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RESEARCH ARTICLE

Factors Affecting Communities on Small Islands Respond to Social-Ecological Changes

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ABSTRACT

A resilience conceptual framework was used to approach problems inherent in foreseeing and measuring responses of complex systems in tourism-dependent small islands. The novel contribution of this framework lies in its transdisciplinary approach to exploring factors affecting communities on small tourism islands respond to changes in their social-ecological system. The review shows six identifiable factors of resilience that reliably define community likely potential to cope with and adapt to probable social-ecological change in tourism-dependent small island. These are social networks, collaborative governance, learning and knowledge, diversity, leadership, and infrastructure and support service. The benefit of this framework reclines in the ability to explicitly recognize and work with system change, complexity and uncertainty, in contrast to traditional methods that are based on linear assessment approaches. Understanding the factors affecting community resilience and their interlinkages should allow us to assess the relative resilience of community to external drivers such as climate changes, economic crisis, natural disaster event, and different policy options. Nevertheless, the practical application of this conceptual framework needs validation to really assess its methodologies on the impact of small island tourism on the community resilience. Research to test the validity of the framework developed will critically help progress in the field relating to advancing resilience and complex systems thinking in the field of tourism research.

INTRODUCTION

Most of the characteristics that are typically associated with small islands are vulnerabilities. These include the limited physical size, their proneness to natural disasters (Cannon 1993, Scheyvens and Momsen 2008), their low adaptive capacity (Adger et al. 2001; Adger 2006) and lack of resilience in the face of outside forces (Briguglio 1995). Small islands are inherently more vulnerable than continental areas because of their economic dependence on external resources (Tita 2014), which make them have little economic choice but to accept conventional tourism development (Wilkinson 1989). Moreover, their susceptibility to hostile impacts of climate change e.g., rising sea levels and global warming (IPCC 2013; Füssel and Klein 2006) may cause a massive impact on marine-based resources, such as fisheries and coral reef ecosystems, which are vital to the economy and environmental health of islands. The vulnerability of small islands affects their level of resilience to stressors and disasters, which tends to be aggravated by climate change and global economic

instability (Adrianto and Matsuda 2004; Boruff and Cutter 2007).

Many small islands use tourism as their main tool of economic growth (Lockhart 1997) because of their natural beauty and cultural value uniqueness (Dodds 2007; Biggs et al. 2012; Graci 2013). In vulnerable tourism-dependent small island system even, small disturbances may cause dramatic social consequences (Adger 2006). The degradation of coral reef ecosystems from anthropogenic caused environmental change includes coral bleaching, ocean acidification, overfishing, fertilizer and sediment runoff, and coastal development, which includes tourism activities (Biggs et al. 2012). These threats are further exasperated instabilities caused by global security concerns, economic recessions, and unpredictable fluctuations in the price of natural resource commodities (Adger et al. 2001). Threats to coral reef ecosystems may rise concerns over the future of tourism on small tropical islands.

Traditional Island tourism studies use a very linear concept approach, despite tourism is a clear example of social-ecological systems (SES), which involves both the community and natural resources, and their interactions. Tourist destinations experience various stress factors simultaneously such as current and future climate disturbances, threats of natural disasters, and socioeconomic crises (Bartelet et al. 2024). Tourism-dependent small islands are complex systems covering various social, economic, and environmental components, which are interconnected with one another (Baggio and Sainaghi 2011; Baggio et al. 2010), thus cannot be effectively evaluated using traditional linear concept approach (Schianetz and Kavanagh 2008; Farrell and Twining-Ward 2004).

To overcome the disadvantages of traditional tourism study approaches, Farrell and Twining-Ward (2004), Schianetz and Kavanagh (2008) and Strickland-Munro et al. (2010) suggest the need for greater consideration of tourism research on complex adaptive systems, including resilience concept (Holling 1973, 2001; Holling and Gunderson 2002). The concept of a complex system describes a system as a process that depends on feedback between various scales that allows this system to self-organize (Levin 1999). Maintenance of the diversity and individuality of components, which are important elements of a complex adaptive system, implies an initiation of perpetual innovation and dynamics that is far from equilibrium (Levin 1998). The concept of resilience as a means to understand the impact of disruption or pressure on the SES has been used by a few scholars such as Biggs et al. (2012); Strickland-Munro et al. (2010), Ruiz-Ballesteros (2010), and Tita (2014).

