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Andrea Berardi, Céline Tschirhart, Jayalaxshmi Mistry, Elisa Bignante, Lakeram Haynes, Grace Albert, Ryan Benjamin, Rebecca Xavier et Deirdre Jafferally

From resilience to viability: a case study of indigenous communities of the North Rupununi, Guyana

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Introduction: System Viability - a more holistic approach to resilience?

1 'Resilience' is a term that has achieved significant prominence in scientific circles (e.g. Folke, 2006; Chapin *et al.,* 2009), and now, within popular discourse. It was peppered throughout the Rio+20 outcome document "The Future We Want", and was at the core of the "Nature +" theme of the 2012 IUCN World Conservation Congress in South Korea. The resilience narrative builds a picture of systems[1], whether social or ecological (or a combination of both) experiencing increasing stress as a result of unpredictable change in their environment. This change is seen as overwhelming, inevitable and irreversible. Resilience advocates that systems, such as communities, need to prepare themselves for this catastrophic change by resisting, adapting and eventually, transforming themselves (Walker *et al*., 2004; Bahadur *et al.,* 2010; Béné *et al.,* 2012). Specifically, when confronted with shocks, a resilient system would be able to modify peripheral system components, their relationships and non-essential processes, so as to retain key system functions that represent the core identity of the system. When key functions can no longer be maintained, survival depends on radical transformation of system properties. But are unpredictable and sudden shocks the sole threats to system survival?

2 Literature on "system viability", on which we will concentrate in this paper, has explored and underlined the existence of different multilayered threats to system survival which go beyond the response to "sudden shocks". Bossel (1992, 1999, 2001) proposes six fundamental conditions of system environments:

- normal environmental state: the environment which a system most commonly experiences. This can be characterised by stability or a recurring pattern of predictable change;
- resource scarcity: this occurs when key limiting resources required for a system's survival are not immediately available when and where needed;
- variety: this is when the environment is characterised by a rich diversity of properties which can vary both over time and space;
- variability: here, the environment fluctuates beyond the normal environmental state, sometimes in random, unpredictable directions. However, the changes are rarely permanent and the probabilities of a return to the normal environmental state are high;
- change: in this situation, the environment significantly and permanently departs from the normal environmental state, to create a totally different state, which can then settle into a new 'normal' state, or can continue changing.
- other systems: the environment may contain other systems whose behaviour might have a direct effect on the system. The case of living systems, these system-to-system relationships may include predation, parasitism, symbiosis and/or competition.

3 Every system must therefore have characteristics that can cope with these six distinct environmental conditions. This is especially significant since characteristics required for coping with one environmental property may not be appropriate for others. Thus, a key aspect of the systems viability approach is that it recognises that the healthy survival of any system at any scale requires attention to a number of essential responses (adapted by Mistry *et al*., 2010 from Bossel 1999, 2001):

- ability to secure resources for basic **existence** in the 'normal environmental state';
- ability to make the best use of limiting resources through **ideal performance** in an environment of resource scarcity;
- ability to be **flexible** in an environment where there is a high variety;
- ability to cope with temporary variability by **resisting**;
- ability to **adapt** to inevitable change;
- ability to **coexist** with interdependent systems.

4 In many cases, there are tensions between these system responses. All of these six 'survival' characteristics of a system often require specific structures and processes to be sustained. Thus, there is often competition for system resources to meet the distinct requirements of these six distinct responses. One can visualise this as the responses pulling the system in six different directions. For example, in some cases, securing resources for basic existence means that system structures and processes could be redirected away from co-operatively engaging with other systems within the environment. Optimising a system so that it can perform ideally with limited resources can reduce a system's flexibility to make the best use of an environment with high variety. Resisting change can take away resources from the system's ability to evolve into a different form. Ideally, a system would have the ability to predict the exact direction its environment is moving towards, and allocate the right balance of resources to the six different responses. Often, the system either has no predictive ability or the system's future environment is unpredictable. In this case, the best strategy is to evenly distribute resources so that all six responses are functioning adequately.

5 In some cases it is possible to identify specific interventions which have a synergistic impact, so it no longer becomes a trade-off between system orientors. For example, the introduction of a novel crop species which can be grown in addition to traditional crops, is an adaptive intervention which could also potentially improve the nutritional status of a community (existence), generate higher productivity (ideal performance) and increase the range of environmental conditions within which food can be grown in a variable environment (resistance).

6 System viability orientors have been used to analyse the viability of family units, businesses, regional plans, agricultural systems, ecosystems and nations (Muller and Leupelt, 1998; Bossel, 1999, 2001, 2007; Mistry *et al.,* 2010). On the other hand, the 'resilience' concept, although attractive to many practitioners and academics, continues to present difficulties in precisely articulating how its characteristics can be measured and applied in practice (Carpenter *et al.,* 2001; Gallopin, 2006). Attempts have been made to produce more nuanced frameworks for operationalising resilience. For example, Béné *et al.* (2012) propose the '3-D Resilience' framework to represent three distinct system reactions to increasing intensities of environmental change:

- low levels of environmental change would focus on a system's absorptive capacity which would prioritise stability;
- medium levels of environmental change would focus on a system's adaptive capacity which would prioritise incremental adjustment;
- high levels of environmental change would focus on a system's transformative capacity which would prioritise radical reorganisation and innovation of system functions and structures.

