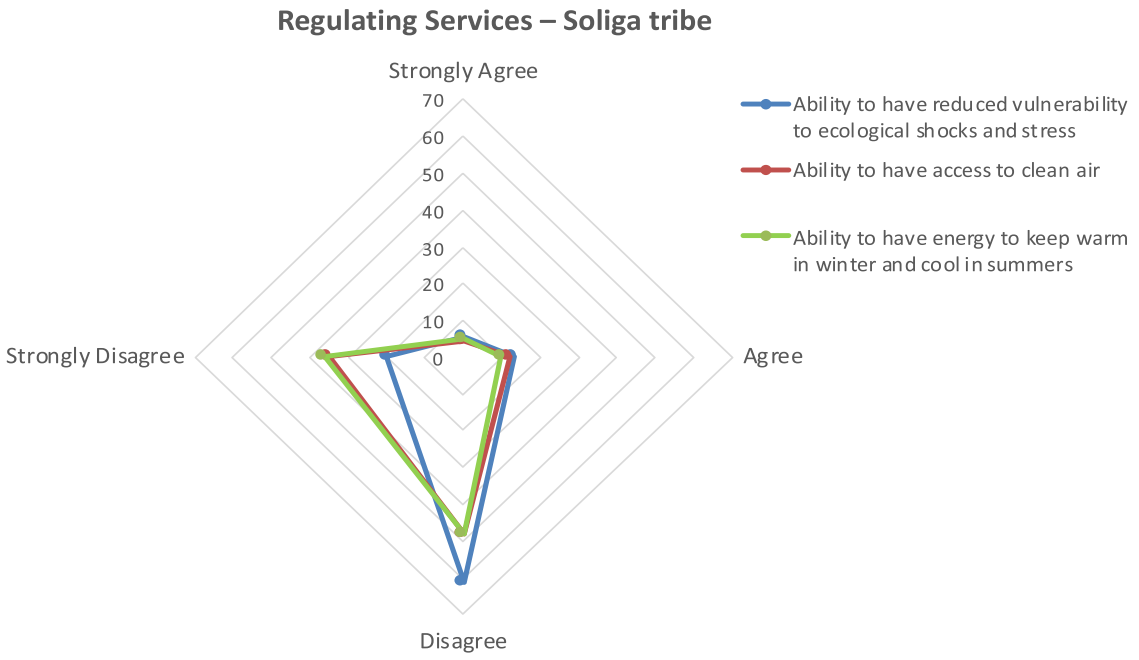

Fig. 4. Regulating services for Soliga tribal community.

Currently lack of integration of forest use and management with the well-being perspectives in policies and legislative instruments in India is a serious issue (Lele and Menon, 2014). For example, in our case studies, tribal people have limited rights to use resources from their forests due to a number of restrictions imposed on the collection of non-timber forest products after the implementation of the Forest Rights Act (2006). These regulations limit peoples' access to forest resources for adequate amounts of nutritious food. There is also lack of resources, compelling people to travel long distances to collect food (Alex et al., 2016), in addition to specific restrictions on the quantity and type of food that one can collect. For instance, if a

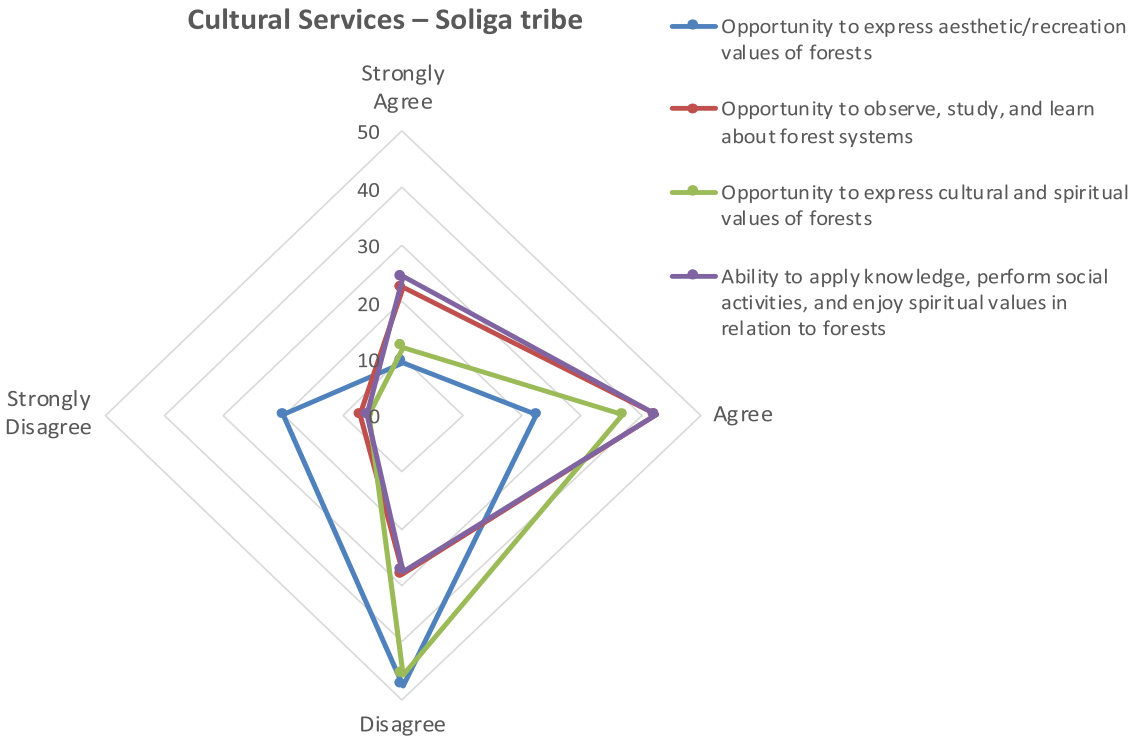

Fig. 5. Cultural services for Soliga tribal community.

