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Assessing the state of traditional knowledge at national level

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ABSTRACT

Traditional practices of Indigenous Peoples support the sustainable management of a quarter of the global land area. Yet their traditional knowledge is declining. To date, there has been insufficient focus on the development of participatory and evidence-based processes for assessing the state of traditional knowledge at national levels. We used traditional knowledge indicators and participatory video to evaluate the state of traditional knowledge within three Indigenous groups in Guyana. We find that traditional knowledge is perceived to be 'stable' and responding and adapting to a diverse set of environmental factors and new circumstances. There are differences amongst Indigenous groups, but also commonalities, which help identify areas of intervention and point towards developing shared and collective narratives at the national level to feed into policy making. The findings have critical implications for the ways in which traditional knowledge should be researched, measured and safeguarded.

1. Introduction

Sustaining the Earth depends to a great degree on the institutions and actions of Indigenous Peoples. Increasing numbers of studies show how biodiversity and carbon are maintained under Indigenous stewardship. Garnett et al. (2018) highlight that about 40% of all terrestrial protected areas and ecologically intact landscapes intersect with lands that Indigenous Peoples manage or have tenure rights. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment in 2019 found that over a quarter of the global land area is traditionally owned, managed, used or occupied by Indigenous Peoples, with nature declining less rapidly there than in other lands (IPBES, 2019). Yet, although international policy actions recognise the importance of including different value systems and diverse interests in policy development (Tengö et al., 2014, 2017), and the critical role of Indigenous Peoples in protecting biodiversity and storing carbon, there are still few attempts where the knowledge of Indigenous Peoples contribute effectively to determining environmental and conservation policy, and resulting actions (Mistry and Berardi, 2016; Wilder et al., 2016).

Indigenous worldviews, beliefs, traditions, practices, and institutions are transmitted and put into practice through Indigenous knowledge (Mistry et al., 2020). This knowledge is held collectively and transmitted orally, through learning by doing. It is relational, in that it is considered to include all living things, non-living things, and supernatural beings that interact and connect in space and time (Thompson, 2019). Indigenous knowledge is adapted over time through everyday life experiences of repetition, learning and experimentation, and is therefore not static but constantly changing. However, the Indigenous knowledge upon which the conservation of global biodiversity and carbon is enacted (Gorenflo et al., 2012), is under threat. It is rapidly decreasing worldwide as a result of forces of suppression, misrepresentation, appropriation, assimilation, disconnection and destruction (Fernández-Llamazares et al., 2021), including changes in lifestyle, education and belief systems, economic and cultural globalisation, urbanization, marginalisation, loss of land rights and poverty (Aswani et al., 2018; Gómez-

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Baggethun et al., 2013).

196 countries agreed to the Convention on Biological Diversity (CBD) Aichi Biodiversity Target 18 on traditional knowledge (which includes Indigenous knowledge), yet the most recent sixth national reports to the CBD indicate that only 16% of countries are meeting or exceeding their nationally defined traditional knowledge targets, with 66% not reporting on this target at all (CBD, 2019). Further analyses of the data show that of the 112 national biodiversity strategies and action plans with national targets related to Target 18, only a fifth (21%) are similar to the scope and level of ambition set out in Aichi Target 18, with more than three quarters (79%) lower than the target, not addressing all of its elements, and in many cases set too generally (CBD, 2020a). In 2018/19, 105 countries assessed progress towards their national targets related to Aichi Target 18, either through self-assessment or by the CBD, and of these 35% were deemed to be on track to reach their national targets while 5% were deemed to exceed them. However, less than a tenth (9%) of these have national targets similar to Aichi Biodiversity Target 18 which are on track to be met (CBD, 2020b).

Looking at the specific country-specific Target 18 indicators reveals that, in many cases, they are a set of self-contained projects or initiatives, rather than a coherent strategy that addresses the loss of traditional knowledge (CBD, 2018). At the same time, while recognising that historical (and continuing) processes of colonisation, resource extraction, state intervention, and rapidly changing socio-environmental conditions, have led to significant disruptions in Indigenous cultures, it is critical to understand that traditional knowledge is dynamic and responsive to change (Mistry et al., 2020). Many Indigenous Peoples have adapted, and sometimes appropriated, different experiences into their knowledge systems (Fernández-Llamazares et al., 2021). So any representation of traditional knowledge needs to arise directly from knowledge-holders themselves to reflect their current situation, as well as include their adaptive strategies for interacting with non-Indigenous cultures and economies. To date, there has been insufficient focus on the development and testing of participatory, transparent and evidence-based processes at the national level for assessing the state of traditional knowledge.

Working in Guyana with three Indigenous groups, we used an Indigenous methodological approach for assessing the status of traditional knowledge that explicitly accounts for the relational, multidimensional and adaptive nature of Indigenous knowledge. Our aim was to assess the state of traditional knowledge of different Indigenous groups in a way that helped knowledge-holders to reflect on themselves (and actions they could take), while at the same time providing data that could be collated at the national level for developing a coherent strategy for maintaining and strengthening traditional knowledge across the country.

2. Methods

2.1. Research background

We aimed to take an Indigenous methodological approach, namely where the approach to, and undertaking of, research processes and practices take Indigenous worldviews, perspectives, values and lived experiences as their central axis (Hart, 2010; Kovach, 2009; Tuhiwai Smith, 2012; Walter and Andersen, 2013). We wanted to collect data that met Indigenous needs and aspirations, and reflected the embodied social, political, historical, and cultural realities of Indigenous people's lives. This is critical to avoid falling into the 'deficit' mental framing of Indigenous Peoples or what Walter (2016, 2018) describes as the 5D of Indigenous statistics; Indigenous difference, disparity, disadvantage, dysfunction and deprivation. Our goal was to disrupt deficit narratives, while at the same time to shift the power dynamics that constrain Indigenous influence in inequitable and unaccountable biodiversity conservation and policy contexts.

The research was shaped by strong and long-term collaborations with Indigenous Peoples in Guyana. Indigenous representative organisations contributed to the design of the research, and at a practical level, research activities were led by Indigenous researchers. This involved established senior community researchers, who had prior and extensive experience of participatory research in their communities, and authors of this paper, organising and facilitating workshops, and carrying out training and data collection. They co-developed specific questions used during workshops and in the participatory video. They trained and worked directly with community researchers in each village, and synthesised video material for non-Indigenous audiences.

The research is part of a larger project on traditional knowledge and conservation in Guyana which aimed to develop a Traditional Knowledge National Action Plan (TKNAP) for the country informed by data collected by and about Indigenous Peoples. In this paper, we present work from three districts - North Rupununi (20 communities of approximately 5,300 people, majority are Makushi), South-Central Rupununi (21 communities of approximately 12,400 people, majority are Wapishan) and Kanashen (1 community of approximately 224