7 Béné *et al.* (2012) suggest that systems would always prioritise stability before incremental adjustment and radical reorganisation since there are increasing transactional costs as systems move from absorptive to adaptive to transformative responses. Other frameworks have attempted to address concerns that many resilience frameworks are unable to appropriately capture and influence social dynamics, including issues of agency and power (Leach, 2008; Hornborg, 2009; Davidson, 2010). Berkes and Ross (2013), for example, combine insights from the resilience and psychology of development/mental health literature. However, these, and many other 'garbage can' decision-making approaches (Cohen *et al*., 1972; March and Olsen, 1986; March, 1994; March, 1999), where potentially useful ideas are thrown into the

mix in order to address the difficulties of applying such an appealing concept in practice, risks making the whole approach inoperable as the clarity and accessibility of the initial concept is overwhelmed with 'add-ons'.

8 We are therefore proposing that the straightforward nature of how system viability orientors are defined can significantly facilitate the identification and collection of indicators for evaluating the long-term survival of systems, whether social, ecological, or a combination of both. It also allows practitioners to identify trade-offs and synergies between system viability orientors and associate indicators, something that is significantly more difficult to operationalise when adopting a resilience model. In a wide-ranging review of sustainability indices, Reed *et al.* (2006) single out the system viability approach as one of the most holistic and comprehensive to-date.

9 Within this framework, how do we measure viability of a community? In other words, how are communities able to persist over time, maintaining their cohesion and distinctiveness? Can system viability be mobilised by geographers to reveal local similarities and specificities to deal with environmental challenges? Is this concept operational and practical? In this paper, we present and discuss how viability indicators have been collected and analysed in three indigenous villages of the North Rupununi, Guyana. We discuss the challenges we faced in exploring communities' viability and we explore how using a participatory and visual approach allowed system viability orientors to be understood, identified, evaluated and disseminated by communities.

10 In our study, the three communities we engaged with can be presented as three distinct systems, constituted by a small number of households and a territory that contains resources for their day-to-day lives. These characteristics allow us to identify them as integrated socio-ecological systems (a group of people sharing common values and practices working together in close proximity and in intimate association with their local biophysical environment) in three distinct locations of the North Rupununi.

Context and methodology: participatory and visual methods for the identification of viability indicators

The COBRA project

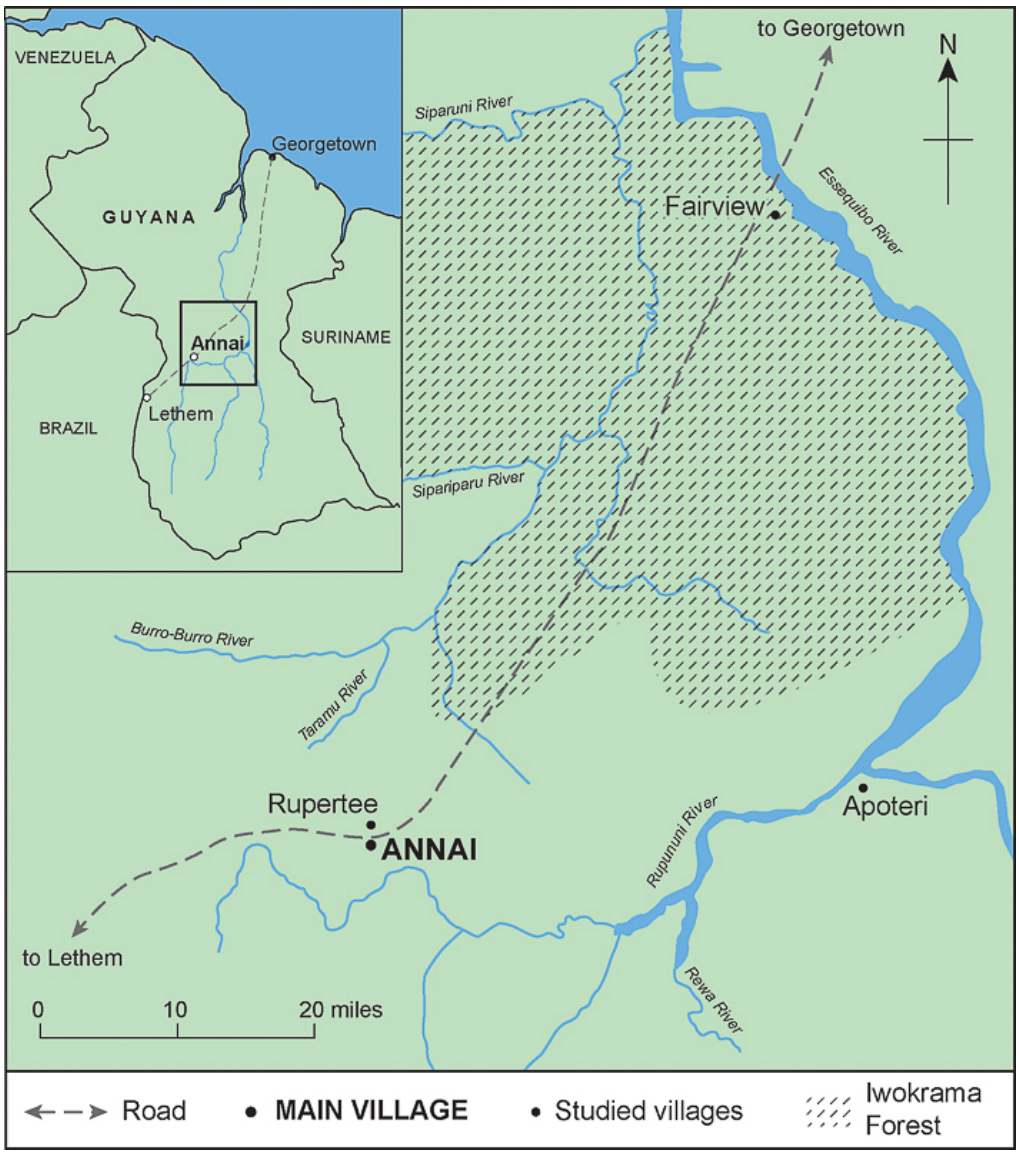
11 Our research focuses around the COBRA project - a research project funded by the European Commission 7th Framework programme. The aim is to integrate community-owned solutions to new social-ecological challenges within policies, through accessible information and communication technologies in the Guiana Shield region of South America (see www.projectcobra.org). The first phase of the project engaged indigenous communities in the North Rupununi, Guyana. Community engagement was led by the North Rupununi District Development Board (NRDDB) (the local umbrella organisation) and supported by the Iwokrama International Centre (national level NGO with long-term community engagement in the region).