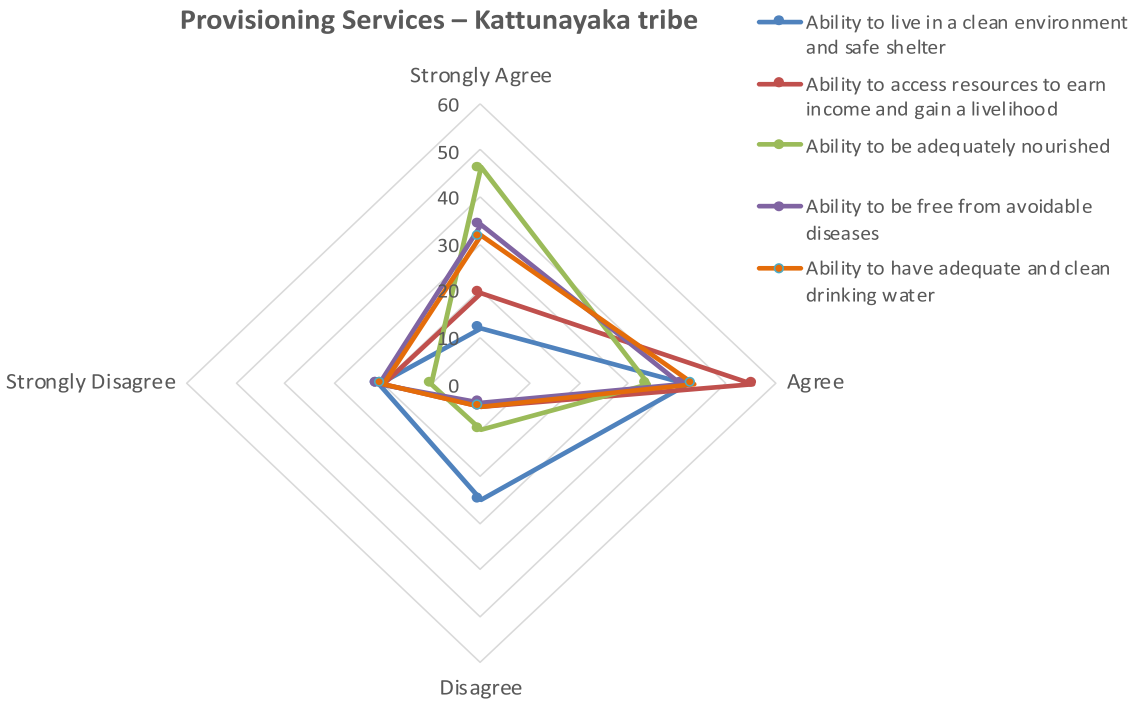

Fig. 6. Provisioning services for Kattunayaka tribal community.

person in a tribal community wants to cultivate a traditional food plant, he/she is not able to do so due to lack of access to cultivable land, and imposed political and institutional restrictions (Chemmencheri, 2013). Under the current policy settings, locals have a minimal level of control, thus limiting their *functionings* and *utility*/well-being benefits. Lack of holistic understanding of tribal well-being among the policy makers impacts significantly on people, including their future generations. Our proposed framework directly addresses this critical gap to help policy makers appropriately comprehend tribal well-being so that future development-related programs focus on enabling Indigenous peoples to lead their lives in their ways while they preserve natural resources for a much greater public benefit.