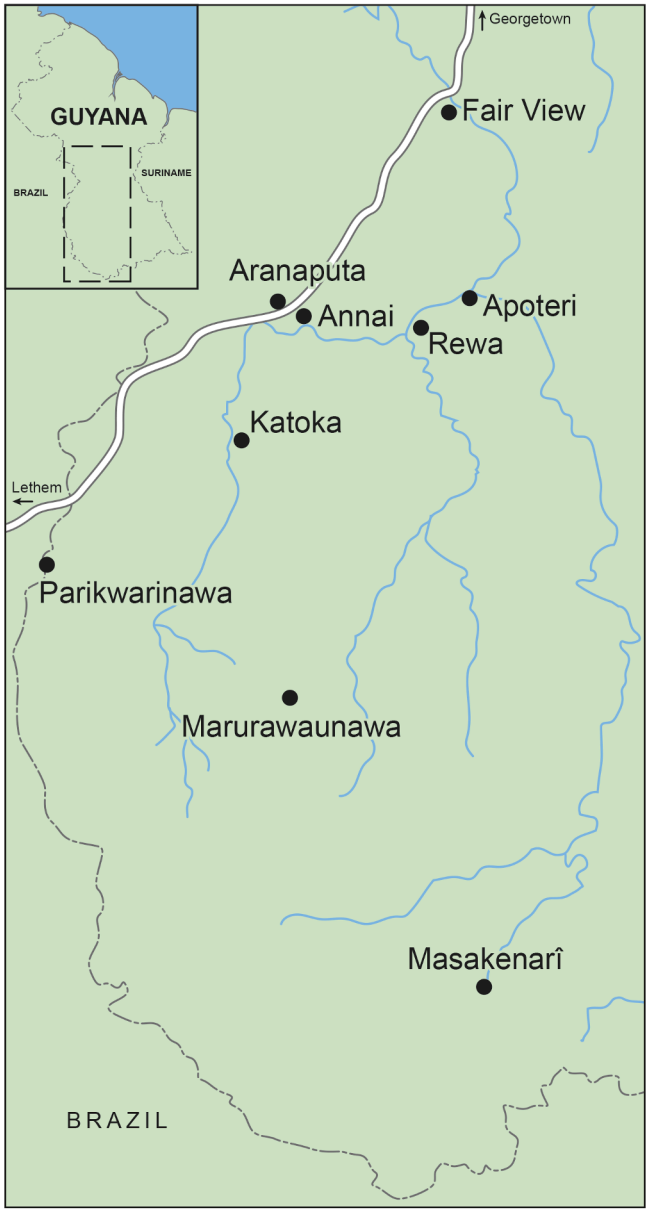

Fig. 1. Map showing location of communities directly working in the research (drawn by Jenny Thornton).

people, majority are Wai Wai) (Fig. 1). Despite a common history of colonisation by European forces, and subsequent oppression by national governments (Mistry et al., 2009a), all three districts and Indigenous groups (Makushi, Wapishan, Wai Wai) have differing development pathways influenced by the agency of Indigenous and non-Indigenous actors, historic and evolving forms of governance, livelihood strategies, culture and worldviews, and underpinned by state policies, markets and changing environmental conditions which have contributed to the current state of their traditional knowledge.

For example, many of the North Rupununi communities are accessible from the (unpaved) Georgetown-Lethem road, and have been subject to external resource extraction, particularly logging, wildlife and fisheries, as well as infrastructure developments such as large farms. At the same time, conservation organisations, particularly the Iwokrama International Centre that manages the Iwokrama Forest protected area in the region, have been active for several decades, also facilitating the establishment of ecotourism enterprises in some communities. The North Rupununi Indigenous communities are represented by the umbrella organisation, the North Rupununi District Development Board (NRDDB). In South-Central Rupununi, extensive cattle raising was historically and continues to be an important economic activity. Some people rely on going to mining areas in the region to gain income. Under the umbrella of the South Rupununi District Council (SRDC), the Indigenous communities are advocating to claim their lands as a Wapichan territory, within a national context of individual village land titles and the presence of the Kanuku Mountains Protected Area. Masakenarî in Kanashen is a remote community which is only accessible in the wet season by plane. They rely almost entirely on subsistence activities, and in 2017 legally established themselves as an Amerindian Protected Area linked to the national protected areas network.

We worked directly and intensively with 8 Indigenous communities within the three districts (Fig. 1). These were: Aranaputa, Apoteri, Fair View and Rewa (North Rupununi); Katoka, Marurawaunawa and Parikwarinawa (South-Central Rupununi), and; Masakenarî (Kanashen). To date we have had 413 people at meetings, 205 at workshops and 1428 at screenings, representing 60% of the villages' population; 638 in total were female. Results from these communities were then compiled by the senior community researchers, and shared with other communities at a district level. Thus, we facilitated a cascading system of participation; from individual participants in a village to the whole community and then to other communities.

2.2. Participatory analysis of traditional knowledge status

Building on previous research with Indigenous Peoples across the Guiana Shield region of South America, we used the system viability framework to evaluate contemporary understandings of how traditional knowledge contributes to Indigenous Peoples lives. As traditional knowledge underpins biocultural sustainability, our aim was to understand the current state of and challenges for that knowledge in order to identify points of intervention. System viability recognises that the healthy survival of any system at any scale requires attention to a number of essential responses to different 'environmental' states (where 'environment' can be the biophysical, social, economic, political) (Bossel, 1999, 2001, 2007). Our system viability framework, adapted through previous research with Indigenous Peoples (Berardi et al., 2013; Berardi et al., 2015; Mistry et al., 2010; Mistry et al., 2016), focuses on community responses or strategies to different environmental states, asking the following questions: How do we meet our basic needs? – to exist under normal environmental conditions, you need basic resources such as food, water, heath, shelter and fuel; How do we work with others? – to co-exist with other communities and/or organisations and institutions outside the community, you need good relationships; How do we maintain our identity? – to resist temporary changes in the environment, you need to draw on past experiences; How have we adapted to new challenges and influences? – to adapt to major and permanent changes in the environment, you need to learn to do new things; What gives us choice and flexibility? – to be flexible in a highly variable environment, you need to have more options; What helps us to be organised and efficient? – to be successful when resources in the environment are scarce, you need to become well organised.

From our previous participatory work with Indigenous communities across the Guiana Shield, we identified a range of strategies that contribute to community viability or survival (Fig. 2). This map was used to guide the process of identifying how traditional knowledge contributes to community survival in a challenging and changing environment, and in particular to encourage the senior community researchers who steered the process to systematically scan the multiple dimensions of traditional knowledge in the community being considered. While we recognise that system viability is externally constructed and imposed, we wanted to use a framework that would allow us to compare different districts/Indigenous groups, and importantly, capture the dynamic and adaptive nature of traditional knowledge. Our previous research has shown that while Indigenous knowledge systems from different regions are unique, there are common strategies and challenges that they share.

Using the community strategies map as a 'structuring' frame, we undertook 1–2 day participatory workshops in each of the 8 Indigenous communities. In order to foster greater participation and account for differing perspectives, particularly amongst those with less voice within Indigenous communities, we divided community participants into men, women and youth. The senior community researchers led a process of explaining and discussing the community strategies, including identifying any strategies missing from the map. Participants were then asked to identify which strategies in the diagram rely on Indigenous knowledge and why/how. To assess the perceived state of traditional knowledge for each strategy, we used emojis to represent current state from extinct, very bad, bad, acceptable, good, very good and excellent. These choices of possible states were identified and agreed amongst the participating communities through meetings and prior discussions involving the participants and wider community members including village toshaos (leaders) and elected village councillors. Each state was characterised as follows: extinct – knowledge completely absent in the community; very bad – poor, sketchy knowledge present in the community; bad – some limited knowledge present in the community; acceptable – adequate, passable knowledge present in the community; good – reasonable, good knowledge present in the community; very good – sound, detailed knowledge present in the community; excellent – comprehensive, deep knowledge present in the community.

In total, there were 24 groups of state ratings comprised of 12 from the North Rupununi, 3 from Kanashen and 9 from the South Rupununi. For analysis, the states were assigned a number from 1 to 7 and analysed using median values and Mood's median test for significance. Although we recognise the subjective nature of ratings, clear agreements on the descriptions for each state were discussed and agreed. The aim was not to produce precise figures, but to provide an overall understanding of perceived levels of traditional knowledge from the knowledge-holders themselves.

2.3. Participatory video

Participatory video aligns closely with Indigenous (oral and visual) modes of communication, is more self-directed and provides a deeper examination of Indigenous perceptions and worldviews of traditional knowledge (Mistry et al., 2014). Seen as a longer-term community engagement and mobilisation process (Milne, Mitchell and de Lange, 2012; Shaw, 2015), where films are planned, made, edited and screened for feedback through a series of iterations (Fig. 3), we used participatory video to allow Indigenous communities to explore and express how traditional knowledge contributes to biodiversity conservation, their view on the current challenges for traditional knowledge and identification of possible solutions to tackle these problems.