12 Integral to the project is community participation to stimulate constant reflection and, if necessary, adaptation of the practices, outcomes and impacts of the project (Reason and Bradbury, 2008). Our approach was to undertake research *in collaboration with* communities rather than undertake research *on* communities. One of our goals was to help indigenous communities develop a critical framework for thinking about how to cope with their environment[2] (some aspects demonstrating stability, while other aspects demonstrating resource scarcity, variety, variability, permanent change and/or interference by other social/ ecological systems). This would enable community participants to reflect on how they have been organising and reorganising their everyday lives and activities in response to environmental challenges and opportunities, such as climate change, natural resource extraction policies, the diffusion of ICTs or new forms of transportation. The ultimate aim is to enable communities to clearly represent their own strategies for long-term survival, so that national and international decision-makers can create policies that support, rather than undermine, these strategies. We therefore consider it essential for local communities to

be involved as active participants, responsible for measuring and communicating their own viability as much as other systems and stakeholders are for theirs.

13 Through a series of initial consultations with the NRDDB and its constituent villages, three communities, Apoteri (isolated forest community), Rupertee (savanna community located close to the main road) and Fairview (a forest community lying within the protected area it lies within) were chosen for in-depth participation in the project (illustration 1). For further details on the ecological and cultural context and history of the North Rupununi communities see Mistry *et al*. (2009, 2013) and Wetlands Partnership (2006, 2008).

Illustration 1- The North Rupununi in Guyana, and the location of the three study villages



14 Apoteri is remote and isolated. From the Brazil-Georgetown road, it can only be reached by a 30 min car ride followed by 3-hour boat journey. Although it does have an airstrip, planes do not land on a regular basis. We would therefore expect the Apoteri community to promote high levels of self-sufficiency as one of their main survival strategies.

15 Rupertee is situated right beside the only road that links Brazil to Georgetown, but it is also in an administrative unit which is well connected and exposed to the outside world: Annai Village (see illustration 1). Annai Village is formed of five communities, with one of the main airstrips of the area, a relatively dynamic eco-tourism centre, and is well represented at the North Rupununi District level. Rupertee is also located close to the Bina Hill Institute, a centre that facilitates local development initiatives and training in the North Rupununi District. The survival strategies of Rupertee are therefore expected to be principally based on making the most of its well-connected situation.

16 Fairview is also close to the Brazil-Georgetown road, but is situated in a forested setting away from the regional hub. It has, however, a strong relationship with Iwokrama, as the community is situated within the NGO's reserve while supplying a significant workforce to the organisation's field centre. The influences of Iwokrama should therefore figure significantly within the community's survival strategy.

17 The three communities share many characteristics, but also have clear distinctions. This provides an opportunity to explore whether there are any common survival strategies amongst the communities, and how the distinct contextual characteristics influence survival strategies. It allowed us to explore the efficiency and practicality of the System Viability concept.

A visual and participatory approach to identifying indicators of community viability

18 We selected the system viability approach because of its comprehensiveness in analysing how a system reacts, resists, changes and evolves in order to promote its own survival in the face of a variety of environmental challenges. Nevertheless, we were aware that System Viability was not necessarily an easy framework to be applied by local communities. Also, systems approaches have been criticised for their inability to go beyond the 'system', as identified by the expert in a 'top-down' process, and engage with the granularity of the situation, including incorporating agency and power (Brown and Westaway, 2011; Fisher *et al*., 2013). However, systems approaches have significantly moved on in the last few decades to incorporate 'softer', constructivist methodologies that are explicit in their identification of multiple perspectives (e.g. Checkland, 1999). The key distinction is in participatory engagement of the 'researched' in order to transform them into 'researchers' of their own situation, while being explicit about their positionality within the investigation.

19 Explaining and identifying distinct environmental conditions and community responses to the challenges was a complex, time-consuming activity, both for researcher facilitators and for community participants. Viability and associated orientors are abstract concepts developed by academics and not easily understood by non-academic participants. Therefore, in order to try and build capacity for applying the System Viability framework by the local communities, we set out to use a visual approach to underpin all communications (Banks, 2008; Pink, 2007; Emmison and Smith, 2000), through the use of photographs, drawings and videos.

20 We used Participatory Photography (PP) and Participatory Video (PV) (Lykes *et al*., 2000; Mistry and Berardi, 2012) as engagement, capacity building and methodological tools in order to stimulate people's interest in the research and in order to allow participants to collect information in a freer and less structured way. We hoped that PP and PV would limit participants giving pre-conceived answers, as can happen in more formal interviewer-interviewed methods, although we accept that there will always be researcher biases and issues of positionality during the capacity building process. However, PV and PP has been shown to readily engage people in the research process and create a more relaxed atmosphere: photo cameras and video cameras can be fun to use and can represent a doorway into discussions involving several people during screenings (eliciting reflection and creative thinking), while the product of a film/photostory can represent a concrete output that communities enjoy watching and showing (Bignante, 2010; Mitchell, 2011).