This review aims to provide an essential contribution that the literature on resilience and tourism research can make to an understanding of how community in small islands should respond to socio-ecological changes. It intends to answer several important questions: What are the important contributing factors that influence community capacity to manage resilience? How are the interlinkages between these factors and capacity to manage resilience? In doing so, this article briefly uncovers the main characteristics of tourism-dependent small island system and highlight a new way to understand the dynamics of tourism in small islands.

1. Review on Resilience Thinking

The resilience approach can be used to assess the capacity of SES in tourism-dependent small islands to cope with disruptions and sudden changes (Farrell and Twining-Ward 2004; Biggs et al. 2012; Tita 2014). The essence of resilience theory includes the following components and assumptions about a SES (Walker and Salt 2006): (1) External change drivers are disturbances that are exogenous to the SES, such as changes in climate conditions, non-local governance systems, and external economic factors; (2) Fast moving internal variables are those that change quickly when stressed, such as air quality, water supply, and gasoline prices, and are often referred to as "disasters" or "crises" when they occur; (3) Slow moving internal variables, also known as controlling variables, are those that remain more stable under pressure, such as soil fertility conditions (for agriculture), lower food chain organisms, religious and cultural traditions, and monetary systems, where changes happen over a long period of time; (4) Both fast and slow variable changes can occur in non-linear patterns, making them problematic to foresee (Walker et al. 2002). Based on these fundamental building blocks and assumptions, Walker and Salt (2006) developed a framework to provide a way of thinking in which a system can sustain itself by (a) retaining control over its core essential functions and structures; (b) being capable of self-organization under

changing conditions; and (c) building and enhancing its future capacity for learning and adaptation. The aim of resilience thinking is to understand how nature and humans operate together in complex adaptive systems to achieve these goals (Walker et al. 2002; Folke et al. 2003; Allen et al. 2011; Folke 2006).

Another main thought in resilience theory is that changes in a SES reflect movement through the "adaptive cycle". Holling and Gunderson (2002) suggest that most, although not all, systems follow a four-phase cycle of: (1) a rapid growth or exploitation phase [r] wherein new resources and opportunities are discovered and exploited; (2) a consolidation and conservation phase [K] in which the system matures, consolidates, and become rigid against change; (3) an energy release or collapse phase [□] where the stress of conservation against increasing levels of change leads to a collapse of the system's structures; and (4) a re-organization and renewal phase □□□ during which a less structured system context allows innovations, adaptations, and eventually new opportunities for exploitation and development to emerge (Holling and Gunderson 2002; Walker and Salt 2006). Through this adaptive cycle, three main variables are rise and fall in influence. Holling (2001) referred to these as resilience (characterized by a high capacity for innovation and adaptation), potential (having a high capacity for change due to accumulated resources, such as biomass or human social capital), and connectedness (providing a high capacity for control and management to guide future directions). Resilience decreases in the consolidation stage, due to its high degree of control. It reaches its lowest point in the collapse phase, but then increases through reorganization as new opportunities for innovation emerge and is highest in the growth phase. Connectedness moves in a roughly opposite direction to resilience, being highest in the consolidation stage, decreasing through collapse, and reaching its lowest point in the reorganization phase before increasing again in the growth phase. The potential phase is highest when an accumulated wealth natural or human resources are most available, which is in the reorganization and consolidation stages, and it is lowest in the transitional growth and collapse periods. Collaboration among actors in the system is strongest in the two high potential phases, although it is more likely to be associated with resilience in the (re)organization stage when collaborators are working to find innovative solutions to a clearly defined problem (a collapse). In the consolidation stage, collaboration is undertaken to conserve existing institutional structures, leading to system rigidity and increasing vulnerability. Collapse, however, can be avoided if the collaborators recognize their vulnerability and the system is adequately reorganized to return to a growth scenario.

The understanding that adaptive cycle is a useful metaphor to create a typical proposition in a complex world of rapid change (Holling and Gunderson 2002) suggests potential management interventions that can enhance the system capacities to bounce back following a disturbance (Folke 2006; Walker and Salt 2006). This helps different institutions and social networks to better accomplish both the human and the ecological domains of the system, and to focus on drivers and slow changing variables that may create vulnerability to the system in the future.