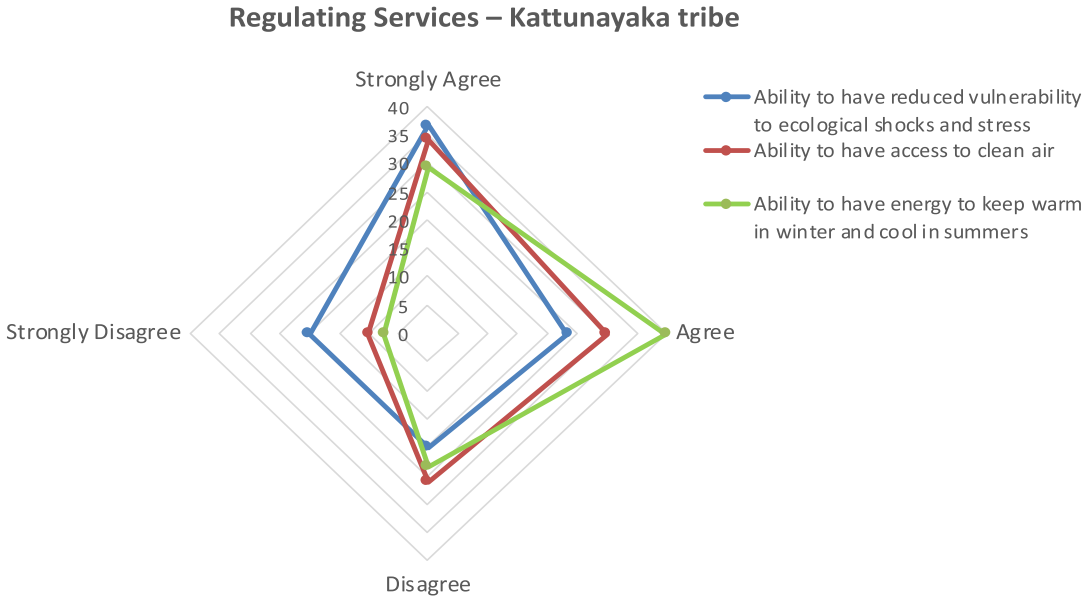

Fig. 7. Regulating services for Kattunayaka tribal community.

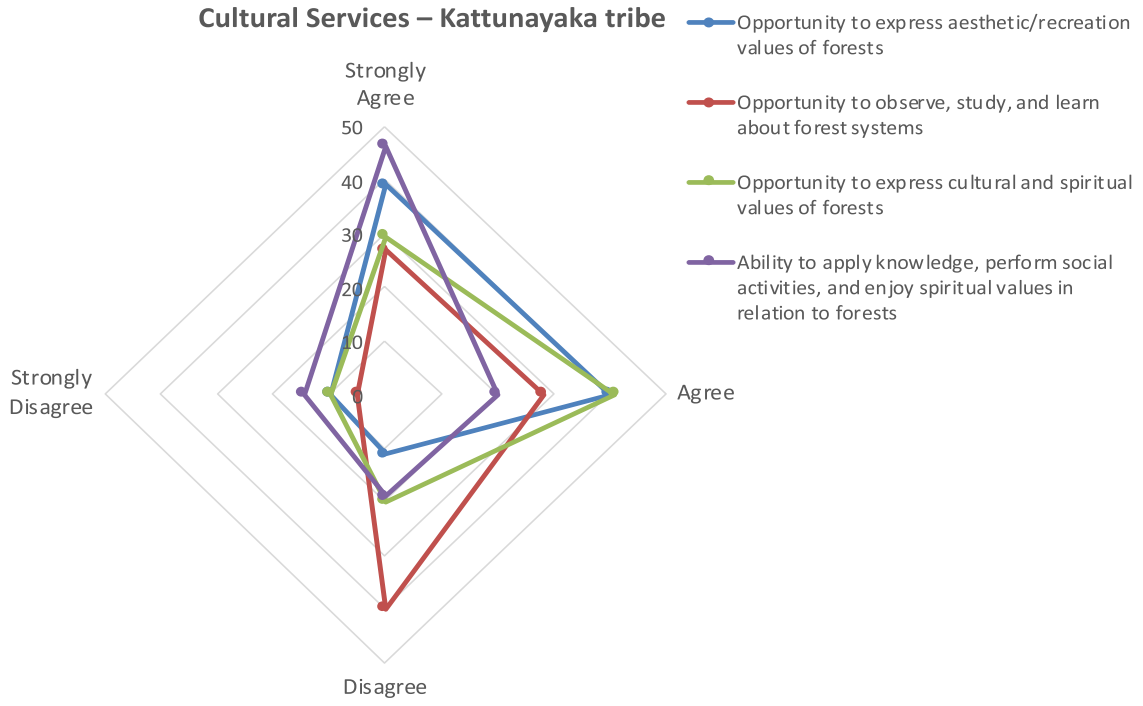

Fig. 8. Cultural services for Kattunayaka tribal community.

7. Discussion and conclusion

Our study demonstrates integration of ES and Capability approaches and its importance from Indigenous and local communities' context. The proposed framework (Fig. 2) explicitly outlines how linking these two approaches is useful for policy decision making as illustrated from two Indigenous tribal communities, Soliga and Kattunayaka, residing and practising their traditional lifestyles in a global biodiversity hotspot, the Western Ghats of India. ES, when used as a lens, highlight a diverse range of well-being benefits (interpreted using the Capability Approach) that people obtain from their lands (MA 2005; Sangha et al., 2018, 2019a, 2019b; IPBES, 2020). Such consolidated ES-well-being understanding can help develop cohesive policies on natural resource management and Indigenous/tribal well-being which can have a much significant impact on improving the well-being of ~67 million tribal people, comprising 8% of the total population in India (Shrinidhi and Thimmaiaha, 2019), and of > 350 million Indigenous people globally. Our study, one of the only few in this area (others include Polishchuk and Rauschmayer, 2012; Klein, 2015; Sangha et al., 2015b, 2018), and probably the only one in India, advances the idea of using ES as a lens to comprehend Indigenous/tribal well-being from capabilities perspectives, for tribal welfare or related public policies under the given geographical and socio-political contexts.