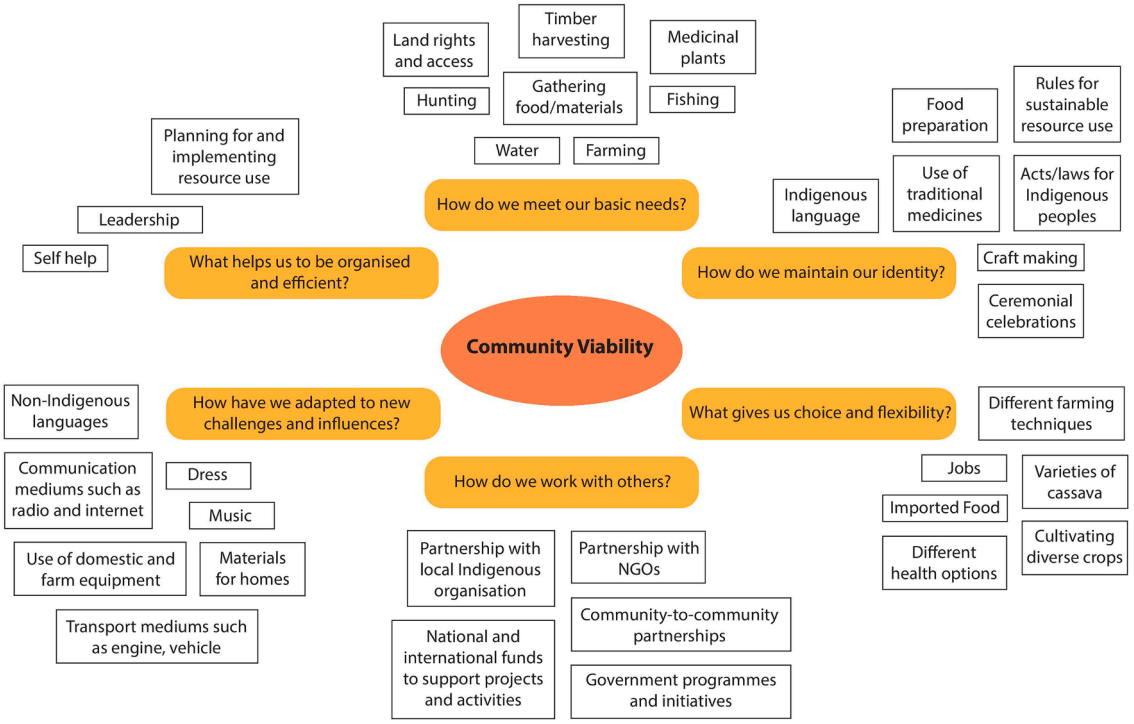

Fig. 2. Map of strategies for community viability (drawn by Malcolm Kelsey).

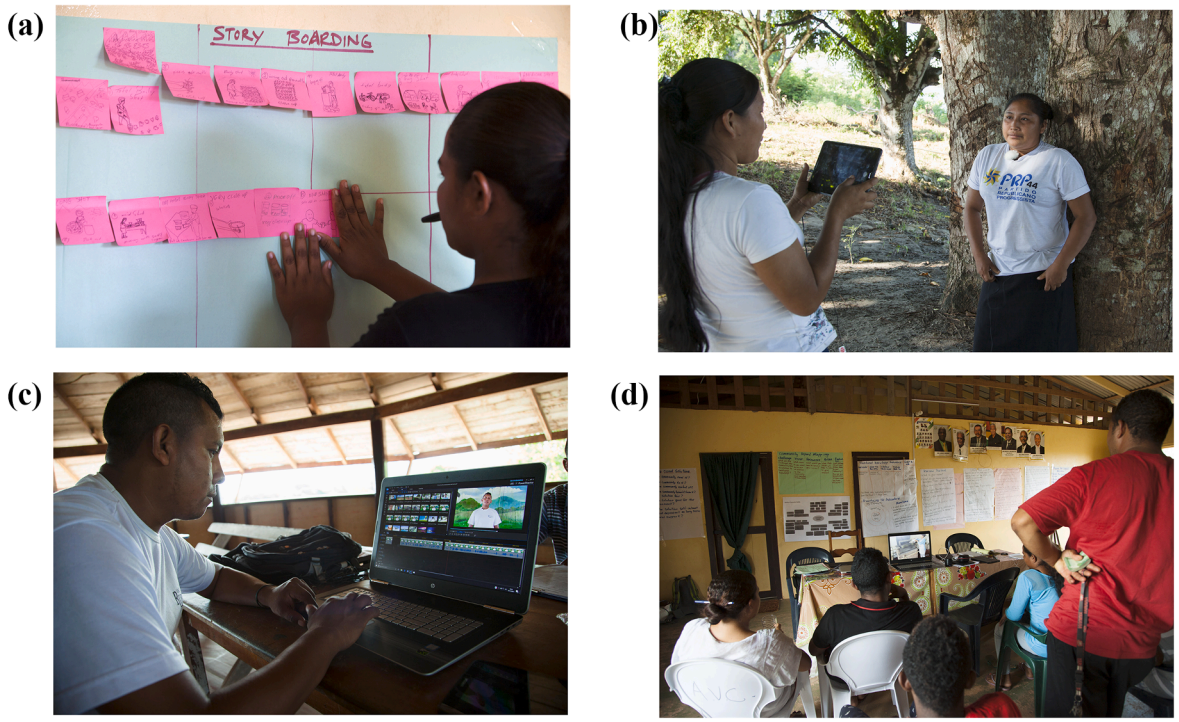

Fig. 3. Different phases of participatory video: a) discussing and planning story ideas; b) filming; c) evaluating and editing; d) screening and sharing. Photos by Claudia Nuzzo.

In each of the 8 Indigenous communities between 6 and 10 people were trained in participatory video techniques over 5–6 days. This started with activities for group forming, internal exploration and horizontal (between participants) videoing and dialogue, such as storyboarding, interviewing, filming, editing and consent/ethics exercises. This was then followed by collaborative production and screenings, where participants developed short films on the topic of traditional knowledge that involved working with the wider community, and then screening footage at the end of the day and collecting feedback from the audience. At the end of the training, with Village Council approval, interested participants were assigned as community researchers to facilitate the participatory video process in their community, working on issues of how traditional knowledge contributes to biodiversity conservation, challenges for traditional knowledge, potential solutions

to address the challenges and best practices in the community. They were supported by the senior community researchers to produce short films and screen them to the wider community to get feedback and comments, thus stimulating second and third iterations of the participatory video process. As part of the community engagement, these senior community researchers developed an accessible visual consent form, so that any material recorded had the participants' free, prior and informed consent to be shown publicly. The editing of the videos was shared, with initial editing done by the community researchers and then completed by the senior community researchers. Drafts of final videos were screened back to the communities for final comments and changes, and to obtain final consent for sharing and distribution. Examples are available on www.communityownedsolutions.org.

Over 150 hours of footage was collected and transcribed. Our data analysis of the participatory videos looked at the emergence of dominant narratives from the visual and audio materials, and how this was received and modified by the local community. Inspired by grounded theory (Charmaz, 2006), the process involved assigning a large pool of preliminary themes to images and narration, and then analysing the resulting spread and diversity of themes. This was an iterative process as emerging themes evolved and changed, often involving a reappraisal of film sections. Our results therefore report on the main themes which emerged from the data through an adaptive and emergent process of analysis (Reed and Peters, 2004). It is important to note here that in our analysis we were not seeking to produce a harmonious and homogeneous representation from the Indigenous participants, but recognising the unavoidable tensions between perspectives, and maintaining, rather than erasing differences (Mistry and Shaw, 2021).

2.4. Ethics

We followed the Right of Free, Prior and Informed Consent (FPIC) processes stated in the 2007 United Nations Declaration on the Rights of Indigenous Peoples. We did not see FPIC as a one-off process; during each visit to the community, there was time and space to discuss the research and wider project, and to ensure that people continued to want to participate. No personal data beyond name and village was collected. Data is owned by the communities in which they were obtained, with storage and access negotiated and agreed at the start of the project. Participants could request for any video recordings made of them to be deleted without requiring justification. Our regular screenings of video material to individuals and within communities aimed to ensure the highest standards of editing ethics, representation and informed consent. Video footage was first broadcast within the contributor groups, and then permission sought for broadcasting to other stakeholder groups and for inclusion online. All materials agreed by the Indigenous communities to be publicly available is licensed under the Creative Commons "Attribution Non-Commercial No Derivatives" protocol.