Tourism System in Small Islands

Farrell and Twinning-Ward (2004) proposed a model of tourism panarchy following the Gunderson and Holling's (2002) hierarchical nesting of one system level within another. In tourism panarchy models, the core of the tourism system is shown as an inner part of the larger regional tourism system, which is part of the larger tourism system, as well as larger systems to the global tourism system. This tourism panarchy model builds a comprehensive and complex tourism system (Baggio 2008), covering significant social and ecological components, along with the processes and functions that complement the totality and is essential for sustainability (Farrell and Runyan 1991; Hall and Lew 1998).

The core of a tourism panarchy model (Farrell and Twinning-Ward 2004) consists of an assemblage of structures, services (diving, snorkeling, eating), and resources directly contributing to the tourism sector, as well as significant social, economic, geopolitical, and ecological components, processes and functions that shape development paths, resource use, and quality of life. Small islands are characteristically complex system due to their diverse and often unpredictable institutional arrangements, their resource or economic dependency, and the tension between managing conservation of marine ecosystem and developing it for tourism. The local complexity in the island is further impacted by external influences from regional and global governance and

economic systems. The global system, for example, bring international tourists and international investors and business people to the islands, as well as crisis events like the Asian economic crisis in 1997, and global warming.

Within this framework, a system of regional tourism is not made up of only one type of cycle on one scale. A regional tourism system functions as a nested, hierarchical structure in the subsystem at some scale. Different subsystems, on a different scale, perhaps in different phases and may change at different rates (Gunderson and Holling 2002). The subsystem is self-organized and undergo cross-scale interactions. Thus, an understanding of island tourism in terms of panarchy system can help investigate how the character of the island appeared and how it may be saved or improved.

In the panarchy model, the lower levels are only semi-autonomous, being impacted more by higher levels than vice versa. Higher level systems are slower moving and usually unaffected by many lower level disturbances. Change occurs at different spatial scales and at across temporal scales (Lew 2014), with change drivers that impact higher levels in the hierarchy, forcing the impacts to lower levels (Carpenter and Gunderson 2001). A regional economic crisis, for example, can influence the spatial systems ranging from the national to the provincial, and from an entire city to an individual tourism business (Hillmer-Pegram 2014). These impacts can potentially move in all directions both within and across spatial and temporal scales. Because of these influences, it is necessary to look at the larger context of the tourist destination system to fully understand its social, economic, and environmental changes (Hall and Lew 2009).

METHODOLOGY

To identify and understand essential factors associated with collaboration in building community resilience, this research first developed a conceptual framework for understanding the role of collaboration in resources management and more specifically collaboration approach in tourism-dependent small islands. I reviewed and synthesized the state of knowledge on collaboration and resilience in small islands. Regarding the selection of papers for inclusion, I focused the scope of review on existing general collaboration and resilience literature before narrowing the research to collaboration approach focused on promoting tourism development in small islands.

Secondly, I continued exploring relevant and recent literature that have developed and applied collaboration and resilience indicators for small island development. Papers included in the analysis were limited to those reporting primary research on community collaboration and resilience framework, e.g., collaboration for solid waste management, collaboration for coral reef protection and restoration, and other social ecological issues. Results of this review helped us to further develop the conceptual framework presented in Figure 1 (A Small Island Collaboration and Community Resilience Framework). The applicability of this framework could be tested in a case study that will assess social-ecological system responses to various external events in a small island.

2. CONCEPTUAL FRAMEWORK

The aim of resilience thinking is to understand how nature and humans operate together in complex adaptive systems to achieve these goals (Walker et al. 2002; Folke et al. 2003; Allen et al. 2011). Resilience is viewed as involving three elements: the 'ability in retaining control over its core essential functions and structures; the ability of 'self-organization under changing conditions; and 'the capacity for learning and adaptation (Walker and Salt 2006). The key element is about the ability to know when to adapt, when to change, rather than the ability to continue doing the same thing (Walker and Salt 2006). In practical terms, this implies that a resilient person, organization or community would have the ability to adapt to pressures and transform itself to be more sustainable in the future (Walker and Salt 2006; Wilding 2011). As a result, the person or entity is not only able to function in the new environment, but also has the capacity to anticipate and arrange for the option of similar shocks and surprises in the future (Walker and Salt 2006).