21 Another reason for using participatory and visual methods is that we wanted to engage with spatial distinctions at the local level, exploring different perspectives, values and influences of the different communities and distinct individuals/groups. Visual methods are a powerful tool to facilitate confrontation and interaction among communities: videos produced in one community can be shown to other communities to elicit discussion in a way that can be more engaging and easily understood than reports or oral presentations, and which can give more concrete and tangible ideas of issues and reflections developed in other communities (directly seeing places and people from other communities presenting their ideas). The same goes for videos produced by particular individuals and groups, such as youths, women and elders. We also wanted to have material representing the voices and perspectives of local communities that could be shown to decision-makers at higher levels of governance so that

the voice of community representatives could be directly heard, without reinterpretation through intermediaries. Moreover, video and photography are accessible forms of recording information in the long term, and they can represent non-tangible relational information for communities – the image can capture information beyond the oral or written by allowing the viewer to engage with the visual context behind the words.

Key-stages of the project

22 Table 1 outlines the key stages of the research at community level in the North Rupununi, Guyana (where five community facilitators were employed[3]). The project began with training of the community facilitators on the project concepts and guidance on the information to be collected. This was done using participatory video/photography and System Viability games devised and collated into a community handbook. We decided to focus on games as a core activity that would enable the deconstruction of some of the project's concepts. For example, knowing the importance of food as part of indigenous culture and survival, a game of the 'viable meal' was developed as a way of working through the different system orientors: people were asked to use each orientor to propose a meal that would allow them to cope with change (being flexible to resource scarcity, adaptable to challenges coming from the exterior, etc.). Then, through a series of participatory action learning cycles (Dixon, 1999), where reflections on progress and needs were identified as research was carried out, community facilitators were directly supported by the project researchers to help achieve their objectives. In total, community facilitators and participants went through three formally facilitated action learning cycles, each underpinned by a series of video and photostory screenings.

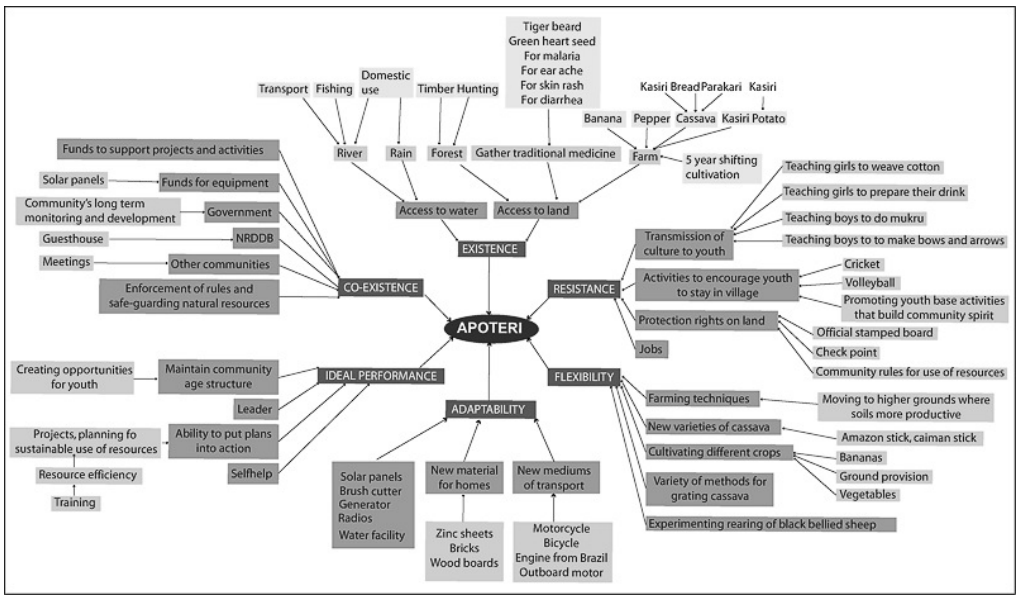
Table 1 - Key stages of participatory action learning with the three communities

Dates	Key stages of the research
October2011-November 2011	Initial training of community researchers. Introduction to key concepts of project through use of community handbook. Videos introducing system viability concepts produced by community researchers for screening to communities (Screening 1).
December 2011-March 2012	Community researchers work with community participants in identifying and filming / photographing indicators of community viability. Preliminary results screened back to the wider community for feedback (Screening 2). Additional training by project researchers on participatory photography provided in January 2012.
April 2012	Based on initial results, project researchers provide additional training on visual methods, give advice and help to facilitate community research.
May 2012	Community researchers continue working on consolidating indicators and thresholds through community engagement and screenings.
June 2012	Final community videos and photostories completed, screened to communities for final approval (Screening 3) and submitted to donor and project website.

23 As part of the community engagement, an accessible 'consent form' was developed by the community facilitators so that any material recorded could be shown publicly and to specific decision-makers. The community facilitators, guided by an Iwokrama research assistant, then set about visiting the villages to discuss, film and photograph community viability indicators. In three formal cycles of action learning, the community facilitators reviewed the visual materials, edited them into films and photostories, and then returned to the villages to screen the drafts and gauge feedback. Comments and extra material arising from community screenings were then incorporated into the films and photostories to produce more representative versions. In addition, all research participants, both at community and academic levels, kept diaries that recorded activities and reflections on practice. These were extremely rich sources of information that helped to inform the practices, achievements and challenges of working at the community level.