Participation is rarely equal within communities and the senior community researchers played a critical role that enabled greater involvement of people, albeit with personal challenges (Bignante et al., 2016; Mistry et al., 2015a,b). Although we employed approaches that build Indigenous agency and support collective action, a continual navigation of tensions was fundamental to our research practice (Mistry et al., 2009b), exactly because our project seeks to tackle the balance of social influence where there are vested interests in maintaining inequality. As researchers, we have examined our own beliefs, positioning, judgments and practices during the research process, and how these may have influenced the findings, and the activities and communications that result. And where possible, we have acted upon those reflections as the participatory processes unfolded to make the research more effective and ethical.

3. Results

Table 1 outlines the main ways in which Indigenous Peoples

Table 1
The ways in which Indigenous Peoples link traditional knowledge to each of the community viability strategies.

Strategy (within system viability category)	How is it related to traditional knowledge?
How do we meet our basic needs?	
Land rights and access	Owning land (land title) is the basis of sustainable Indigenous practices. Place is integral to Indigenous identity and worldviews, and the traditional knowledge that stems from it.
Hunting	Knowing the species, seasons, location, ways of tracking and trapping, tools and how to make them.
Medicinal plants	Knowing the species, seasons, location, ways of finding and harvesting.
Fishing	Knowing the species, seasons, location, ways of tracking and trapping, tools and how to make them.
Timber harvesting	Knowing the species, seasons, location, methods of felling.
Farming	Knowing the process of rotational farming; clearing land in the forest, burning, planting, looking after plot and harvesting.
Water	Knowing sources and quality. Knowing different waterbodies and how to navigate waterways.
Gathering food/materials	Knowing the species, seasons, location, ways of finding and ways of harvesting.
Traditional mining (*only in Kanashen*)	Knowing the seasons, location, kinds of soils and rocks, tools and how to make them.
How do we maintain our identity?	
Use of traditional medicines	Knowing species, parts to use and how to use it, including methods of preparation.
Ceremonies, beliefs and stories	Knowing rituals and beliefs, for example, associated with farming, hunting, fishing, landscape, as well as stories associated with identity.
Indigenous language	Knowing how to speak, the words associated with different practices and places.
Food preparation	Knowing how to process and cook crops, particularly cassava and all its by-products.
Craft making	Knowing how to make basketry, cotton weaving, pottery, wood work, and all the tools associated with livelihood practices.
Rules for sustainable resource use	Customary land management, through village toshao (leader) and council, use of traditional beliefs and rituals.
Acts/laws for Indigenous Peoples	Amerindian Act (*legal act created in 2006*). To recognise and protect the collective rights, land and practices of Indigenous communities.
Indigenous dress and music	Knowing how to make and wear traditional dress, jewellery and ornaments, knowing the songs and dances.
Shaman (*known as 'Piaimen'*)	Person who is knowledge holder for prayers, medicine, and spiritual beliefs.
What gives us choice and flexibility?	
Different farming techniques	Knowing various locations, soils, the different methods dependent on location, and how to grow crops in different farm contexts.
Varieties of cassava	Knowing the location, soil and climate, and variety of cassava to plant. Knowing the different varieties of cassava.
Cultivating diverse crops	Knowing the variety of crops, the different location and seasons for planting.
Imported food	Supports local food security, as well as tourism enterprises, alongside diets based on traditional crops.
Different health options	Persons trained in both traditional and conventional medicinal use, to complement each other.
Jobs	Employment opportunities through tourism, craft-making, research and other biodiversity-based enterprises.

(*continued on next page*)

Table 1 (*continued*)

Strategy (within system viability category)	How is it related to traditional knowledge?
How do we work with others?	
National and international funds to support projects and activities	Enable land rights, traditional livelihood practices, culture and conservation.
Partnership with local Indigenous organisations	Represent and promote Indigenous rights and knowledge from the community to the national level.
Community-to-community partnerships	Promote shared understanding, use and governance of land and resources.
Partnership with NGOs	Build alliances and networks to promote land rights, traditional livelihood practices, culture and conservation. Support in advocacy for Indigenous rights.
Government programmes and initiatives	National level efforts to support land rights and traditional knowledge e.g. land titling, bilingual education.
How have we adapted to new challenges and influences?	
Non-Indigenous languages	Support campaigns and lobbying of Indigenous rights, promote traditional knowledge in non-Indigenous arenas, help bi-lingual programmes.
Communication mediums, such as radio, video and internet	Way of sharing information on traditional knowledge and language. Access information to learn what is happening in the wider world regarding other Indigenous groups and their traditional knowledge.
Transport mediums, such as engines and vehicles	Support traditional livelihoods, as well as jobs based on traditional knowledge e.g. tourism
Use of domestic and farm equipment	Support community enterprises based on traditional knowledge e.g. forestry, peanut / cassava factories.
Dress	Supports revitalisation of traditional dress / costumes and use of materials / textiles in traditional dress making.
New materials for buildings	Supports local construction, complementing and adapting buildings made with local resources.
Music	Adapting non-Indigenous music genres to support traditional knowledge and language.
What helps us to be organised and efficient?	
Leadership	Person(s) in community in management and governance of land, and maintaining traditional knowledge.
Self help	Promotes collectiveness and social cohesion in community.
Planning for and implementing resource use	Collective planning of resources using traditional knowledge to ensure long-term sustainability.

associate traditional knowledge with community survival strategies. It shows that strategies for supporting traditional knowledge can be 'direct' e.g. practices that maintain Indigenous language, or 'indirect' e.g. strategies that provide political support for achieving land rights. In many cases, traditional knowledge is about 'knowing', whether it is about which species to hunt, how, when and where, or about the rules and laws on resource use and governance. In other cases, such as working with others and adapting, strategies are seen to help strengthen or promote traditional knowledge. For example, many Indigenous groups see 'Partnerships with NGOs' as an important part of their viability as it helps to build alliances and networks to promote land rights, traditional livelihood practices, culture and conservation. These NGOs can also support advocacy for Indigenous rights. This highlights how traditional knowledge is perceived by knowledge-holders to play a critical role not only in the day to day survival of communities, but in their response to new and changing social, ecological and political contexts.

It is clear that in most cases, Indigenous People relate to or 'measure' traditional knowledge by a collective sense of whether that knowledge is present or absent in the community, rather than a particular number of people that hold the knowledge. This accounts for the multiple aspects of many strategies, particularly those related to livelihood practices, as well as the knowledge being formed at different levels of 'expertise' within different age/gender groups. For example, fishing involves knowing different species, the season(s) during which they can be caught sustainably, the different waterways (ponds, creeks, rivers) that different species inhabit, ways of tracking and trapping fish, the various tools (e.g. nets, spear, bow and arrow) specific to different species, and how to make them. Different members of the community – elders, men, women, youth, children – will have different levels of knowledge about the diverse aspects of fishing outlined above. Thus, measuring traditional knowledge quantitatively and objectively in practice would be challenging and choosing individual elements would not capture the complexity of the knowledge, how it is shared within the community, and its status.

When grouped across all the communities sampled, traditional knowledge within the majority of strategies is perceived to be 'acceptable' or between 'acceptable' and 'good', with some lower than this, and none 'good' or above (Fig. 4). Thus as a whole, knowledge is perceived to be adequate or passable. Knowledge about farming has the highest value, whereas knowledge linked to ceremonies and beliefs, and the associated role of the shaman, is considered to be between 'bad' and 'very bad'. A similar pattern is found when disaggregated by men, women and youth, with little disagreement between the groups (Fig. 5, $\chi^2 = 0.58163$, DF = 2, p = 0.74765). When grouped according to the system viability categories (Fig. 6), there are little differences, with levels of traditional knowledge in most categories around 'acceptable'.

However, there is a significant difference in median scores between the different villages ($\chi^2 = 81.66345$, DF = 7, p = 6.30469E−15). Traditional knowledge in the North Rupununi communities is perceived to be at a comparably lower state compared to Kanashen and South-Central Rupununi (Fig. 7). Within the North Rupununi, there is little difference in median scores between villages ($\chi^2 = 4.72183$, DF = 3, p = 0.19333), whereas within the South-Central communities, Parikwarinawa has a lower score compared to the other two villages ($\chi^2 = 14.97453$, DF = 2, p = 0.00056).

