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Perspective

An applied research agenda for navigating diverse livelihood challenges in rural coastal communities in the tropics

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SUMMARY

Rural, tropical coastal communities are experiencing sustained, often increasing food insecurity, poverty, and global change impacts. These challenges have stimulated a rise in projects aiming to enhance and diversify local livelihoods. The ability of these projects to achieve broad-scale benefits is limited by approaches that do not account for feedbacks among sectors and across marine and terrestrial environments. To address these limitations, we present an applied research agenda to support an integrated approach to livelihood project planning and management. This agenda explicitly examines interactions among natural resources, industries, and livelihoods and is based on three foundational activities: (1) a governance review and assessment, (2) strategic partnership formation, and (3) a diagnostic approach supported by science and shared outcomes. We add structure to the established logic in our field by broadening the sectoral and spatial scope of livelihoods projects, so they can better contribute to interrelated UN Sustainable Development Goals.

LIVELIHOOD CHALLENGES FOR RURAL COASTAL COMMUNITIES

Rural coastal people in many low and middle-income countries in the tropics face tremendous livelihood challenges. While rural coastal communities have historically navigated significant changes to sustain their livelihoods (i.e., their means of securing a living),[1–3] the rate, scale, and interconnectivity of global change processes pose both significant threats and new opportunities.[4,5] Coastal zones are characterized by a diversity of activities and actors competing for limited natural resources. For instance, large-scale business and conservation interests increasingly interact and compete with existing livelihoods dependent on marine resources, with negative, inequitable impacts on natural resources, food security, and well-being.[6] Similarly, natural resources from terrestrial areas in the tropics are increasingly used to sustain growing human populations and commodities that fuel local, national, and international economies.[7] Indeed, extractive industries and trade in natural resources is rapidly changing tropical coasts and landscapes, particularly in remote locations such as the Pacific.[8] These combined pressures can create adverse environmental impacts on land and in downstream marine environments, and undermine local livelihoods.[9] Fast growing, ever younger populations must sustain livelihoods amidst resource use, geographic remoteness, and the compounding impacts of climate change.

In this context, there are growing efforts to support rural coastal livelihoods through locally led, externally supported development.[10–13] Specifically, there is a growth in initiatives that seek to diversify, supplement, and/or enhance existing livelihood activities in the face of increasing stressors.[14] However, these approaches often face practical and conceptual challenges that limit understanding of how to effectively enhance rural coastal livelihoods.[15–17] Reminiscent of the difficulty in operationalizing transdisciplinary research,[18] many projects emphasize single sector initiatives (e.g., fisheries, aquaculture, tourism, or agriculture) and/or focus on small spatial scales (e.g., households and communities).[19] These siloed approaches fail to acknowledge the diversity of coastal peoples' livelihoods, and risk missing cumulative impacts and feedbacks between

sectors and natural resources.[19–21] For example, single sector approaches risk obscuring interactions with broader-scale development of extractive industries, technological innovations, or broader public infrastructure or government service delivery. Livelihood approaches that account for connections between people and natural resources (i.e., social-ecological systems), and drivers of change at multiple spatial scales are needed.[22,23] In this context, we seek to translate and apply insights from participatory rural appraisal and agricultural systems research to rural coastal communities experiencing increasing rates and scales of change.[24–26]

In late 2019, the authors—an interdisciplinary team of experts with diverse and extensive experience working on livelihoods projects in the tropics—convened a 3-day workshop to develop potential applied solutions to the current tendency to take sectoral, small-scale approaches to livelihoods initiatives in coastal communities. Here, we present a rationale and applied research agenda for implementing a diagnostic, integrated, and spatially orientated approach to planning livelihoods projects, to navigate trade-offs across sectors and space pragmatically. The agenda is intended to guide scientists and practitioners (e.g., non-governmental organizations, aid agencies) and support decision-makers (ranging from community to government level) to overcome some of the challenges that underpin sectoral, small-scale approaches. It seeks to support shared outcomes and co-benefits that extend beyond financial gains and include (1) fair and just livelihoods, (2) sustainable and integrated natural resource use, and (3) adaptive livelihood portfolios. Our agenda provides three foundational activities that provide a scaffolding to pursue an integrated approach: (1) a governance review and assessment, (2) strategic partnership formation, and (3) a diagnostic approach supported by science and shared outcomes. We invite those involved in livelihoods research and practice to systematically implement, adapt, and develop this agenda to progress toward a more integrated, broad-scale approach to project planning and implementation, and share their lessons in doing so. In this way, we continue the path to build a collective understanding of how to tackle current limitations in the livelihoods field. In this paper and our invitation to adopt this approach we refrain from being overly prescriptive in the methodologies that should be used to implement the three foundational activities as we acknowledge that this will be highly context specific.