The integrated ES-Capabilities approach, as proposed in here, is essential for local, and tribal/Indigenous peoples whose livelihoods are interwoven with natural systems (Sangha et al., 2019b; The Indigenous World Report, 2019; Notess et al., 2018; Reytar and Veit, 2017). This study demonstrates how the well-being of two ancient tribal communities is linked with their *capabilities* and *functionings* that people derive from their tribal lands. These links were much stronger for Kattunayaka tribe—on average, ~70% people agreed that forest ES play key role in various aspects of their well-being—than Soligas (30%), as the former is still deeply connected to their traditional lifestyles, and are rightly called 'the chiefs of the forest'. Soligas have experienced many adverse effects of various Government policies including declaring Wildlife Sanctuary (BRTWLS) in 2006 and Tiger Reserve in 2011 that has severely impacted upon peoples' connections with their land (Madegowdwa and Rao, 2017). However, there is little published information available about the traditional living styles of both these communities.

Current Indian conservation policies lack consideration of ES-well-being links (Chemmencheri, 2013; Alex et al., 2016; Madegowdwa and Rao, 2017; Narain 2019). For example, the Forest Rights Act (2006)—key legal instrument to protect tribal rights—is designed for two purposes: i. conservation of forest resources; ii. to support livelihoods for local communities. Yet, there is a lack of understanding on how and what needs to be done to achieve tribal livelihoods (Chemmencheri, 2013; Madegowdwa and Rao, 2017; Narain 2019). This Act has been focussed on material (objective) well-being of forest dependent communities only, and excludes any cultural aspirations or learning, mental/emotional (subjective) well-being, let peoples' capabilities alone. India's recent National Forest Policy (2019) clearly outlines its first priority to conserve water, mitigate climate change, and last to secure livelihoods (Kukreti, 2019).

Sen's Capability approach connecting both the objective and subjective aspects of well-being (Sen, 1985, 1999), and further, the ES approach for how people derive benefits in relation to their *rights* and *freedoms* to access natural resources, and *opportunities* to create better health and knowledge relating to spiritual and cultural living on tribal lands, as demonstrated in this study, offers an

integrated vision that is essential to appropriately inform policy makers (Sangha et al., 2019b). Integrating environmental issues with tribal aspirations, capabilities and livelihoods is essential to sustain natural resources in the present times (Sangha, 2020).

In the recent years, public awareness, realisation among the government organisations, and presence of NGOs have contributed towards supporting the tribal people. The co-operative societies such as Large-Scale Adivasi Multi-Purpose Societies (LAMPS), established by the Indian Government under the Integrated Tribal Development Programme (ITDP), have supported innovative non-timber based enterprises to enhance tribal welfare. Across the entire state of Karnataka, there are more than 23 LAMPs (Usharani, 2017). In our study area alone, four LAMPs were operational at the time of this study. Implementation of Mahatma Gandhi National Rural Employment Guarantee Act (2005) further enhanced the economic opportunities, in line with sustainability goals (Madegowda and Rao, 2013). In addition, NGOs such as Vivekananda Girijan Kalyan Kendra (VGKK) also assist tribal people in Karnataka. However, results on-ground suggest limited improvements to date as the main focus for many of these organisations has been to mainstream tribal people into modern economy rather than valuing, understanding, enabling or supporting them to lead their way of living.

Among key developments by the NGOs/governments include new enterprises for Non-Timber Forest Products (NTFPs) such as tubers, bamboo, honey production, etc. Under the Forest Rights Act (2006), although tribal people are allowed to stay inside the forest/declared reserves, this is rarely followed as often people are displaced to nearby villages/towns (Menon, 2019; Kukreti, 2019; Lele and Menon, 2014). As an exception, in Soliga tribe, after the area was declared as a Tiger Reserve in 2011, some members have managed to stay inside the protected area (while many were evicted) to continue their traditional lifestyles and advance NTFP enterprises (Madegowdwa and Rao, 2017). Likewise, Kattunayaka tribal households collect NTFPs for their livelihoods under the Forest Rights Act (2006). ITDP, a local government initiative, have provided some socio-economic opportunities to Kattunayaka tribal community through offering loans and subsidies for small scale enterprises such as processing, packaging and marketing NTFPs. Particularly, ITDP enables tribal women to form 'Self Help Groups (SHGs)' for establishing small scale enterprises. An NGOs, Key Stone Foundation, has also been involved in the socio-economic upliftment of Kattunayakan tribe. Despite various government schemes and NGOs, consideration of tribal concerns and voices in decision making is very little to date; instead a considerable degree of eviction prevails (Menon, 2019; Narain 2019; Kukreti, 2019; The Indigenous World Report, 2019). Hence, the need to emphasise the holistic aspects of tribal living, understanding and applying the proposed framework or policy planning, is rather dire.

A temporal analysis of how the past and current policies has impacted on peoples, what are their responses to those policy initiatives, as well as a comprehensive understanding of peoples' links with their forest including capabilities, using ES as a lens, can offer much needed insights for developing the right and culturally appropriate set of policy initiatives.