24 Once the video and photographic materials were submitted to the project, these were analysed by project researchers through a process of coding individual segments/photos based on visual and audio content. The NVivo qualitative software was used for this process. Coding then led to the development of spray diagrams of indicators illustrating parent-child relationships (see illustration 2). These diagrams were then presented to the community facilitators through in-depth discussions; the representations of indicators and their relationships were adapted and refined where necessary. Final spray diagrams of indicators were then presented back to communities in the three villages for final agreement and comments.

Illustration 2 - Example of an indicator spray diagram



Results: comparing locally-owned viability indicators in three communities of the North Rupununi

25 The approach described in the former paragraphs led to the building of three sets of viability indicators, one for each of the three communities. Indicators were often organised in nested hierarchies, with higher-level categories, such as 'the presence of forests' incorporating lower-level indicators such as the availability of a particular medicinal plant. Here, rather than presenting the exhaustive, nested list of viability indicators per community, we will carry out a comparative approach, focusing on similarities between the communities, but also the strong specificities that have emerged.

Similarities

Existence - access to land and waterways

26 The videos and photostories show that 'access to land', namely forests and waterways, encompasses important elements needed for meeting basic needs. Forests are needed for food (hunting, gathering fruits), for health (medicinal plants) and for extracting wood for domestic use (firewood, construction wood for homes or canoes). Forests also provide farming areas for cultivating dietary staples such as cassava (and its many by-products). Waterways are also crucial for food (fish), for domestic use (such as washing), but also for transport. To secure access to land, obtaining a community land title was highlighted as a key indicator.

Ideal Performance - efficient use of titled land

27 Although land was not necessarily felt as a scarce resource *per se*, the fact that it is geographically limited means it has to be used in a way which isn't wasteful, for the survival of the community now and in the future, as well as for generating income at community level. Thus, community management plans and projects for the sustainable and efficient use of resources were chosen as indicators of *ideal performance*, especially making the most of demarcated, titled, land.

Flexibility - developing more options for food and health security

28 Having leeway to face a highly diverse environment appears to be crucial in key areas such as food and health. To be flexible in terms of food, diversification of farming techniques and the possibility to buy food in shops, were highlighted. Farming techniques involve, for example, moving farm plots to more productive grounds, planting new, more resistant, more productive varieties of cassava, cultivating a wide variety of crops to avoid being dependant on one crop, or having two farming plots. More flexibility is also ensured with access to non-traditional food, bought in shops. However, buying food is possible where there is monetary income through employment. As a consequence, having job opportunities is an important indicator of flexibility for these three communities, as it decreases dependence on local natural resources and traditional livelihoods. In terms of health, the three communities value their choice of access to three types of health resources: local traditional practitioners, community health posts and health workers, and medical centres and hospitals in towns and cities. Indeed, if one health resource is limited or unsuccessful, communities can resort to another one, and even resort to one or the other according to the type of health issue they are dealing with.

Resistance – keeping traditions, protecting the environment

29 Two main themes emerged from the films and photostories on resistance in what was perceived to be a highly variable and confusing situation both in terms of cultural practices and weather patterns: (1) maintaining and passing on traditional practices and culture; (2) preserving the natural environment. An intimate dependence between these two aspects was strongly emphasised by the communities, reflecting a holistic indigenous worldview where the social and ecological cannot be separated (De Sartre and Berdoulay, 2011; Mistry, 2009). Maintaining and passing on traditional practices and culture involves simple daily tasks like processing cassava, but also building traditional weapons, knowing how to weave cotton, speaking the native language and knowing dances, songs and stories. Transmission of knowledge across generations, but also programmes and projects focusing on the transfer of traditional culture to youth, through local learning centres for example, were filmed. Protection of the natural environment was indicated by having conservation areas on community territory, and having/knowing/implementing laws at national and local scales for protection and sustainable use of resources. Thus, the combined promotion of traditional practices/values and natural resource conservation was seen as bringing significant stability within a highly variable situation.

Adaptability - all non-native technologies

30 New modes of transport (bicycles, motorcycles, cars, lorries) and communication (radio, television, computers, internet), new materials for homes, solar panels etc. are amongst the indicators showing how communities are adapting to a changing world, chiefly by integrating non-indigenous tools. By knowing and using these tools, the North Rupununi communities can keep up to speed with the global world and interact with it, as well as improve or support their day-to-day life.

Co-existence - benefitting from partnerships at regional, national and international levels

31 Indicators of interaction with other systems are mainly development/conservation projects, where communities interact with local to international NGOs or with the government. Co-existence is about living side-by-side with other systems, about reciprocal interaction. But the chosen indicators tend to show that communities do not consider how they are collaborating with other systems, or how they think they contribute to these other systems, at local to international levels. It seems that co-existence is interpreted as a one-way process - international aid organisations or the government lead the interactions with local communities, who act mostly as beneficiaries without really having a strong influence in determining the type of benefits.

Specificities

Apoteri: viable practices in a remote context

32 A strong focus on traditional and innovative farming techniques (Existence and Flexibility), solutions to maintain a healthy age structure and prevent youth from migrating (Resistance and Ideal Performance), and the importance of self-help (Ideal Performance) reflects a community relatively weakly connected, relying more on its own internal strengths and resources, and facing the challenge of keeping younger generations in the village.