However, resilience is not only about robustness in the event of disturbance but also about the opportunities for disturbance that open up in terms of evolving structure and process recombination, system updates and the emergence of new paths. Thus, resilience provides adaptive capacity (Walker and Salt 2006) which enables prolonged development, such as dynamic adaptive interactions between maintaining and developing with change to avoid collapse. In relation to the social-ecological system, resilience combines the ideas of adaptation, learning and self-organization

in addition to the general ability to survive when disruptions occur. Adaptive processes in dealing with change arise from self-organization systems. The dynamics after disturbance are highly dependent on self-organizing capacity of the complex adaptive system and the process of self-organization refers to the temporal and spatial scales above and below the system in focus (Gunderson and Holling 2002).

Yet, what are contributing factors affecting community capacity to manage resilience in tourism-dependent small island? To answer these questions, we propose a framework that consists of a set of definitions and a list of attributes that are of key importance to understanding the resilience of a social ecological system. We identify six important factors commonly reported to enhance community resilience, namely social networks (Hegney et al. 2008; Woolcock and Narayan 2000; Narayan 1997; Isham and Kähkönen 1999), collaborative governance (Berkes and Folke 2002; Lebel et al. 2006; Hegney et al. 2008; Resilience Alliance 2010; Ravera et al. 2016), learning and knowledge (Armitage et al. 2008; Hegney et al. 2008; Allen et al. 2011; Anderies et al. 2004; Mayunga 2007; Muro & Jeffrey 2008; Pahl-Wostl et al. 2008; Longstaff et al. 2010; Cabell and Oelofse 2012), diversity (Holling and Gunderson 2002; Hegney et al. 2008; Darnhofer 2010; Resilience Alliance 2010; Barrow 2014), leadership (Chrislip and Larson 1994; Gray 1989; Wondolleck and Yaffee 2000; Hegney et al. 2008), and infrastructure and support service (Scoones 1998; Hegney et al. 2008). These factors provide a guide for resilience building at the community level; leading to discussions on how adaptive capacity, self-organization and agency can be supported and fostered through processes such as community development and community-based planning. Collaboration in distributed governance along with learning, leadership, infrastructure, social capital, and diversity are keys in building community resilience in tourism-dependent small islands.

Figure 1 shows the main factors affecting community resilience in small islands and their interlinkages with key characteristics of community resilience that help build community resilience. The solid-line arrows show the main relationships among the community resilience characteristics. Collaboration in distributed governance are the key steps in the directions for managing community resilience. Collaboration can contribute to some building blocks for resilience, such as distributed governance, learning, sustainable infrastructure, and diversity, (Smith 2016). Firstly, governance, which is a form of collaboration formalization involving decision making, is a powerful mechanism to increase community involvement, and enhance partnership integration (Alexander et al. 2001). Distributed governance with decentralized decision making at different levels connected through networks rather than a single top-down authority center is an important component of resilience. The community's response to shocks and stresses can be independently identified and carried out quickly at the most effective level, then coordinated through the network, if there are clear responsibilities and defined authority boundaries. Collaboration is one of the main principles of deep institutional resilience. Collaboration can avoid overlapping responsibilities, improve decision-making processes, and increase responsiveness (Sapirstein, 2009). Decentralization and participation in decision-making produce the capacity to self-organize, which is important for resilience. Collaboration among stakeholders in distributed governance increases participation in the network. Collaboration therefore opens up new ways to organize and reorganize, which helps people not only respond to change but also to promote and experiment with change. Those who are most affected by the disturbance can find and determine the best solution for vulnerability. Thus, successful collaboration can increase system adaptive capacity (Adger 2000).