THE SHORTCOMINGS OF SECTORAL AND SMALL-SCALE APPROACHES

There are several shortcomings to sectoral approaches to livelihoods. Specifically, livelihood decisions are made without full awareness of externalities—how decisions might affect the social-ecological system on broader spatial and temporal scales—or of how other activities in the land and seascape may interact with emerging livelihood activities. For example, a project on sportfishing tourism in Papua New Guinea worked with one community that had rejected engagement with the oil palm industry to protect their sport fishery resources for tourism because they had observed significant negative marine impacts in a nearby community that had engaged with oil palm.[27] In this case, the communities were located far enough apart to avoid ecological interactions but, had they been closer together, the choice of one community to engage in oil palm may have negatively affected the other community's marine environment and, hence threatened their aspirations to grow tourism. Indeed, another community engaged with the same project did suffer downstream impacts of logging activities from neighboring communities, which had a detrimental effect on the estuarine habitat that supported their sport fishery. Had the project applied a more integrated perspective, it is possible that negotiations could have occurred to anticipate or even ameliorate the negative downstream consequence of the community affected by logging.

Livelihoods researchers and practitioners who consider how the sector their project is focused on interacts with other sectors could foster more positive engagement with emerging livelihood activities in coastal communities.[28] For example, one study that explored contributions of a new sea cucumber fishery in Papua New Guinea on food security highlighted the importance of understanding how this new fishery could be "best promoted within the mix of cash income and seasonal subsistence production" (p. 390).[29] Other studies have also suggested that livelihood diversification initiatives that extend to income-generating activities outside the community can successfully complement new alternative livelihoods such as small-scale, community-based aquaculture in the case of coastal communities in Vietnam.[30] These examples illustrate the importance of increasing the capacity for dialogue and negotiation across sectors in the planning stage of livelihood projects to be able to anticipate and, where possible, mediate or take advantage of interactions at broader spatial scales.

In addition to being sectoral, livelihood initiatives in tropical coastal communities also tend to be small-scale for several reasons. First, small-scale fisheries and other livelihoods in tropical coastal communities are still predominantly managed using community-based approaches.[28,31,32] Second, traditional livelihoods approaches are difficult to operationalize beyond the household level because they were originally conceived for local level analysis with a focus on place and context. For this reason, there is a call to combine livelihoods-based analyses with other, macro-scale approaches focusing on networks and value chains.[33] Similar to sectoral approaches, small-scale approaches can fail to identify interactions and processes occurring at other scales that could be advantageous to influencing adaptations to and consequences of global change. For example, studies have shown that with increased socioeconomic development, households tend to specialize (e.g., fewer livelihood activities per household), while the range of livelihoods pursued across and among communities become increasingly diversified (e.g., more livelihoods represented at the community level).[34,35] As such, livelihood approaches at a household scale may fail to identify important adaptive processes at higher scales and there is a need to better understand and capitalize on interactions between specialization and diversification at multiple scales. Extending livelihoods initiatives to encompass broader scales in addition to households could illuminate a multitude of strategies to improve sustainability and efficiency (e.g., livelihood supplementation, enhancement, expansion, management), which could improve system resilience at larger (i.e., inter-community) scales, and increase the potential for broader benefits.

TOWARD AN APPLIED LIVELIHOODS RESEARCH AGENDA

The need for intersectoral, broad-scale approaches to manage landscapes is widely recognized in the natural resource management and conservation literature. As such, several integrated approaches have emerged. Landscape approaches seek to bring together diverse stakeholders and sectors to address environmental, socioeconomic, and political challenges at spatial scales that transcend management boundaries. However, to date, they have been most used in terrestrial areas (see recent reviews[36,37]) rather than across the terrestrial-marine interface (Integrated Coastal Zone Management[38] and Ridge to Reef[39] are notable exceptions). In addition, the focus of most projects adopting the landscape approach has been on conservation or agriculture—in part because they emerged from the natural and biophysical sciences.[40,41] Integrated approaches have not been systematically applied to planning livelihoods projects, especially in the coastal tropics.

An integrated approach to livelihoods could address multiple sustainable development goals. The elaboration of the UN Sustainable Development Goals (SDGs) is an urgent call to action to tackle interrelated global challenges related to poverty, food security, livelihoods, sustainable natural resource use, gender equity, and social justice.[42] However, progress toward these goals is uneven.[43] Although there have been some improvements in areas such as maternal and child health, and women's representation in government, these have been offset by deteriorating trends related to food security, natural resource degradation, and equity.[43] Notably, these worrying trends have been exacerbated by the COVID-19 crisis.[44] Integrated approaches to livelihoods that address the aims of multiple SDGs, and the different trade-offs that have to be considered, are an important step towards more inclusive, sustainable and resilient societies.