33 Apoteri's isolated context reduces opportunities for youth, who tend to leave the village affecting its dynamism and even survival in the long-term. This explains the attempts to develop activities and opportunities for youth in the village. Isolation also explains why their Flexibility strategy is to diversify farming techniques, as access to the market or a variety of health services is extremely limited. Their priority is to reduce vulnerability, especially with changing weather patterns. With fewer or infrequent contacts with NGOs or governmental stakeholders, self-help and solidarity become important aspects of community viability.

Fair View: making the most of partnerships

34 Dominant indicators of Fair View's viability - access to education (Existence), using the rule of law and community management plans for sustainable resource use (Resistance and Ideal Performance), job opportunities (Flexibility), partnership with Iwokrama (Co-existence) - indicate a highly regulated context, where training, knowledge, education and new responsibilities are common. One of the explanations for this specific set of indicators lies in Fair View's relationship with Iwokrama. Its field station is situated only a few kilometres away from the village, along the only road that links interior South Guyana and Brazil, to the capital Georgetown (see illustration 1). The presence of the field station, and the fact that the community's territory is located within the protected Iwokrama forest, means they have benefitted from various social and ecological training programmes. Iwokrama also actively integrates them in the life of the field station, providing jobs among many other things. The Fair View viability strategy is clearly oriented towards following the rule of law and management plans for their village, partly to comply with the rules that regulate the surrounding protected forest while making the most of their particular situation.

Rupertee: finding its place and roots in an 'exposed' context

35 Rupertee is situated in a context that highly exposes it to the 'outside world'. Indeed, many of their main viability indicators are very much aimed at engagement with, and protection from, external impacts, including job opportunities (Existence), programmes to preserve traditional culture (Resistance), communication technologies (Adaptability), district level planning (Ideal Performance) and partnerships (Co-existence). Situated close to the regional micro-hub, Rupertee seems to be considering other stakeholders as partners rather than 'donors', although indicators of these partnerships are similar to the other communities: development projects and infrastructure. As a result of this exposure, concerns about identity and traditions have been raised, leading to the creation of a cultural group. The videos and photostories also show leadership and benefit-sharing issues. Within the wider community there was also contrasting perceptions on certain indicators, as some female participants felt that projects and infrastructure did not always benefit the whole village, but focused on certain groups of individuals/families, or even certain male leaders, to the detriment of the community as a whole.

Discussion: evaluating system viability for supporting community survival

A participatory approach for measuring viability: local engagement towards more harmonious development policies?

36 Carrying out system viability at the community level in a participatory way, revealed strong specificities, strengths, vulnerabilities, needs, and most of all strategies to cope with very specific contexts. As we have shown, each of these communities is dealing with a

different context, whether it is remoteness (Apoteri), growing under the wing of a strong ally (Fair View), or finding its place and identity in a relatively highly connected environment (Rupertee). The participatory approach gave a voice to the communities to express their specific perspectives on challenges and opportunities without being categorised into broader group identities (e.g. Amazon people, indigenous, remote, rural). This very locally owned set of indicators allows these communities to develop (or reinforce) a critical framework of thinking on how to cope with their environment, allowing an examination of the various tensions apparent between different orientors. It has the potential to help communities to reflect on how they have been (re)organising their everyday lives in response to social-ecological challenges and opportunities (e.g. environmental policies impacting on their land, the diffusion of ICTs, new forms of transportation etc.), but also how certain aspects of their livelihoods remain constant (such as traditional practices). In so doing, local communities were involved as active participants, responsible for identifying key indicators of their own viability, highlighting community resourcefulness and best practices, as well as vulnerabilities. Viability is thus presented as a process that is worked towards from the inside of the social-ecological system, by the local communities themselves, as much (if not more) than from the outside (national to international stakeholders).

37 As national and international policy-makers are increasingly challenged to develop policies and plans appropriate for specific contexts at the local level, our approach demonstrates how it is possible to incorporate community perspectives and aspirations through a process that they lead themselves, in ways which will directly contribute towards the viability of their specific social-ecological system. It also addresses concerns with identifying agency and power relations, as each community perspective is able to clarify the nuanced arrangements which distinct players bring to the fore within each community. The participatory approach allows us to identify which individual/group said what. It will come as no surprise that communities did not represent their survival strategies as a single voice. Youths tended to focus on adaptation strategies with a stronger emphasis on new technologies. Elder women, on the other hand, tended to focus on traditional practices and culture. This ‘tension’ and diversity of perspective within a community is in fact healthy, in that long-term viability is dependent on a diversity of strategies.

38 Although there was much specificity between communities and within communities themselves, we also found strong similarities between communities. The results show that the three communities share views and practices concerning their viability: securing access to land; managing resources sustainably using the rule of law; actively transmitting traditional practices to younger generations; strengthening food and health security by developing farming techniques and generating income; buying imported food and accessing a wider range of health services; integrating technologies from the global world to better interact with it; developing partnerships with key stakeholders that will bring benefits to the community. These common indicators reveal the shared challenges and opportunities across indigenous communities of the North Rupununi, regardless of the specific context, and potentially across the wider Guiana Shield.