Most community strategies in the North Rupununi are perceived to have an 'acceptable' or 'bad' level of traditional knowledge, with a few in the 'good' category such as farming, water, acts/laws for Indigenous Peoples and government programmes and initiatives (Fig. 8). The participatory videos in particular show examples of perceived healthy practices, including timber harvesting through community-based forestry. Those areas considered in a 'bad' state include land rights, ceremonies, beliefs, stories, and Indigenous language. Concerns with land rights and access stem from the way in which land titling has occurred in Guyana, where individual villages have had to apply for land titles, and then later for extensions. As a result of disagreements in the process of assigning land rights, some communities decided not to accept land titles, while others who have historically utilised resources in adjacent lands believed to be under neighbouring user rights, made and were granted legal claims to these lands. Ceremonial practices, and their associated beliefs and stories are being lost in most communities, as they are not regularly practised but primarily performed at the annual Indigenous Heritage Month celebrations. Although the North Rupununi is renowned for its cultural groups, who present songs and dance at district and national events, the everyday, lived experiences of stories and beliefs are not as widespread as in previous times.

Kanashen has many more community practices with a much higher perceived level of traditional knowledge. Farming, gathering of resources, food preparation and ceremonies, beliefs and stories are all 'very good' and above, with many others at 'good'. The Wai Wai of Kanashen are located in the deep south of Guyana, relatively remote and inaccessible by road for almost half the year during the rainy season. Despite conversion to Christianity in the 1960s, their participatory videos show that they maintain a strong worldview of reciprocity with

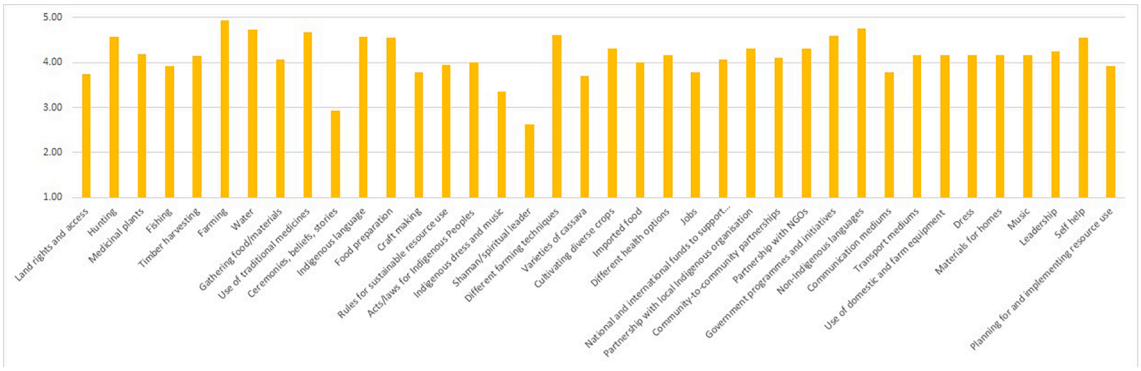

Fig. 4. Median traditional knowledge values for all communities sampled (n = 24), where 1 = extinct, 2 = very bad, 3 = bad, 4 = acceptable, 5 = good, 6 = very good and 7 = excellent.

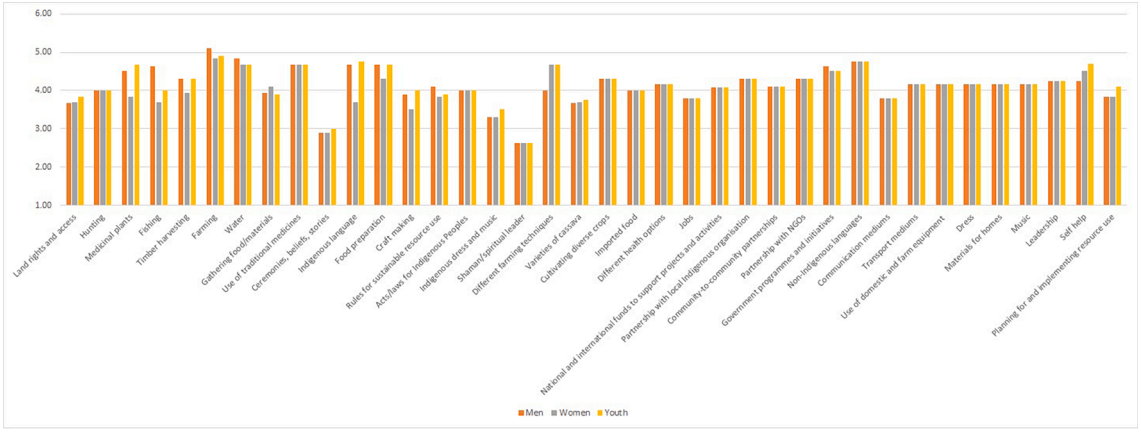

Fig. 5. Median traditional knowledge values for men, women and youth in all communities sampled (n = 8), where 1 = extinct, 2 = very bad, 3 = bad, 4 = acceptable, 5 = good, 6 = very good and 7 = excellent.

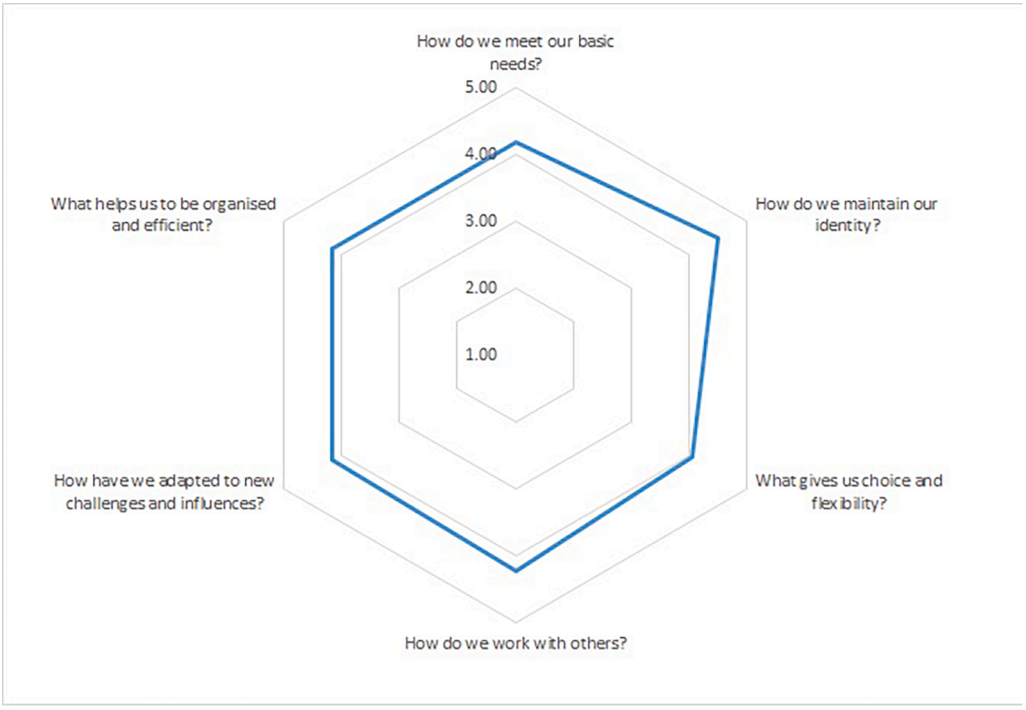

Fig. 6. Median traditional knowledge values for each system viability category for all communities sampled (n = 24), where 1 = extinct, 2 = very bad, 3 = bad, 4 = acceptable, 5 = good, 6 = very good and 7 = excellent.