To implement the proposed ES-Capability framework, and develop related policies, *freedom* and *rights* of tribal peoples to access forest resources, *opportunity* to learn, and to make their own decisions to enjoy a closer relationship with nature—a set of *instrumental freedom*—is essential. Such freedom is pivotal for supporting peoples' *capabilities* and *functionings*, and overall *utilities*/welfare (Sen, 1999). These different but interlinked constituents of well-being, however, require a well-planned locally designed governance system that includes aspirations of the present and future tribal generations over the long-term. Such an arrangement can also help to achieve better conservation outcomes (Bennett et al., 2019). Unfortunately, the traditional governance systems have been severely hampered over time, reviving and supporting local governance can be a first step to improve the current state of affairs in these two communities.

Our current economic growth paradigms, focusing on typical utilitarian modes of development (Gross Domestic Product), are severely impacting natural systems (Costanza et al., 2014; MA 2005; IPBES, 2020). Conversely, Indigenous/tribal peoples live in harmony with nature with much smaller ecological footprint than the mainstream society (The Indigenous World Report, 2019; Sangha et al., 2019b; Sangha, 2020). Supporting them through the right policy settings can help achieve efficient conservation outcomes for the wider global audience in a much more cost-effective way (Sangha et al., 2018, 2019b; Sangha, 2020; Veit and Ding, 2016). Moreover, since tribal peoples' *functionings* and *utilities* depend directly upon the availability of natural resources (Kimhur, 2020), investing in supporting tribal communities to manage natural resources is a logical option. Overall forest resources comprise ~28% of rural/livelihood income in 24 developing countries around the world (Angelsen et al., 2014), developing integrated policies applying ES-Capabilities approaches can be highly valuable for local and Indigenous communities, comprising 2.5 billion people across the globe, as well as for the wider public.

In India, the tribal communities are typically denied their rights (Menon, 2019; Alex et al., 2016; Chemmencheri 2013). So, achieving *functioning* is totally rejected by the 'agent'. Agent here refers to various government and non-government agencies working for tribal empowerment but enforcing their own vision and policies. Also, the agent's role in tribal economic, social and political development is questionable (Menon, 2019). If tribal and Indigenous peoples' well-being is evaluated using ES indicators such as provisioning, regulating and cultural services and through various *functionings* that ES offer, then we can make a significant progress not just for enhancing the well-being of tribal and Indigenous communities but also for many non-Indigenous communities who depend on nature too.

Our framework precisely emphasises human and nature relationships from policy perspectives, while highlighting the importance of *freedom*. Institutions have a vital role for supporting rights and livelihoods of Indigenous communities (Nussbaum, 1992). An intrinsic value of living on peoples' own tribal lands affords them the opportunity to 'act freely' and to 'choose'—an important feature of leading a good life (Sen 1993; Nussbaum, 2006), although such opportunity is restricted under the current circumstances in our case studies (Menon, 2019). In this paper, we have used the normative approach such as substantive individual freedom which implies that the members of the society enjoy the existing resources to develop their *capabilities*, to achieve *functionings*, and realise *utilities*. Freedom to celebrate tribal culture in the core forest areas, freedom to learn and work for forest and biodiversity management supporting tribal style life, beyond the current policy settings, can help both Indigenous communities as well as policy makers to

achieve their targets (Bennett et al., 2019; Sangha et al., 2018, 2019b; Sangha, 2020). A multi-dimensional understanding of tribal well-being by comprehending the role of peoples' *capabilities* and *functionings* in relation to natural resources is vital for conservation outcomes. Such an understanding must include non-monetary measures into decision-making to appropriately assess the role of ES for tribal well-being (Kumar and Kumar, 2008; Milcu et al., 2013; Sangha et al., 2017, 2018).

This study suggests a shift in the current paradigm from seeing tribal and Indigenous communities as a hinderance to conservation or development, to those who significantly contribute to manage forest resources for the greater public benefit. Developing an integrated understanding of Indigenous and tribal peoples' connections with their traditional estates using the lens of ES and Capability Approaches is imperative for the effectiveness of conservation and development programs to help enhance peoples' well-being and achieve sustainable outcomes over the long-term. Moreover, such integrated and targeted programs will help achieve seven out of 17 Sustainable Development Goals (no poverty, zero hunger, good health and well-being, clean water, climate action, life on land, and peace justice and strong institutions; the UN 2016).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Questions asked to the tribal people, and images

The common questions asked to Slogas and Kattunayaka people, on a scale from strongly agree, agree, disagree to strongly disagree, in both the tribes, include (these questioned were framed and asked in local language):

In relation to Provisioning Services:

Q1. Do you think your forest enables you to live in a clean environment and provides you a safe shelter?
Q2. Does your forest land enable you to earn income and gain a livelihood?
Q3. Do you think your forest provides you an adequate nourishment?
Q4. Does your forest land keep you free from avoidable (infectious) diseases?
Q5. Does your forest provide you adequate and clean drinking water?

In relation to Regulating Services:

Q1. Does your forest reduce your vulnerability to ecological shocks and stress?
Q2. How you rank the clean air services of your forest?
Q3. Does your forest help you keep warm in winter and cool in summer?

In relation to Cultural Services;

Q1. Do you recognise the aesthetic, recreational and cultural importance of your forest land?
Q2. Does your forest provide you an opportunity to learn and study the forest systems?
Q3. Do you recognise the cultural and spiritual values of your forest land?
Q4. Do you believe that forest enables you to perform social activities and enjoy spiritual connections?