39 This shared understanding emerging from the communities opens great opportunities in terms of planning for the sustainable and resilient development of the region. Indeed, it means that with a bottom-up approach, coherent shared narratives can be identified that can also embrace a diversity of survival strategies. These are community owned interests national and international policies should focus on to implement sustainable development programmes. And these local, community perspectives are the indicators of viability stakeholders should incorporate in order to monitor the success of their policies. For example, it may be that development projects focusing on food diversification and income give training and funding for the development of vegetable gardens, which would no doubt enhance food flexibility. However, as we have seen, this type of project might affect what local communities consider a key aspect of their Existence and Resistance: traditional cassava growing and processing. Interventions therefore need to weigh up a range of trade-offs and/or synergies: would it be possible to introduce new crop varieties without undermining traditional agricultural

practices? As we have also seen, most projects and infrastructure are welcomed by the local communities, and therefore have a great influence over the community's viability strategies. Communicating communities' perspectives emerging from a System Viability analysis to decision-makers would significantly promote the long-term success of any project, as well as enhancing the long-term survival prospects of local communities.

40 Overall, the System Viability framework we implemented has revealed the tensions that each North Rupununi community experiences, and the fragile balance that these communities are constantly trying to maintain to cope with a range of factors in their environment, from resource scarcity to change to mediating with other systems. The most evident tension from our perspective, at both levels, is the tension between Resistance and Adaptability: how to keep traditional knowledge and practices within a healthy natural environment, while incorporating non-native equipment and life-styles in day-to-day life? Furthermore, System Viability seems to be an operational tool for geographers, allowing us to link the very local geographical specificities to the higher scale common indicators and challenges that bring communities together.

Scope and limitations of the visual identification of indicators

41 System viability can be seen as an abstract conceptual framework to engage with, but the visual approach proved to be engaging, fun, motivating and appropriate for involving the local community, as well as the facilitators and researchers. The approach we adopted helped engage local communities in the comprehension and subsequent discussion of the orientors. Images helped connect orientors with people's experience and became the medium to give concreteness to the various indicators. For example, Existence indicators were proposed by community participants through images of the forest and farmland, followed by discussions around access to land in order to meet basic needs. Picturing the orientors made these abstract concepts 'more tangible' and less theoretical, and helped participants focus and reflect on specific elements. It also helped us, as researchers, to understand the meaning behind each proposed indicator, through a range of images and fruitful discussions.

42 However, this success in terms of community engagement also had limitations and challenges. Firstly, using images allowed the collection of highly qualitative data, but how to translate it into 'usable' indicators? Translating pictures, discussions and elements brought up by communities during discussions, into 'measurable' indicators was not an easy task and it demanded a significant amount of time and resources. Some images captured a complex message that somehow needed to be reduced into one short indicator. For example, in Apoteri, the picture of young people playing cricket was in fact the visual indicator of "creating opportunities for youth to stay in the village because it is remote and young people are migrating...". To identify the right indicator, for use by the community, as well as for planners and researchers, in-depth discussions are necessary. And finding the connection required further consultation with local communities in order not to misrepresent their thoughts. This extensive participatory and 'action learning' process required additional time, and additional financial resources.

43 Secondly, an indicator must come with thresholds in order to monitor in time and space whether that particular response is 'good', 'acceptable' or 'bad', in order to prioritise the challenges facing community viability. It has taken the team of facilitators and researchers up to a year to identify a rich and extensive set of indicators according to each orientor. The task of deciding on thresholds, in a visual way, for each of these indicators is extremely challenging, is still on-going, and links strongly to the sustainability indicator debate on how to 'measure the immeasurable' (Bell and Morse, 2008).

Conclusion: System Viability- a holistic framework for supporting communities

44 Béné *et al.* (2012) report that the "apparent inconsistency between different characteristics of a resilient system, is possibly the main unresolved issue relating to resilience" (p. 11). Norris *et al.* (2008), for example, propose that resilience should be "better conceptualised as

adaptability than stability" (p. 103). This paper has shown that an exclusive focus on enhancing system *adaptation* properties, for example, may in fact prejudice the very survival of the system in the long-term, because systems have to respond to *at least* six distinct environmental characteristics.

45 Although System Viability is a challenging framework for researchers, facilitators and communities, it allows us to replace the confused measure of resilience with a clearer and more holistic framework, allowing the identification of a comprehensive range of indicators that can help us understand how communities constantly cope with on-going and changing pressures. These locally owned indicators of viability should be taken into account by national and international policies aimed at promoting the sustainability of these social-ecological systems. Indeed, making sure that local concerns, challenges, and most of all, best practices, are considered in policy-making and planning will inevitably improve the sustainability of (and support for) these policy systems as well.

46 Using a bottom-up, visual and participatory approach also proved to be a promising approach to explore geographies of viability. Indeed, our approach clearly revealed nested and interacting scales, with a specific focus on the 'granularity' of how local social-ecological systems survive, and how these characteristics are differentiated across space and time. It revealed the very specific practices of each community to be 'more than just resilient' in its own very specific geographical context. It revealed the shared strategies across communities, at the regional scale, for dealing with social and environmental challenges. It also revealed interactions with national and international policies and plans, through partnerships with governmental and non-governmental stakeholders.

47 The System Viability approach, implemented through action learning and participatory video and photography, is an innovative way of working with agency and power, identifying conflict and synergies between the interests of local social-ecological systems, their constituent social groupings, and national/global policy systems. It could propose appropriate scales and levers of intervention, in order to promote the viability of nested systems that cannot be isolated from others in our highly interlinked and globalised world.

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Notes

1 Systems are often described as interdependent components that regularly interact to form unified wholes (Bossel, 2001). One could therefore describe a community as a system where different individuals work together in order to maintain the survival of the 'community' as a whole. Without a functioning community, individuals would find it much harder to survive.

2 this is applied in the widest possible sense, to include the biophysical, social and economic.