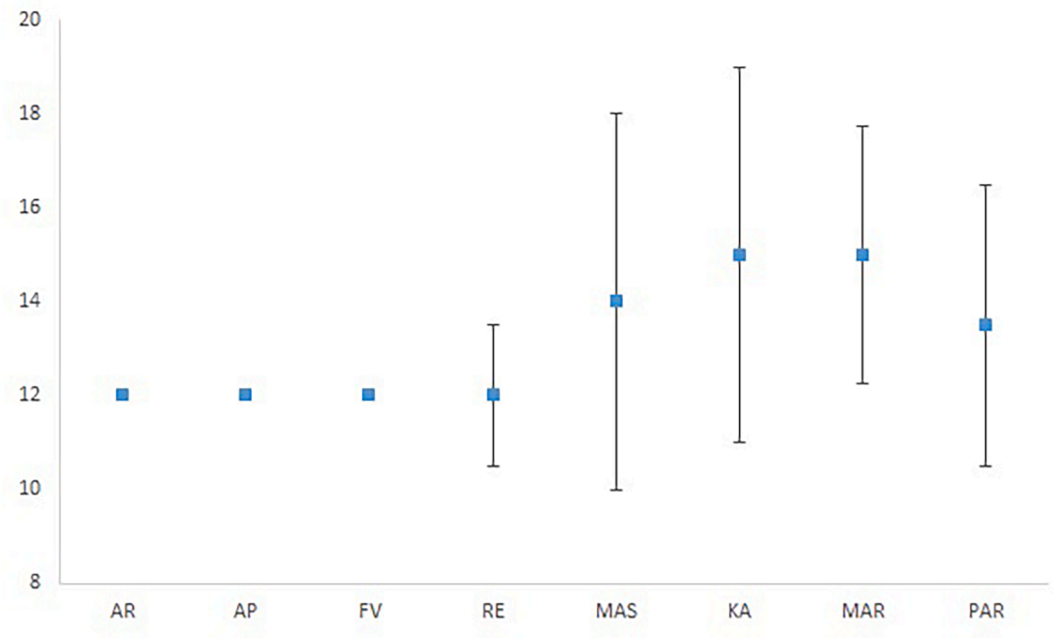

Fig. 7. Median values and interquartile range for each village, where AR = Aranaputa, AP = Apoteri, FV = Fair View, RE = Rewa MAS = Masakenarî. KA = Katoka, MAR = Marurawaunawa and PAR = Parikwarinawa.

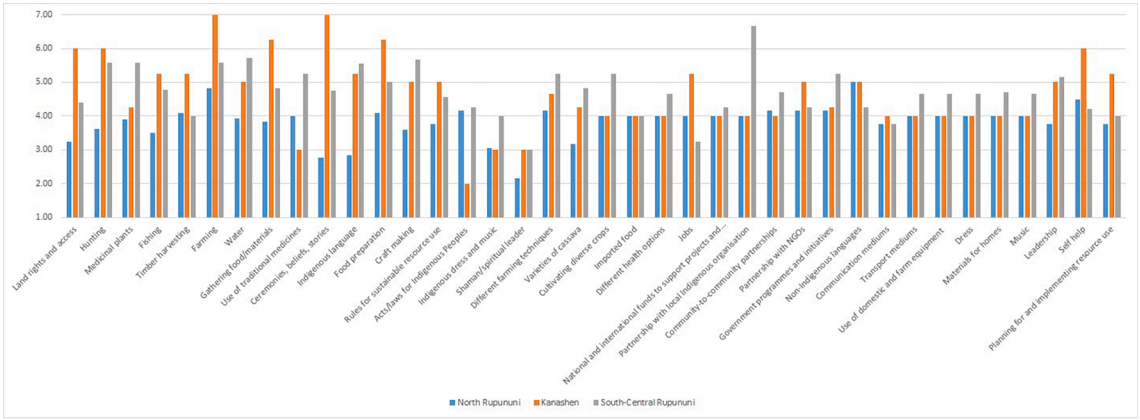

Fig. 8. Median traditional knowledge values for communities sampled in each region (n = 12, n = 3, n = 9 respectively), where 1 = extinct, 2 = very bad, 3 = bad, 4 = acceptable, 5 = good, 6 = very good and 7 = excellent.

the land and the non-human, and a strong nexus between individual, community and landscape health. This is reinforced through their establishment in 2017 as a legally protected Amerindian Protected Area, covering 625,000 ha or 3% of Guyana's land area and becoming part of Guyana's Protected Areas System. Despite concerns about illegal activities in their territory, and individuals not abiding by community rules, their perceived levels of community governance (e.g. leadership, community cohesion), identity (e.g. language, beliefs) and livelihood practices (land rights, farming, hunting) are high.

In South-Central Rupununi, there is also a higher proportion of community strategies perceived to have a 'good' level of traditional knowledge, with the role of their representative organisation seen as 'very good'. This is a reflection of the historical and sustained efforts by Indigenous Peoples in the South Rupununi to secure legal recognition over their traditional lands and establish a Wapishan territory (South Central and South Rupununi Districts Toshaos Councils, 2012). As in the North Rupununi, the government process of assigning land tenure has been done (and continues today) through individual village titling. However, the Wapishan, through their representative organisations, have been lobbying to establish a unified territory, with the backing (financial, political, technical) of national and international NGOs and supporters. In South-Central Rupununi, maintaining identity through Indigenous language is perceived to be 'good', although at an aggregated national level it is perceived to be 'acceptable'. In the participatory videos, most of the storytellers spoke in the Wapichan language, regardless of age and gender, and there has been a concerted effort in the region to introduce bi-lingual teaching at nursery school level supported by the Ministry of Education. In the North Rupununi, on the other hand, stronger historical repression of speaking Indigenous languages has left a legacy of language decline; fewer people are able to speak fluently and confidently in Makushi, a factor we encountered in the participatory video process, especially when people know that their videos will be seen by a non-Indigenous audience. Of the three South-Central villages, Parikwarinawa had lower median values, particularly for strategies under 'How do we meet our basic needs', which correspond with their concerns about external people coming onto their land to illegally extract resources and loss of knowledge on traditional methods of resource use shown in their participatory videos.

When grouped according to the system viability categories (Fig. 9), the largest differences between Indigenous groups are in the categories of 'basic needs' and 'being well-organised', with Kanashen having the highest perceived levels. Kanashen and South-Central Rupununi communities also perceive 'traditional knowledge for maintaining their identity' at a higher level than the North Rupununi.

In the participatory videos, there was an overwhelming portrayal of Indigenous people as custodians of biodiversity (Fig. 10), illustrated by quotes such as "*Amerindian always be friendly to the forest because it's their home. The real strength of the Amerindian people, they don't destroy the forest*" and "*We continue to practice our traditional knowledge by keeping our traditional Indigenous language and sustainably manage our forest biodiversity and other ecosystems. We still keep our traditional culture* e.g. *hunting, fishing and gathering, still living our way of life*". However, there is real concern about extractive and/or illegal activities affecting the biodiversity that people rely on, with fisheries in particular being mentioned by many of the storytellers. At the same time, communities realise that traditional knowledge and governance is declining as exemplified by the following; "*As Amerindians within the community, we also need to look at responsibility to ensure that we continue to do sustainable activities and should adhere to rules and regulation*". This corresponds with the traditional knowledge status data (Fig. 4), showing that many livelihood practices and rules for sustainable use are perceived to be 'acceptable' or below.

When the participatory videos on traditional knowledge were screened and shared within communities and more widely between communities (Table 2), people supported and corroborated the content, particularly the role of livelihood practices such as farming, hunting, fishing and gathering in sustaining biodiversity. They acknowledged the many challenges facing Indigenous Peoples in terms of traditional knowledge loss, including new methods of fishing and hunting leading to overharvesting, fewer young people speaking Indigenous languages and making craft (for example, objects linked directly to livelihood practices such as baskets), and a loss of collectiveness that ensured community members cared and helped each other e.g. in farming and village maintenance. At the same time, they were able to easily identify the solutions for addressing their challenges, most of which could be done by Indigenous Peoples themselves. This included, for example, using participatory video as a new form of inter-generational knowledge transmission allowing young people to engage with their language and with elder knowledge-holders, and strengthening local governance mechanisms.

4. Discussion

Our results contribute to understanding how Indigenous Peoples in Guyana currently perceive the status of their knowledge, and uniquely, provide a national-level baseline for conservation and development policies. Compared to the pre-determined, broad and frequently expert-led assessments of traditional knowledge at a national level, as exemplified by the Aichi Target 18 measures, we have presented a method that can be used across Indigenous groups and that captures a more detailed and complete picture of the status of traditional knowledge from the knowledge-holders themselves.