Images 1–3 from Soliga and Kattunayaka tribal communities.

Image 1. A young girl selling NTFPs (fruits on the road side).

Image 2. Tribal house located inside the forest.

Image 3. Children from Kattunayaka tribe.

References

Aguado, M., González, J.A., López-Santiago, C., Montes, C., 2018. Exploring subjective well-being and ecosystem services perception along a rural–urban gradient in the high Andes of Ecuador. Ecosyst. Serv. 34, 1–10.

Alex, A., Vidyasagaran, K., Prema, A., Kumar, A.S., 2016. Analyzing the livelihood opportunities among the tribes of the Western Ghats in Kerala. Stud. Tribes Tribals 14 (1), 11–17.

Alkire, S., 2002. Valuing Freedoms: Sen's Capability Approach and Poverty Reduction. Oxford, New York.

Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J., Smith-Hall, C., Wunder, S., 2014. Environmental income and rural livelihoods: a global-comparative analysis. World Dev. 64, S12–S28.

Axford, N., Jodrell, D., Hobbs, T., 2014. Objective or subjective well-being? In: Ben-Arieh (Ed.), Handbook of Child Well-Being. Springer, Netherlands.

Balasubramanian M. , 2020. The Valuation of Ecosystem Services: A case study of BRTWLS in Karnataka. 56th Annual Conference of The Indian Econometric Society (TIES), organised by the School of Economics, Madurai Kamaraj University, Tamil Nadu: January 8th -10th 2020.

Bawa, K.S., Joseph, G., Setty, S., 2007. Poverty, biodiversity and institutions in forest-agriculture ecotones in the Western Ghats and Eastern Himalaya ranges of India. Agric. Ecosyst. Environ. 121 (3), 287–295.

Bennett, N.J., Di Franco, A., Calò, A., Nethery, E., Niccolini, F., Milazzo, M., Guidetti, P., 2019. Local support for conservation is associated with perceptions of good governance, social impacts, and ecological effectiveness. Conserv. Lett. 12 (4), e12640. https://doi.org/10.1111/conl.12640

Berry, M., 2017. Morality and Power: On Ethics, Economics and Public Policy. Edward Elgar, Cheltenham.

Carpenter, S.R., Mooney, H.A., Agard, J., Capistrano, D., DeFries, R.S., Díaz, S., Dietz, T., Duraiappah, A.K., Oteng-Yeboah, A., Pereira, H.M., Perrings, C., 2009. Science for managing ecosystem services: beyond the Millennium Ecosystem Assessment. Proc. Natl. Acad. Sci. 106 (5), 1305–1312.

Chemmencheri, S.R., 2013. Decentralisation, participation and boundaries of transformation: forest rights act, Wayanad, India. Commonw. J. Local Gov. 51–68.

Chopra, K., Dasgupta, P., 2008. Assessing the economic and ecosystem services contribution of forests: issues in modelling, and an illustration. Int. For. Rev. 10 (2), 376–386.

Chopra K. Kadekodi , Bathla , DV Subbarao , 1997. Natural Resource Accouonting in the Yamuna Basin Accounting for Forest Resources, IEG Monograph, New Delhi.

Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'neill, R.V., Paruelo, J., Raskin, R.G., 1997. The value of the world's ecosystem services and natural capital. Nature 387 (6630), 253–260.

Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., Danigelis, N.L., Dickinson, J., Elliott, C., Farley, J., Gayer, D.E., 2007. Quality of life: an approach integrating opportunities, human needs, and subjective well-being. Ecol. Econ. 61 (2–3), 267–276.