Integrated approaches that account for interactions and feedbacks among sectors and ecosystems across terrestrial[36] and marine environments[45] are also crucial to effectively understand and address social and ecological challenges. For viable coastal, fisheries-dependent communities, acknowledging and understanding possible downstream effects of land-based livelihood activities on the marine environment is critical. Given the widely documented deleterious impact of land-based activities on the marine environment, the scientific community has called for new approaches that treat the multitude of marine and terrestrial habitats as "one ecosystem."[46] However, while they embrace a more holistic view of the connections between ecosystems and sectors, landscape approaches have failed to achieve desired social and ecological outcomes.[2,36] In part, this failure may be due to the challenges of balancing multiple objectives, identification of interactions and negotiating trade-offs among diverse stakeholders,[2] an inability to overcome interdisciplinary boundaries,[36] and the difficulties of integrating multiple scales of governance.[37,41,47] For an intersectoral approach to be successful, project planning should include a wide range of actors, including government officials in departments that represent interacting sectors such as ministries of agriculture, fisheries, mining, forestry, tourism, and proponents of business initiatives like palm oil development, logging operations, or hotel construction, as well as "upstream/downstream" communities. As such, balancing multiple needs and perspectives for an integrated approach in a livelihoods project planning context will present similar obstacles. The emphasis on balancing livelihoods, economic activities, equity, and environmental outcomes will present unique challenges and opportunities.

Livelihoods researchers have also acknowledged the need for cross-sectoral interventions[23,48] and have explored the relationships between household occupations and their interrelationships at different scales of social aggregation.[34] For instance, a study in small-scale fishing communities in Africa called for a multisectoral assessment that encapsulates more widespread sources of vulnerability to replace the current focus solely on the fishery sector.[49] However, while significant progress has been made toward understanding the science and modeling requirements of integrated approaches to livelihoods,[48,50] major challenges still exist in the applied research space. Some of these challenges could be overcome by laying the appropriate foundations for integration in the project planning stages. In this context, we propose that a landscape approach should be modified and extended to support planning, implementation, and assessment specific to livelihoods in coastal communities in the tropics. Our goal is to develop an applied research agenda to overcome some of the challenges inherent to integrated approaches, and thereby design and implement projects that better manage the interactions among sectors and livelihoods, and across terrestrial and marine environments. In the following section, we present an applied research agenda that combines the philosophy of landscape-based approaches, with three foundational activities to support an integrated, participatory, iterative, and contextual approach to social learning and innovation for livelihoods scientists and practitioners: (1) governance review and assessment, (2) strategic partnership formation, and (3) a diagnostic approach supported by science and shared outcomes (Figure 1).

FOUNDATIONS OF AN INTEGRATED LIVELIHOODS APPROACH

In the following sub-sections, we outline the foundational activities of our applied research agenda in more detail and explain how they may be used to overcome some of the challenges associated with implementing integrated approaches to livelihoods projects. These activities align with a current project funded by the Australian Centre for International Agricultural Research project 'Spatially Integrated Approach to Support a Portfolio of Livelihoods' which is being implemented by several of the authors in Solomon Islands as a way to pilot our proposed agenda (https://www.aciar.gov.au/project/fis-2020-111).

In Figure 2 we illustrate the iterative process for applying an integrated approach to livelihoods. All the proposed activities are well established, although prescriptive methods are not provided here due to the contextual nature of their application on a project-by-project basis. We acknowledge there are livelihoods researchers, practitioners, and decision-makers already applying one or more these foundational activities. Here, we encourage their application collectively and systematically for both planning and evaluating livelihoods projects, including sharing of the

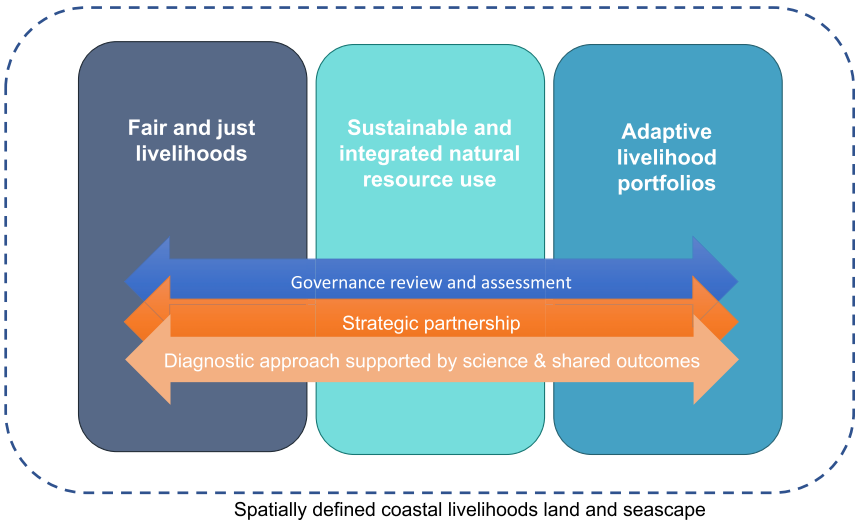

Figure 1. Schematic diagram of shared outcomes (fair and just livelihoods, sustainable and integrated natural resource use, and adaptive livelihood portfolios) and the three foundations of an integrated approach to livelihoods

outcomes and lessons learned with the broader community of practice.