Our system viability and participatory video approach to identify how traditional knowledge contributes to community lives reveals specificities, strengths and vulnerabilities within individual communities, while at the same time illustrates commonalities across villages and Indigenous groups (Berardi et al., 2013). The very locally owned set of indicators allows these communities to reflect on how traditional knowledge is being lost, maintained and strengthened, as well as the key areas that require attention, whether it be around meeting basic needs or adapting to new social, ecological or political challenges. This local perception data is potentially subject to 'generational amnesia' i.e. a gradual loss of information regarding past conditions by each subsequent generation, leading to a downgrading of perceived 'normal' over

Fig. 9. Median traditional knowledge values for each system viability category for communities sampled in each region (n = 12, n = 3, n = 9 respectively), where 1 = extinct, 2 = very bad, 3 = bad, 4 = acceptable, 5 = good, 6 = very good and 7 = excellent.

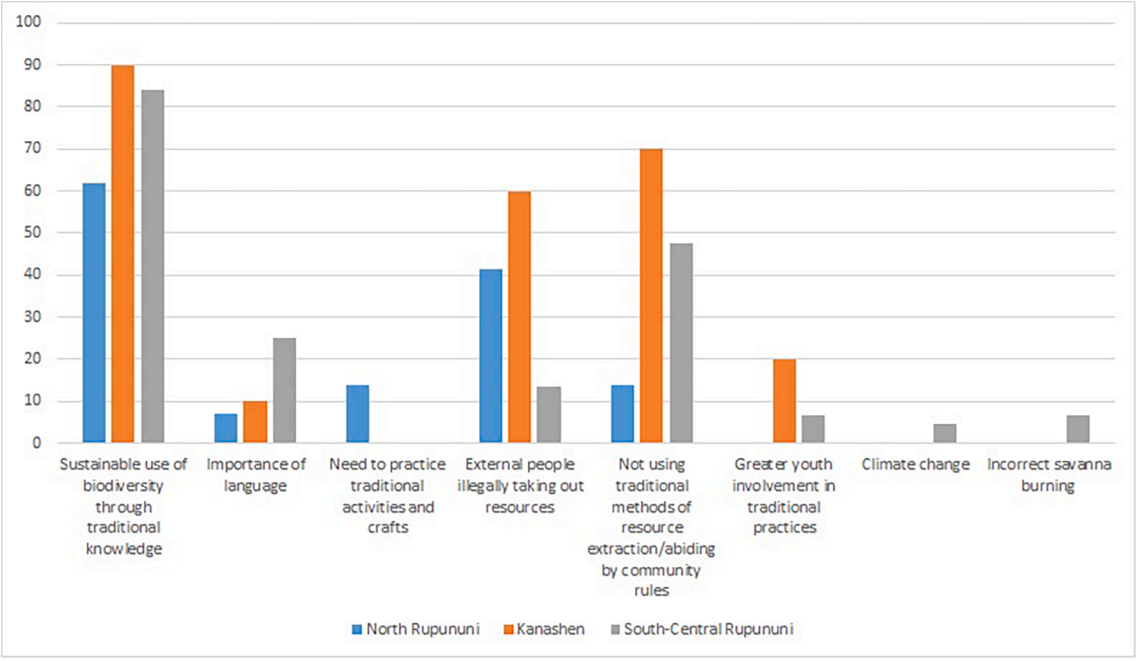

Fig. 10. Percentage of main themes mentioned in the participatory films, where number of storytellers were 26, 10 and 44 for the North Rupununi, Kanashen and South-Central Rupununi respectively.

Table 2
Main topics of discussion from community screenings of participatory videos.

Region	Sustainable use of biodiversity through traditional knowledge	Challenges for traditional knowledge	Solutions for maintaining and strengthening traditional knowledge
North Rupununi	Farming, hunting, fishing, gathering, timber harvesting, planning for and implementing resource use	Overharvesting of fish through seine nets, traditional medicines, language, out-migration of youth, craft-making	Communities have consultations, enforce village rules to stop overharvesting. Check points at key fishing locations. Revive use of traditional medicines through demonstrations, video recording, training. Develop craft-based businesses.
Kanashen	Farming, hunting, fishing, gathering, rules on resource use, patrolling territory	Chainsaw use in farming, timber materials, traditional medicines, language, craft-making, beliefs and stories, community cohesion	Involvement of elders in formal language and craft teaching. Documenting traditional knowledge through videos, photostories and books. Encourage activities to bring groups across the community together, such as hunting, gathering, preparing food and eating.
South-Central Rupununi	Farming, hunting, fishing, language, gathering, craft making	Overharvesting of fish through seine nets, traditional medicines, traditional foods, language, craft-making, beliefs and stories, community cohesion	Bi-lingual language teaching in schools. Help youth prepare locally made food for community gatherings or celebrations. Share success stories between communities and different Indigenous groups.

time (Pauly, 1995; Papworth et al., 2009). For example, Fernández-Llamazares et al. (2015) showed how gradual movement away from traditional farming practices and religious traditions in light of rapid ecosystem change provided barriers to the passing of knowledge between generations of the Indigenous Tsimane people in Bolivia. Our data currently shows little difference between men, women and youth in overall perception of traditional knowledge status, which does not rule out generational amnesia, but does suggest that age-related differences in the perception of change may not yet play a significant role. There is also the argument that traditional knowledge has to evolve over time in order to remain relevant and useful; "it is essential to understand Indigenous knowledges and practices not as static, solely traditional, and directed at a precolonial past, but as dynamic, innovative, and changing according to neo/colonial influences, new technologies, and political developments" (Knopf, 2015, p.183).

Nevertheless, a lack of experience of nature, a loss of historical knowledge or rapid environmental and social change can all impact the stability and resilience of community memory (Soga and Gaston, 2018; Turvey et al., 2010). Indigenous communities in Guyana, as reflected worldwide, are subject to a myriad of threats, including colonialism, capitalism, globalisation and environmental change (Fernández-Llamazares et al., 2021), that have significant consequences for their knowledge systems and ways of remembering (Mistry et al, 2013). Our approach of using participatory video not only helped communities to record aspects of their traditional knowledge and to reflect on its status, but also facilitated intergeneration transmission as (mostly) younger members of the communities were the community researchers interviewing and filming older people. Encouraging narratives or the documentation of knowledge held by older people may aid in the prevention of generational amnesia (Fernández-Llamazares et al., 2015).

We have shown that different Indigenous groups have differing perceptions of traditional knowledge status. At the same time, we also found strong similarities between communities and Indigenous groups, with securing rights and access to land, and strategies for maintaining

identity, being common concerns across Indigenous groups. Language, for example, was consistently mentioned in the participatory videos by all Indigenous groups, villages and men, women and youth. There is an intrinsic link between linguistic and biological diversity (Gorenflo et al., 2012). Indigenous languages not only contain extensive information about ecological systems and processes, but are commonly characterised by a community-centred way of life of their speakers reflecting the systemic Indigenous worldview (Gafner-Rojas, 2020). The breakdown of community governance mechanisms, as well as the threat of illegal resource extraction from Indigenous lands, were also prominent fears amongst the different Indigenous groups (see Fig. 10). Surfacing shared understandings emerging from the different Indigenous groups opens opportunities for developing coherent collective narratives at the national level in order to advocate for change, including the protection of cultural heritage, land rights, equity and inclusion in decision-making and inclusion of traditional knowledge in educational systems (Fernández-Llamazares et al., 2021). Our approach is limited to Indigenous groups belonging to single nation states; the Makushi and Wapishan have cross-border relations with family and kin in Brazil, in particular, but clearly identify as Guyanese citizens. This may not be the case for other Indigenous groups, thus producing a collective national-level narrative based on traditional knowledge would not be possible.