Costanza, R., Kubiszewski, I., Giovannini, E., Lovins, H., McGlade, J., Pickett, K.E., Ragnarsdóttir, K.V., Roberts, D., Vogli, R.D., Wilkinson, R., 2014. Development: time to leave GDP behind. Nature 505, 283–285.
Cruz-Garcia, G.S., Sachet, E., Blundo-Canto, G., Vanegas, M., Quintero, M., 2017. To what extent have the links between ecosystem services and human well-being been researched in Africa, Asia, and Latin America? Ecosyst. Serv. 25, 201–212.
Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J.R., Arico, S., Báldi, A., Bartuska, A., Baste, I.A., Bilgin, A., Brondizio, E., Chan, K.M.A., Figueroa, V.E., Duraiappah, A., Fischer, M., Hill, R., Koetz, T., Leadley, P., Lyver, P., Mace, G.M., Martin-Lopez, B., Okumura, M., Pacheco, D., Pascual, U., Pérez, E.S., Reyers, B., Roth, E., Saito, O., Scholes, R.J., Sharma, N., Tallis, H., Thaman, R., Watson, R., Yahara, T., Hamid, Z.A., Akosim, C., Al-Hafedh, Y., Allahverdiyev, R., Amankwah, E., Asah, S.T., Asfaw, Z., Bartus, G., Brooks, L.A., Caillaux, J., Dalle, G., Darnaedi, D., Driver, A., Erpul, G., Escobar-Eyzaguirre, P., Failler, P., Fouda, A.M.M., Fu, B., Gundimeda, H., Hashimoto, S., Homer, F., Lavorel, S., Lichtenstein, G., Mala, W.A., Mandivenyi, W., Matczak, P., Mbizvo, C., Mehrdadi, M., Metzger, J.P., Mikissa, J.B., Moller, H., Mooney, H.A., Mumby, P., Nagendra, H., Nesshover, C., Oteng-Yeboah, A.A., Pataki, G., Roué, M., Rubis, J., Schultz, M., Smith, P., Sumaila, R., Takeuchi, K., Thomas, S., Verma, M., Yeo-Chang, Y., Zlatanova, D., 2015. The IPBES Conceptual Framework — connecting nature and people. Curr. Opin. Environ. Sustain. 14, 1–16.
Diener, E., Suh, E., 1997. Measuring quality of life: economic, social, and subjective indicators. Soc. Indic. Res. 40 (189), 216.
Diener, E., Tay, L., 2015. Subjective well-being and human welfare around the world as reflected in the Gallup World Poll. Int. J. Psychol. 50 (2), 135–149.
de Groot, R., Ramakrishnan, P.S., 2005. Cultural and Amenity value. In: Hassan, R., Scholes, R., Ash, N. (Eds.), Millennium Ecosystem Assessment: Volume 1 – Current State and Trends. Findings of the Condition and Trends Working Group. Island Press, pp. 455–476.
IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services), 2020. IPBES conceptual framework, https://www.ipbes.net/conceptual-framework, (Accessed 23 June 2020).
Kimhur, B., 2020. How to Apply the Capability Approach to Housing Policy? Concepts, Theories and Challenges. Hous., Theory Soc. 1–21.
Klein, E. , 2015. A critical review of the capability approach in Australian Indigenous policy. CAEPR Working paper 102/2015. Centre for Aboriginal Economics and Policy Research, Australian National University, Canberra.
Kukreti, I. , 2019. Now tribal affairs ministry FRA claim settlement number under cloud. URL: https://www.downtoearth.org.in/news/forests/now-tribal-affairs-ministry-fra-claim-settlement-number-under-cloud-63326. Published by Down to Earth.
Kumar, M., Kumar, P., 2008. Valuation of the ecosystem services: a psycho-cultural perspective. Ecol. Econ. 64 (4), 808–819.
Lele, S., Menon, A., 2014. Democratizing Forest Governance in India. Oxford University Press, pp. 432 (Eds.).
Madegowda, C., Rao, C.U., 2013. The ban of non-timber forest products collection effect on Soligas migration in Biligiri Rangaswamy temple wildlife sanctuary, India. Sociology 9, 105–114.
Madegowda, C., Rao, C.U., 2017. Impact of forest policies and the economy of the soliga tribal's in biligiri rangaswamy temple wildlife sanctuary, South India. J. His Arch. Anthr. Sci. 1 (4), 112–123. https://doi.org/10.15406/jhaas.2017.01.00022
Menon, V. , 2019. India: Rising Tiger Numbers and Dwindling Tribal Rights. https://pulitzercenter.org/reporting/india-rising-tiger-numbers-and-dwindling-tribal-rights, (Accessed 8 Aug 2020).
Milcu, A.I., Hanspach, J., Abson, D., Fischer, J., 2013. Cultural ecosystem services: a literature review and prospects for future research. Ecol. Soc. 18 (3), 44.
Millennium Ecosystem Assessment, 2003. Ecosystems and Human Well-being: A Framework for Assessment. Island Press, Washington, D.C.
Millennium Ecosystem Assessment, 2005. Ecosystems And Human Well-being. The UN Island Press, Washington, DC, pp. 563.
National Forest Policy , India, 2019. National Forest Policy (Approved Draft) URL: http://www.indiaenvironmentportal.org.in/files/file/Draft%20National%20Forest%20Policy,%202018.pdf, (Accessed 8 Aug 2020).
Narain, J.P., 2019. Health of tribal populations in India: How long can we afford to neglect? Indian J. Med. Res. 149 (3), 313–316. https://doi.org/10.4103/ijmr.IJMR_2079_18
Ninan, K.N., Kontoleon, A., 2016. Valuing forest ecosystem services and disservices–Case study of a protected area in India. Ecosyst. Serv. 20, 1–14.
Notess, L., Veit, P.G., Monterroso, I., Sulle, A.E., Larson, A.M., Gindroz, A.-S., Quaedvlieg, J., Williams, A., 2018. The Scramble for Land Rights: Reducing Inequity between Communities and Companies. World Resources Institute (WRI), Washington DC.
Nussbaum, M., 1988. Nature, function and capability: aristotle on political distribution. Oxford Studies in Ancient Philosophy (Supplementary Volume). Oxf. Stud. Anc. Philos. 6. Oxford University Press, pp. 145–184.
Nussbaum, M., 1992. Human functioning and social justice: in defense of aristotelian essentialism. Political Theory 20 (2), 202–246.
Nussbaum, M., 2003. Capabilities as fundamental entitlements: sen and social justice. Fem. Econ. 9 (2–3), 33–59.
Nussbaum, M., 2006. Frontiers of Justice. Massachusetts: Havard University Press, Cambridge.
Polishchuk, Y., Rauschmayer, F., 2012. Beyond "benefits"? Looking at ecosystem services through the capability approach. Ecol. Econ. 81, 103–111.
Posey, D., 1999. Cultural and Spiritual Values of Biodiversity. United Nations Environment Programme (UNEP) and Intermediate Technology Publications, Nairobi.
Ramakrishnan, P.S., Boojh, R., Saxena, K.G., Chandrashekara, U.M., Depommier, D., Patnaik, S., Toky, O.P., Gangwar, A.K., Gangwar, R., 2005. One Sun, Two Worlds: An Ecological Journey. Oxford & IBH Publishing,, UNESCO Man and the Biosphere Programme (MAB).
Reytar, K., Veit, P., 2017. 5 Maps Show How Important Indigenous Peoples and Local Communities Are to the Environment. World Resources Institute, Washington DC, USA. https://www.wri.org/print/57261.
Robeyns, I. , 2003b. The capability approach: an interdisciplinary introduction. Training course. Proceedings of the Third International Conference on the Capability Approach, Pavia, Italy.
Robeyns, I., 2003a. Sen's capability approach and gender inequality: selecting relevant capabilities. Fem. Econ. 9 (2–3), 61–92.
Robeyns, I., 2006. The capability approach in practice. J. Political Philos. 14 (3), 351–376.
Robeyns, I., 2017. Wellbeing, freedom and social justice. Cambridge: Open Book Publishers.
Sangha, K., Russell-Smith, J., 2017. Towards an indigenous ecosystem services valuation framework: a north australian example. Conserv. Soc. 15, 255–269.
Sangha, K.K., 2020. Global importance of indigenous and local communities' managed lands: building a case for stewardship schemes. Sustainability 12, 7839. https://doi.org/10.3390/su12197839
Sangha, K.K., Le Brocque, A., Costanza, R., Cadet-James, Y., 2015a. Ecosystems and indigenous well-being: an integrated framework. Glob. Ecol. Conserv. 4, 197–206.
Sangha, K.K., Le Brocque, A., Costanza, R., Cadet-James, Y., 2015b. Application of capability approach to assess the role of ecosystem services in the well-being of Indigenous Australians. Glob. Ecol. Conserv. 4, 445–458.
Sangha, K.K., Preece, L., Villarreal-Rosas, J., Kegamba, J.J., Paudyal, K., Warmenhoven, T., RamaKrishnan, P.S., 2018. An ecosystem services framework to evaluate Indigenous and local peoples' connections with nature. Ecosyst. Serv. 31 (Part A), 111–125.
Sangha, K.K., Maynard, S., Pearson, J., Dobriyal, P., Badola, R., Hussain, S.A., 2019a. Recognising the role of local and Indigenous communities in managing natural resources for the greater public benefit: case studies from Asia and Oceania region. Ecosyst. Serv. 39, 100991.
Sangha, K.K., Russell-Smith, J., Costanza, R., 2019b. Mainstreaming indigenous and local communities' connections with nature for policy decision-making. Glob. Ecol. Conserv. 19, e00668.
Sen, A., 1993. Capability and wellbeing. In: Nussbaum, M., Sen, A. (Eds.), The Quality of Life. Clarendon Press, Oxford.
Sen, A., 1985. Commodities and Capabilities. North-Holland, Amsterdam.
Sen, A. , 1999. Development as Freedom. New York.
Sen, A., 2013. The ends and means of sustainability. J. Hum. Dev. Capab. 14, 6–20.
Shiva, V., 2016. Earth Democracy: Justice, Sustainability and Peace. ZED Books Ltd., London, UK.
Shrinidhi, V.S., Thimmaiaha, T.D., 2019. Role of integrated tribal development for the upliftment of tribal communities in Virajapet taluk of Kodagu District. Res. Rev. Int. J. Multidiscip. 4 (8), 180–183.