Governance review and assessment

It is widely accepted that coastal livelihoods are influenced by multiple scales of governance[28,29,51] and that understanding and engaging with these is important for achieving positive outcomes for livelihoods projects. Governance scales interact across sectors and space, which makes understanding this dimension a critical foundational activity of an integrated approach. In this context, this stage involves identifying and establishing relationships between relevant governance actors, and associated sectors and ecosystems within a bounded spatial scale (i.e., a scale that captures the main interactions relevant to the project). In addition, gaining an understanding of key interactions and power dynamics within and between existing governance institutions (government and non), public administration, service delivery, and other stakeholders. This stage should also include an evaluation of integration of existing policies, formal and informal governance processes from national to community scales (for examples of integration supporting better environmental outcomes see Morrison et al.[47]). This will help determine potential changes required to support an integrated approach to planning livelihood projects (e.g., joint committees for government ministries managing different sectors, integrated policies to manage interactions among sectors, strategic partnerships, strengthening communication between communities and higher levels of governance, etc.). We acknowledge that a complete understanding of all governance interactions at multiple scales is outside the scope of most projects and thus suggest applying a deliberative and pragmatic approach to identifying system actors and interactions that are most relevant to the livelihoods scenario. The challenge of finding a balance between being too narrow in scope and missing key explanatory variables in a system and being too all encompassing to the detriment of depth is inherent to applying the interdisciplinary, social-ecological systems underpinning our approach.[52] While a discussion of how to address this challenge in relation to the governance assessment and subsequent components of our agenda is outside the scope of this perspective paper, we emphasize the importance of identifying methods to address this challenge (for example, the "framework for disentangling intangible social-ecological systems" developed by Bodin and Tengö[53]).

Strategic partnership formation

Intersectoral partnerships have demonstrated positive outcomes for livelihoods in the agricultural sector[54] and can support the achievement of co-benefits for private sector and development interests.[55] This stage involves the formation of a strategic partnership based on the information uncovered in the governance review and taking into account the best fit (e.g., partnering, supporting, or working in parallel) of relevant stakeholders to ensure optimal chances of sustainability and/or scaling of the outcomes. The partnership would comprise stakeholders spanning interconnected sectors, communities, and governance levels in the project's "sphere of influence," for example, a small-scale mariculture project could engage with communities, private sector representatives (e.g., cash crops, fisheries, forestry), and associated decision-makers throughout the watershed or governance region. This means that project leaders should prioritize engagement of project beneficiaries in the strategic partnership in the early stages of project design and, in doing so, align and adapt the initiative to fit local goals associated with the context of the project. Moreover, the establishment of multi-industry working groups including diverse stakeholders that impact on livelihoods could be achieved through facilitated multi-party meetings, vertical and horizontal trust building, and negotiated and shared outcomes.

We acknowledge the reality that not all relevant stakeholders will be open to engaging in this dialogue or may have conflicting motivations and values. This can be partially addressed via strategies for ongoing peacebuilding and conflict management that should be developed to support the project's short-, medium- and long-term goals. It is also not pragmatic to include too many stakeholders in the process so project leaders will need to consider ways to maximize representation while minimizing the size of the partnership (e.g., working with network representatives or using a nested party approach). In this context, we suggest that livelihoods project teams could benefit from inclusion of individuals with skills and training in areas such as conflict mediation and multi-party facilitation on project teams. This foundational activity is arguably the most important and the most challenging as communication underpins effective integration. The science-based diagnostic approach we present below is intended to address some of these challenges and could be complemented by other methods such as Bayesian Belief