3 The five community facilitators are community members of 3 of the 16 villages of the selected study area (Rewa, Wowetta and Aranaputa). They are supported in their activities by a research assistant working with them for most of the year and by the European and South American Cobra partners, who joining them regularly (on a monthly basis) for specific work tasks.

Pour citer cet article

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À propos des auteurs

Andrea Berardi
Andrea Berardi, andrea.berardi@open.ac.uk, is Lecturer at Open University, UK. She published recently:
- Mistry J., Berardi A., Haynes L., Davis D., Xavier R. & Andries J., 2013. The role of social memory in natural resource management: insights from participatory video. *Transactions of the Institute of British Geographers*. Article first published online: march 18, 2013 | DOI: 10.1111/tran.12010 and forthcoming in print.
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Céline Tschirhart
Céline Tschirhart, celine.tschirhart@rhul.ac.uk, is Post-Doctoral Research Assistant at Royal Holloway, University of London, UK. She published recently:
- Tschirhart C., Handschumacher P., Laffly D., Bénéfice E., 2012. Resource Management, Networks and Spatial Contrasts in Human Mercury Contamination along the Rio Beni (Bolivian Amazon). *Human Ecology*, 40, 4, p. 511-523.

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Jayalaxshmi Mistry
Jayalaxshmi Mistry, j.mistry@rhul.ac.uk, is Senior Lecturer at Royal Holloway, University of London, UK. He published recently:
Mistry J., Berardi A., Haynes L., Davis D., Xavier R. & Andries, J., 2013. The role of social memory in natural resource management: insights from participatory video. *Transactions of the Institute of British Geographers*. Article first published online: march 18, 2013 | DOI: 10.1111/tran.12010 and forthcoming in print.
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Elisa Bignante
Elisa Bignante, elisa.bignante@unito.it, is Senior Lecturer at the University of Torino, Italy. She published recently:
- Bignante E., 2011. *Geografia e ricerca visuale. Strumenti e medodi* [Visual research in Geography. Methods and tools], Laterza, Bari.
- Bignante E., Calandra L., 2010. Cooperazione, saperi, cartografie per la governance ambientale e lo sviluppo locale in Africa: dodici casi di studio, [Cooperation, knowledges, carthography for environmental governance and local development in Africa: twelve case studies]. *In* A. Turco (ed.), *Governance ambientale e sviluppo locale in Africa. Cooperazioni, saperi, cartografie.* Milano, Franco Angeli, p. 151-168.

Lakeram Haynes
Lakeram Haynes, lakehayes@gmail.com, is Community Research Assistant within the project COBRA. He published recently:
- Mistry, J., Berardi, A., Haynes, L., Davis, D., Xavier, R. & Andries, J. (2013) The role of social memory in natural resource management: insights from participatory video. *Transactions of the Institute of British Geographers*. Article first published online: march 18, 2013 | DOI: 10.1111/tran.12010 and forthcoming in print.
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Grace Albert
Grace Albert, grace_beautyalbert@yahoo.com, is Community Research Assistant within the project COBRA.

Ryan Benjamin
Ryan Benjamin, ryanbejamin@gmail.com, is Community Research Assistant within the project COBRA.

Rebecca Xavier
Rebecca Xavier, rebeccaxavier @ymail.com, is Community Research Assistant within the project COBRA. She published recently:
- Mistry J., Berardi A., Haynes L., Davis D., Xavier R. & Andries J., 2013. The role of social memory in natural resource management: insights from participatory video. *Transactions of the Institute of British Geographers*. Article first published online: march 18, 2013 | DOI: 10.1111/tran.12010 and forthcoming in print.

Deirdre Jafferally
Deirdre Jafferally, djafferally@iwokrama.org, is Doctorate Research Associate, Royal Holloway University of London.

Résumés

Le terme “résilience” a conquis une place importante dans le discours scientifique, et même à présent dans le langage courant. Or son utilisation reste souvent floue, puisqu’il peut être compris différemment : s’agit-il de résister ? De s’adapter ? De se transformer ? Cet article suggère l’utilisation d’un concept, la *System Viability*, ou la Viabilité des Systèmes. Ce concept permet d’appréhender six propriétés qui maximisent les chances d'un système de persister dans le temps, qu'il s'agisse d’écosystèmes ou de communautés. Dans cet article, nous appliquons et évaluons ce cadre conceptuel grâce à des méthodes visuelles participatives au sein de trois communautés indigènes du North Rupununi, au Guyana. Cet article tente de montrer que ce cadre conceptuel permet d’évaluer les stratégies de survie des communautés de manière cohérente et théoriquement corroborée, ce qui pourrait susciter l’intérêt de décideurs nationaux et internationaux en matière de résilience et durabilité.

'Resilience' is a term that has achieved significant prominence in scientific circles and now within popular discourse. However, its practical application is often unclear or confused because it can mean different things to different people: To resist? To adapt? To transform? In this paper, we propose a framework - System Viability - able to coherently engage with six distinct properties of all systems, from ecosystems to communities, allowing the identification of trade-offs and synergies for maximising the chances of systems persistence. We apply and evaluate the System Viability framework through participatory visual methods within three indigenous communities in the North Rupununi, Guyana. This paper highlights how the framework allows the measurement of community survival strategies in a consistent and theoretically corroborated way, with implications for national and international policy-makers aiming to promote resilience and sustainability.

Entrées d’index

Mots-clés : viabilité, système, indigène, indicateur, méthode participative visuelle, Guyana.
Keyword : viability, system, indigenous, indicator, participatory visual method, Guyana.