Sindhu, M., Natchimuthu, K., Ramkumar, S., Venugopal, S., Rao, S., 2019. Scope and challenges faced by Soliga tribes of Biligiri Rangan hills of Chamarajanagar District, Karnataka in livestock rearing. J. Entomol. Zool. Stud. 7, 1345–1348.

Summers, J.K., Smith, L.M., Case, J.L., Linthurst, R.A., 2012. A review of the elements of human well-being with an emphasis on the contribution of ecosystem services. Ambio 41 (4), 327–340.

The Indigenous World Report, 2019. The Indigenous World 2019. International Work Group for Indigenous Affairs, Copenhagen, Denmark.

Usharani, B., 2017. Performance appraisal and role of the lamp co-operative societies in tribal areas in Karnataka. IRA International Journal of Education and Multidisciplinary Studies 7. pp. 160–165. https://doi.org/10.21013/jems.v7.n2.p12

Veit, P., Ding, H., 2016. Protecting Indigenous Land Rights Makes Good Economic Sense. World Resources Institute,, Washington DC. https://www.wri.org/blog/2016/10/protecting-indigenous-land-rights-makes-good-economic-sense.

Verma, M., Negandhi, D., Khanna, C., Edgaonkar, A., David, A., Kadekodi, G., Costanza, R., Gopal, R., Bonal, B.S., Yadav, S.P., Kumar, S., 2017. Making the hidden visible: economic valuation of tiger reserves in India. Ecosyst. Serv. 26, 236–244.