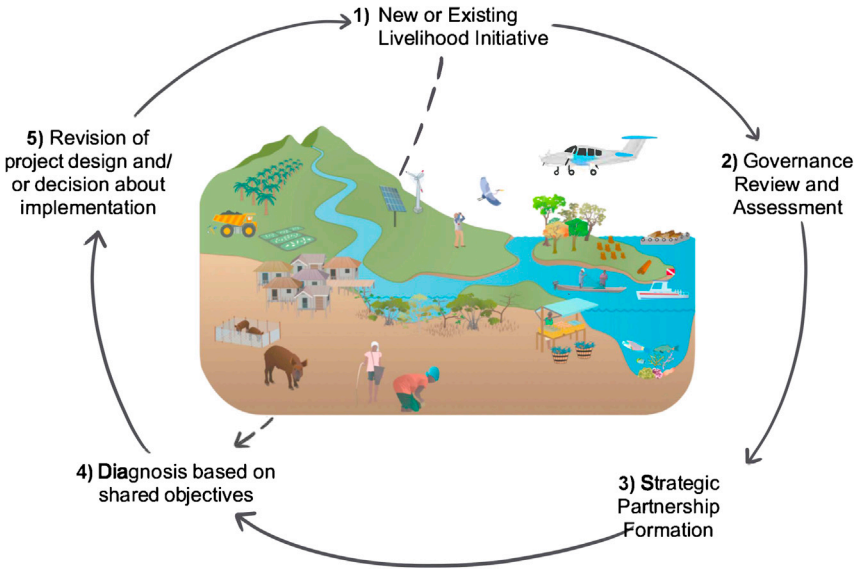

Figure 2. Iterative process for implementing an Integrated Approach to assessing new or existing Livelihoods Initiatives

(1) New livelihoods initiative is proposed or existing one requires evaluation; (2) a review of the governance context is conducted within the project's "sphere of influence" that extends to interreacting sectors and land and seascapes; (3) concurrently with the governance review, key players are identified for formation of the strategic partnership to represent interacting sectors and communities; (4) contextually relevant scientific indicators and models are compiled into (where relevant) a spatially explicit scientific decision-support tool and used to implement a diagnostic approach based on shared objectives; and (5) project planning or implementation is revised to meet identified criteria for shared objectives and decision is made about implementation. The dotted arrow represents adaptive management processes where outcomes are monitored, and activity is revised to increase the potential for favorable and shared outcomes.

Network Analysis that have been used to reconcile stakeholders' preferences in a social-ecological systems context.[56]

Diagnostic scientific decision-support

This foundational activity involves the application of a participatory, diagnostic approach to help the strategic partnership (including scientists, practitioners, communities, and other decision-makers) to diagnose whether the potential outcomes of new or existing livelihoods activities align with stakeholders' desired goals or shared outcomes. A diagnostic approach has been described in the context of environmental management as one that, "seeks to disaggregate environmental issues, identifying elements of individual problems that are significant from a problem-solving perspective and reaching conclusions about design features needed to address each of the elements identified."[57]

Diagnostic approaches have been touted as a solution to addressing the complexity of human-environment interactions[58,59] and have been applied to natural resource management in a participatory context[48] and differ from other evaluations in that they possess no prescribed, predetermined methods.[60] Although diagnostic approaches are not new in their application to fisheries, development, and livelihoods initiatives in coastal communities,[48,58,60,61] they are rarely applied in conjunction with spatially orientated, multisectoral (i.e., landscape-based) approaches. In addition to helping to identify and measure shared outcomes, diagnostic models also help overcome challenges of interdisciplinary science, and align the views of multiple stakeholders to achieve real-world solutions in the context of climate change adaptation.[62] They can also help to address the problem of classic development project "pipeline models," where scaling-out livelihood and food system innovations is often unfeasible.[63] Diagnostic tools and processes to guide stakeholders through integrated, iterative decision-making—i.e., scaling up processes that guide social learning and innovation, rather than a specific innovation itself—can lead to better outcomes for a particular context.[63] As such, an integrated approach to project planning and implementation stands to benefit greatly from processes, steps, and tools that enable stakeholders to diagnose and navigate livelihood decisions in a holistic way.

Although a diagnostic approach cannot be expected to capture and address all challenges and opportunities, making the interactions between sectors and spatial scales across land and sea explicit coupled with a diagnostic approach can support decision-makers in recognizing feedbacks and making informed decisions about trade-offs. A key challenge is that this approach may conflate or reveal contradictory views among stakeholders operating from different perspectives and at different scales of governance (see previous sub-section). A nested approach, whereby the participatory diagnosis conducted at multiple scales that are relevant to the initiative (e.g., high-level decision-makers, watershed, communities) could help capture and negotiate some of this complexity. This step also carries with it an ethical dimension; those individuals engaged in livelihoods project planning and assessment should be prepared to terminate the activity if the diagnosis suggests that the activity will not lead to favorable or shared outcomes.

Applying a participatory diagnostic approach as described above involves engaging relevant parties in the development and application of a series of questions about the potential outcomes (and associated indicators) of new or existing livelihood initiatives. Diagnostic questions help decision-makers to identify and address whether the likely impacts of current or planned livelihood initiatives will impede or deliver their shared aspirational outcomes (e.g., Will the project approach ensure that benefits/inclusion/opportunities are fair/equitable? How will the livelihood approach interact with natural resources and ecosystem services supporting diverse existing and emerging livelihoods?). An important feature of this approach is that it allows for the gradual unpacking of the complexity of a system through developing questions that are increasingly specific.[64] This accommodates the use of "multilevel analyses," which can be facilitated by spatially explicit scientific decision-support

tools. In this way, a diagnostic approach supports adaptability by helping to define shared outcomes from multiple perspectives, and by providing a deliberative and scientific process for establishing questions and indicators to determine if these outcomes are being achieved.[61]