Indigenous peoples in Guyana see the majority of solutions for tackling traditional knowledge concerns either within their own power and/or can be addressed with the help of outsiders (see Table 2). This indicates the importance of promoting and strengthening community owned solutions i.e. locally led knowledge and practices that are still perceived to be at a good level, while also tackling the loss of traditional knowledge by providing enabling conditions for communities to take action. In this vein, there is considerable scope for sharing and learning ways of strengthening traditional knowledge between Indigenous groups using techniques of peer-to-peer knowledge exchange. Working across Guyana, Suriname, Venezuela, Colombia, French Guiana, and Brazil, Tschirhart et al. (2016) found that Indigenous community members were significantly more receptive to solutions emerging from, and communicated by, other Indigenous peoples, and that hearing and reflecting on stories and solutions from peers can provide a strong incentive for people to take notice and act on their challenges.

Our use of the system viability framework for the traditional knowledge indicators arises from long-term development of the approach with Indigenous communities across the Guiana Shield region of South America (Berardi et al., 2013; Berardi et al., 2015; Mistry et al., 2010; Mistry et al., 2016). There are other indicator frameworks, for example the Indicators of Resilience in Socio-ecological Production Landscapes and Seascapes (SEPLS) (Dunbar et al., 2020), that explore community or landscape resilience. There are overlaps between these frameworks and system viability (e.g., Dacks et al., 2019), but in most, traditional knowledge is not the underpinning element for all the indicators (it is included as one component), and there is limited explicit focus on the different ways communities are responding to social and environmental change. We show, for example, that as well as using traditional knowledge for basic needs and maintaining identity, Indigenous Peoples are drawing on their knowledge in new endeavours such as employment opportunities, building networks and alliances to promote and advocate for their land and rights, and in supporting conventional health systems. On this latter point, the current Covid 19 pandemic has highlighted how in the context of remote distances and limited government support, Indigenous peoples have relied on their traditional knowledge to address issues of food security and loss of income, as well as using traditional medicines to respond to this new social and economic crisis (Mistry et al., 2021a).

The system viability framework corresponds with the Los Indicadores del Bienestar Humano or Indicators of Well-being among Indigenous Peoples (IWIP), developed with Indigenous Peoples in Amazonian Colombia, in which traditional knowledge is defined as the basis for Indigenous well-being and both modern and traditional needs of Indigenous societies are taken into account (Acosta, 2013). Implementation of IWIP in the southern Colombian Amazon has shown that it has a possibility to influence the development of public policy that takes into account Indigenous cultural traits, land rights, and traditional knowledge (De La Cruz et al., 2020). At the same time, the indicators can promote communication and collaboration among local actors in decision-making, and provide visibility and legitimacy of traditional knowledge to national policy makers in contexts of unequal power relations. In the case of Guyana, we have found similar findings, where the data collected has enabled clear identification of areas for intervention and has directly informed the establishment of a Traditional Knowledge National Action Plan (TKNAP).

Although inclusion of traditional knowledge in national policy and practice in Guyana has been given some attention in the past, and new policies produced in the last few years have shown a marked improvement in the level of traditional knowledge inclusion, at least at the conceptual, and operational levels, there has been a clear gap in seeing improvements at an implementation level i.e. on the ground progress for Indigenous communities in actual policy- and decision-making situations (Ingwall-King and Mistry, 2021). A similar pattern is reflected at the global level, largely determined by political barriers (Ingwall-King, Gangur and Mistry, 2019). It is clear that although strong legal instruments and frameworks are important for traditional knowledge, such as the Amerindian Act in Guyana and Article 8(j) of the CBD, by themselves they can be insufficient to ensure that good practice is achieved and traditional knowledge is safeguarded at a national level. The use of traditional knowledge indicators, and their inclusion in the development of public policy, as in the TKNAP, is therefore a significant improvement.

Our use of participatory video alongside the indicators has helped to address the communicative and conceptual barriers towards traditional knowledge inclusion in policy. Traditional knowledge-holders are often most comfortable when communicating orally in their native languages, and they may lack equivalent words for many scientific and technical terms (Ellis, 2005). Logistical impediments to communication, such as remoteness, also impose considerable burdens on Indigenous Peoples to take part in activities and policy processes that affect them. Our approach of using participatory video has enabled greater participation of Indigenous Peoples in conservation in ways that are more appropriate to their knowledge systems. Furthermore, as part of the process of greater voice and representation of their knowledge in conservation in Guyana, we have been promoting inclusive, collaborative and responsive relations between Indigenous Peoples and decision-makers through video-mediated dialogue (Mistry and Shaw, 2021; Mistry et al., 2021b). Here, participatory videos representing Indigenous communities have been screened to decision-makers, whom in turn have responded through video to issues raised in those films. By taking these responses back to communities, we have not only attempted to build trust and knowledge between these groups, but also contributed to fostering greater recognition and respect for Indigenous worldviews and knowledge.

Our results highlight the collective and complex nature of traditional knowledge. However, difficulties in comprehending the distinct values, practices and contexts underlying traditional knowledge can lead to conceptual barriers, which in turn, affect the co-benefits people value and manage for, with the tendency in Western perspectives to favour market benefits. In Guyana, as in other parts of the world, Indigenous Peoples have been part of market-based instruments such as payments for ecosystem services (Smith et al., 2019), where their knowledge is linked to isolated entities such as carbon, rather than seen as the basis of maintaining the whole biocultural system. For example, Guyana's latest vision for its national REDD + strategy includes "supporting Indigenous communities (if they choose to) to better manage their transition to more market-based means of provisioning for their social and cultural well-being in ways that continue the tradition of wise use" (Severino et al., 2019). Although there is mention of traditional knowledge in the

strategy under the Cancun safeguards, and emphasise on secure land tenure, much of the narrative on benefit-sharing is focused on carbon ownership and the allocation of benefits and rights related to carbon offset payments. Analysis of Guyana's REDD + policy process has shown that it has been rather highly contingent on personal relationships and narrow (elite) political interests (Hook, 2020). With limited involvement of Indigenous Peoples beyond collecting forest monitoring data (Laing, 2018), there is a significant risk of knowledge 'extraction' and further deterioration of the status of traditional knowledge.

The CBD's post-2020 Global Biodiversity Framework has the opportunity to take a more rights-based, participatory and holistic approach to traditional knowledge, to ensure that Indigenous Peoples and local communities' sustainable customary use and their traditional lands are protected. The new Target 19 states that 'By 2030, ensure that quality information, including traditional knowledge, is available to decision makers and public for the effective management of biodiversity through promoting awareness, education and research'. Consultations have pointed out that as it is currently worded, this is a weaker target compared to the previous Aichi Target 18. It does not solely focus on traditional knowledge, nor does it acknowledge the rights of Indigenous Peoples. In contrast, in Guyana, and based directly on the participation and evidence from Indigenous Peoples, we have developed a TKNAP that intends to increase recognition and respect of the knowledge, innovations and practices of Guyana's Indigenous Peoples, strengthen local laws, governance and mechanisms for respect and use of traditional knowledge, and enable Indigenous Peoples themselves to document and address safeguarding their traditional knowledge.

How Guyana funds the TKNAP in the longer-term is still being debated. What is clear is that there needs to be funding for environmental protection underpinned by traditional knowledge and controlled by groups living in conservation-critical areas, such as Indigenous Peoples. Recent proposals for a conservation universal income (Fletcher and Büscher, 2020), could contribute to developing non-instrumental or -utilitarian means of relating with nonhuman natures and further help to decolonise conservation, while legitimising traditional knowledge for environmental governance. We have much to learn from Indigenous Peoples, but this exchange of knowledge must be based on an ethical position of mutual respect, autonomy in decision-making and commitment to revitalizing traditional knowledge.

CRediT authorship contribution statement

Jayalaxshmi Mistry: Conceptualization, Methodology, Data curation, Formal analysis, Writing – original draft, Writing – review & editing, Visualization, Project administration, Funding acquisition. **Deirdre Jafferally:** Conceptualization, Methodology, Data curation, Formal analysis, Writing – review & editing, Project administration. **Rebecca Xavier:** Conceptualization, Methodology, Data curation, Project administration. **Grace Albert:** Conceptualization, Methodology, Data curation. **Bernie Robertson:** Conceptualization, Methodology, Data curation. **Ryan Benjamin:** Conceptualization, Methodology, Data curation, Project administration. **Sean Mendonca:** Methodology, Writing – review & editing. **Lisa Ingwall-King:** Methodology.

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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