The development of indicators and models to support the diagnostic process involves compiling and adapting current data, both spatial and non-spatial, to suit the local context. These can be defined iteratively through the process of developing diagnostic questions about potential outcomes of livelihoods projects, and through defining the characteristics of the social-ecological system. Data collection for key indicators will be required (e.g., the extent and state of natural resources, existing livelihoods, infrastructure, functional governance, and the interactions between them), and these can be compiled (where relevant) as spatial data. Specific indicators will also need to be identified that reflect key outcomes for equity, sustainable natural resource use, and adaptive livelihoods (Figure 1) among other shared outcomes identified by the participants.

Participatory mapping approaches have been widely used, have the potential to address complex social issues,[65] and are an effective component of multimethod ethnographic approaches to working in coastal communities (e.g., Aswani et al.[66] used participatory mapping to capture community perceptions of tourism development in the Solomon Islands). The process involves engaging community members and other stakeholders in creating maps that reflect their place-based knowledge and values for a range of applications. Indeed, participatory mapping has been found to be particularly effective at overcoming barriers and engaging local communities that are intimately connected to the landscape in a culturally respectful and equitable manner[67] and helping to identify and manage environmental values and risks.[68]

Although we acknowledge that indicators informing the diagnostic approach may not always be spatial and/or quantitative, the emphasis on spatial data stems from the ability of maps to provide a common language and base from which to conceptualize diverse information types and visualize their interactions and are fundamental to landscape-based approaches. Maps can be used in conjunction with non-spatial data and can facilitate the participation of and communication among a broad range of stakeholders from different backgrounds, which is crucial to achieving an integrated approach. In addition, maps provide the ability to dynamically compile information from a wide range of sources at multiple scales and are widely used for decision-support and scenario planning. From a scientific perspective, therefore, their flexibility allows them to overcome disciplinary boundaries, inform negotiation and decision-making, and adapt decisions to multiple scales of relevance. Therefore, where deemed appropriate by participating stakeholders, we consider a spatial approach, including participatory mapping, to be an effective scientific decision-support that will identify and visualize interactions between different physical, natural, social, and governance elements across a livelihoods landscape.[69]

AN EMPHASIS ON SHARED OBJECTIVES

Identifying common concerns and priorities is a key element of success for a landscape approach[40] and a starting point shared by diagnostic approaches. Our proposed approach supports the achievement of three, broad outcomes that may be adapted to suit the social and vulnerability context of individual initiatives: fair and just livelihoods for diverse people, sustainable and integrated natural resource use, and adaptive livelihood portfolios. These shared outcomes complement and extend the current predominant focus of landscape approaches on poverty, food security, climate change, development, and conservation to encompass UN SDGs related to gender equality (goal 5), livelihoods and employment (goal 8), reducing inequality (goal 10), and shifting the emphasis from conservation to sustainable use of natural resources (see Mbow et al.[70] or Reed et al.[36] for the alignment of current landscape approaches with the UN SDGs). The relevance of, and interactions among, these outcomes are described in more detail below.

Fair and just livelihoods

This outcome centers on the need for existing and new livelihood activities to be socially inclusive and socio-culturally sensitive, not harmful to well-being, and to contribute to the maintenance or improvement of equity. More specifically, project planning should consider the gendered distribution of resources, opportunities, and benefits, procedures for making decisions about resources, and recognize diverse views.[71,72] Livelihood initiatives thus need equitable and transparent procedures for inclusion, based on locally relevant criteria of, and values surrounding equity, at the appropriate scale. This outcome matters ethically and pragmatically. Ethically, attending to aspects of justice can ensure that livelihood interventions protect basic human rights and avoid excluding or increasing vulnerabilities, especially for women. Pragmatically, more socially inclusive communities tend to be more adaptive and, hence resilient.[73] Also, there is evidence that local communities' concerns about inequality may outweigh their concerns about whether a resource is sustainably managed or not.[74] Poor governance, lack of recognition of stakeholders, and corruption exacerbates injustice in livelihoods projects. Corruption in a broad sense covers the use or overuse of community (state, village, city, etc.) natural resources with the consent of a state agent, by those not legally entitled.[75]

Achieving this outcome will require engaging with local contexts and considering socio-cultural values and power dynamics. Specifically, accounting for different social groups and identities (e.g., dimensions of class, ethnicity, clans, gender, age, different generations, occupational groups, future generations, and intersections of these), understanding how groups relate to each other, their aspirations, perceptions of fairness and responsibility regarding resources, and how these are changing—especially between generations—is an important diagnostic step.[75,74,76,77] This diagnosis will help to understand who is marginalized, hierarchies of decision-making power, access to benefits or cash, and thus how the livelihood approach will support or disrupt these hierarchies, and with what implications.[78]

The outcome of fair and just livelihoods interacts with other outcomes and will require decisions about trade-offs. For instance, a key consideration for coastal livelihoods in the Pacific is the rights of individuals or groups over land and sea associated with existing customary tenure systems. These systems will determine access to resources, especially between those locally

perceived as insiders and outsiders of a community and increasingly along gender lines.[79] In addition, exercising customary tenure including the exclusion of outsiders has long been identified as a vital component for regulating fisheries pressure in the Pacific.[80,81] As such, a focus on social inclusion and equity without attention to the local context may increase tensions in other domains. For instance, where a livelihood depends on an area under tenure, the people with tenure rights have an advantage.[82] Thus, the trade-off here relates to the fact that tenure systems may provide barriers to equitable outcomes, yet undermining existing tenure systems that govern sustainable natural resource use may lead to adverse environmental outcomes. Thus, decisions about whether to address equity of outcome or equity of opportunity in livelihood projects needs to be made clear from the outset.

At a local level, broad drivers of change may include political, social, demographic, and economic shifts linked to globalization, modernization, and Westernization, and be associated with changes in traditions and legitimacy. In addition, livelihood changes—such as increased income or changed forms of labor—can change power relations, for example, between youths and elders,[83] or between women and men.[84] Often, increases in income can also contribute to inequalities and undermine social resilience,[22] as well as community relations,[85] which can also result in negative feedbacks with natural capital.[86] A participatory, diagnostic approach can help to define "go" and "no go" scenarios related to whether livelihood initiatives will lead to inequities and injustices within and beyond a community.

Sustainable and integrated natural resource use

This outcome centers on the need for existing and new livelihood activities to support resilient social-ecological systems. First, this requires recognition that interdependencies across human and biophysical systems are diverse and dynamic and should function in a state of balance to ensure long-term productivity.[87] Second, it recognizes that these interdependencies are subject to external and internal pressures and drivers of change, both human and non-human.[88] Livelihood projects should therefore incorporate measures to ensure they do not harm the broader health of natural resources, maintain or enhance ecosystem function and resilience, and improve overall productivity (by complementing, substituting, or adding to existing resource dependencies). Tropical rural communities are often highly dependent on natural resources, not only to make a living but also as a component of people's living environment and foundational cultural identity.[28] Drawing on natural resources to support livelihoods in a sustainable way implies staying within the limits of carrying capacity. Ultimately, long-term use hinges on whether resource-dependent livelihood activities inherently enhance, or at least maintain the resilience of the natural system, or are paired with measures to ensure that.

In these contexts, livelihood initiatives cannot be separated from natural resources, therefore necessitating a social-ecological approach.[89] Breaking human-environment interactions into three parts ensures the approach applies a comprehensive perspective: the natural ecosystem, the human system, and the interactions between them.[90] First, understanding the ecosystem requires attention to the biophysical characteristics (e.g., what ecosystem types/habitats are present and what sustains them). Second, understanding the human system points toward the characteristics of the human dependency, including the current resource user groups and the varying extents of their dependence on resources, and the cultural values associated with the natural resources.[91] Cultural and economic values are often specific for different sectors within communities. The importance of acknowledging internal diversity with respect to access to and control over resources thus applies as much to people's spiritual association to natural resources as it does to their more easily recognized economic or subsistence dependencies. Third, understanding the kind of social-ecological interactions, their impacts, and what control mechanisms there are in place is important. Interactions may include, for example, exploitation status of resources/resource health, and whatever governance and tenure arrangements are in place. The characterization of the social-ecological system described here can be supported by the diagnostic approach and spatially explicit scientific decision-support tool described previously. This will allow for contributions from multiple stakeholders and knowledge systems (e.g., local provincial, sectoral, scientific), and the articulation of contextual variables and interactions related to culture, values, and formal and informal governance, among others.

The sustainable and integrated natural resource use outcome brings to the forefront key trade-offs people face when choosing to engage in a livelihood activity. These trade-offs can result from drivers from outside or inside the community, where human or non-human changes external to the community can impact the function and health of ecosystems within a community's territorial grounds. For example, logging and mining operations upstream can structurally alter a water catchment and potentially increase sedimentation on mangroves and seagrass flats.[92,93] Key drivers of external change vary temporally, from slow-onset shifts caused by climate change to acute shocks resulting from cyclones, invasive species outbreaks, disease outbreaks, industrial pollution impacts, demand-driven market forces, infrastructure development, and land-use change. Moreover, within communities, impacts from one activity may lead to changes in the availability or health of resources on which other activities depend, even if that activity is specifically designed to sustain natural resources. For example, fisheries closures that are close to shore may disproportionately affect marginalized groups, such as women, by restricting access to gleaning sites.[94] Also, aquaculture ponds may be developed to ensure food security for households. However, diverting village water supply for these ponds may inadvertently limit water availability for the rest of the community, with potential negative impacts on other food production.[95]

A participatory, diagnostic approach supported by a spatially explicit scientific support tool can help make explicit whether and how a livelihood initiative will lead to negative impacts on natural resources, whether it is insensitive to cultural values associated with natural resources, or whether it is susceptible to potential or expected effects from activities elsewhere, e.g., logging, mining, industrial fishing, or plantation agriculture. Importantly, incorporating such risk considerations explicitly as part of planning phases, might result in deciding against an activity where it would otherwise be pursued with detrimental impacts down the line.

Adaptive livelihood portfolios

This outcome recognizes adaptability (i.e., the capacity to take advantage of or adapt to change, acknowledgment and consideration of market dynamics) as a key characteristic of sustainable livelihoods.[17] It seeks to extend livelihoods planning across sectors and space so that they cultivate adaptability at scales that enhance resilience,[96] maximize co-benefits, and minimize trade-offs among multiple, interacting industries and livelihoods. Rural coastal people in the tropics often move in and out of various subsistence and economic activities based on resource availability (e.g., seasonality and abundance of resources), resource access (e.g., tenure and rules), immediate household cash needs (e.g., school fees, health care, entrepreneurial growth), disasters and catastrophic events (e.g., cyclones, tsunamis, global shocks), their skills and capacity, the collective focus of the larger community, and customary beliefs and social accountabilities.[18,97] This flexibility and diversity have been noted as features that ensure resilience,[23] creating a justification for a livelihoods enhancement focus that facilitates community agency rather than a predetermined shift to new fads or industries.[98] This flexibility and agency are important, if existing activities are not considered, the top-down introduction of new economic activities can become a source of stress to households and individuals.[99] Moreover, existing livelihoods may be less able to adapt to the increased rate and incidence of exposure to new markets and sectors they have previously been isolated from.[100] With cash economies increasingly expanding into coastal communities and driving more specialized livelihood foci, trends of intensified resource harvest stand in contrast to practices of more diversified resource use.[101]

The contextual considerations related to this outcome include understanding people's preferences, aspirations, and activities (considering generational values), and how these interact spatially and temporally. It also requires acknowledging and identifying local livelihood possibilities beyond the subsistence, traditional, and small-scale activities to broader-scale and extractive industries and sectors. Neighboring communities in a landscape may differ in their engagement with these activities, and their choices will have varied consequences for other parts of the social-ecological system.

The outcome of adaptive livelihood portfolios will require management of biophysical and socioeconomic trade-offs and interactions between stakeholders and the other shared outcomes of an integrated approach. For example, where increasing wealth and material aspects of well-being can provide benefits, the introduction of new markets in places where markets have been scarce can also erode local cultural and moral values (e.g., rural parts of the Pacific).[5,102,103] Further, increased economic development can also lead to adverse ecological outcomes[88] and increase inequity.[104] From a spatial perspective, when engagement in a new livelihood activity in one community leads to downstream impacts that will make other livelihoods more vulnerable, it is necessary to consider these interactions and trade-offs at multiple spatial scales.[9]

Conclusions

Projects aiming to diversify, supplement, and/or enhance existing livelihood activities have not reached their full potential for improving people's lives, particularly at broader spatial scales. Although the application of integrated approaches to managing land and seascapes has been well established in the context of conservation and agriculture, we have argued progress is required to systematically apply such approaches to planning and implementation of livelihoods projects at cross-sectoral scales. In this context, we presented an applied research agenda to overcome some of the challenges associated with navigating trade-offs across sectors and coastal landscapes, with benefits that extend beyond financial gains and across broader spatial scales. Our approach stems from three foundational activities including (1) a governance review and assessment, (2) strategic partnership formation, and (3) a diagnostic approach supported by science and shared outcomes. We acknowledge the inherent flexibility and lack of prescribed methodological processes associated within these foundational activities, and the significant amount of work that will be required to tailor them to the unique needs and challenges of each project (e.g., equity, financing, etc.). This call for action aims to provide the scaffolding for a research agenda to support livelihoods of researchers and practitioners to better address the complexity of livelihoods and their wider social-ecological context, and matches a shift in the perspective of the donor community, that is moving away from sectoral, programmatic approaches toward focusing on broader-scale outcomes such as gender equity and social justice.[105,106] Current approaches to tackling complex challenges to achieve sustainable livelihoods and the broader UN SDGs will be ineffective unless they move beyond the intra-community scale and encompass a multisectoral approach; the approach we have proposed here is a first step to move in this direction.

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AUTHOR CONTRIBUTIONS

A.D. led the drafting and revision of the manuscript with contributions from all authors. All authors contributed to the conceptualization of the manuscript.

DECLARATION OF INTERESTS

The authors declare no competing interests.

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