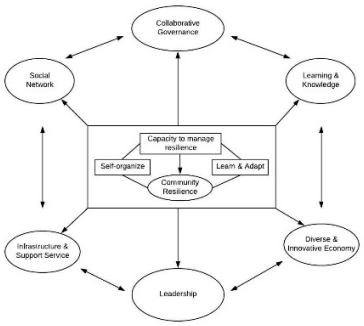

Figure 1 Association between factors affecting community resilience and capacity to manage resilience

Secondly, learning through collaborative activity, where different knowledge and experiences are considered in decision making process, is an important mechanism for building resilience in social-ecological systems. Collaboration between private sectors, governments and civil society can helps to provide more channels for learning and sharing data and information (Armitage et al. 2008). They have more opportunities to experiment, learn collectively from success and failure and to then adjust or reorganize accordingly. Through implementation of collaborative governance, community can build resilience by engaging, innovating, and learning continuously within and between the knowledge and cultural systems in which they grow (Allen et al. 2011).

Thirdly, community resilience depends on the availability of efficient infrastructure and services to meet various community needs. Supporting infrastructure and services such as safe drinking water supply, public transportation, health care, school, telecommunications and markets, allow individuals and communities to function well and recover from the difficulties they face. In contrast, when the main supporting facilities and services in a community are not available, they imperil the quality of life of the community. Collaboration between stakeholders that aims to enable change to build resilience at a significant scale and level can be more successful if the required infrastructure and services are available.

Fourthly, promoting diversity is the main property of resilient system (Holling and Gunderson 2002) because it can serve as a buffer capacity, which can help changing systems to maintain their identity, functions and structures by providing a number of options for dealing with shocks and pressure (Darnhofer 2010). Collaboration may encourage greater variation in mobilizing resources, including financial, social, and natural capital. Collaboration can enhance social diversity (Berkes et al. 2003). It brings a diversity of players together working on problem solving and change. Diverse players with different roles within a governance system are critical in the resilience of social-ecological systems, as they provide overlapping functions with diverse strengths (Berkes et al. 2003). The diverse organizations tend to respond differently to social, economic, and political changes and pressures. In a well-connected community, where overlapping functions occur, creativeness and flexibility can flourish. Engaging multiple stakeholders in the management of a socio-ecological system can help build resilience by enhancing legitimacy, extending the depth and diversity of knowledge, and helping to detect and interpret interference during the decision-making process (Lebel et al. 2006).

In addition to the above components, other important factors in building community resilience are social networks and leadership. Managing for resilience requires cooperation among stakeholders in the social-ecological system. This cooperation can be facilitated by an understanding of the social relations among the stakeholders by examining social networks that include family, friends and community organization. Social networks build a sense of community that contributes to the resilience of individuals and groups (Hegney et al. 2008; Woolcock and Narayan 2000). These groups build strong links with other outside groups that can bring additional social and financial resources. The existence of trust and social network in collaborative governance helps to encourage involvement of key multi stakeholders in the collaboration, while collaboration can further accelerate learning and innovation. Communities that build diverse social networks will be in a better position to deal with the emergence of social ecological changes in the system (Narayan 1997) and take advantage of new opportunities (Isham and Kähkönen 1999). Different network characteristics facilitate different processes that are important at different stages of a governance process. Depending on the specific challenges facing a social-ecological system, some characteristics may be more beneficial than others for influencing the adaptive capacity of the system.

Leadership plays central role in the success of collaboration as they can catalyze collaboration. Leadership along with trust and social capital, can enhance the likelihood for collaboration. Collaborative leadership assures that motivation and inspiration occur through trust in the credibility of the collaborative process and the mutual acceptance of all parties. Collaborative leaders are responsible for group diversity by bringing together all relevant stakeholders, thus, appreciating everyone's thoughts and ideas. The presence of credible, communicative, and collaborative leadership will support the process of learning and adapting to the enabling conditions for building resilience. The following is a brief exploration of the factors that influence the response of community in small islands when responding to social-ecological changes.

3.1 Social Network

The concept of social capital refers to the connections between personals, social networks and the norms of reciprocity and trust derived from their interactions (Putnam 2000) that make it likely for individuals and groups to reach certain goals (Kunitz 2004; Gibbon and Pokhrel 1999). The essence of social capital is about the social network value, which can be useful when dealing with disruption. Social networks, including family, friends, and community organizations, create togetherness in community that may help in building the individual and group resiliency (Hegney et al. 2008; Woolcock and Narayan 2000). These networks can take resources from outside by establishing solid relations with different groups or social networks, as they generate connections with shared goals and encourage common awareness with flexible and adaptable roles. Therefore, communities that build diverse networks will have a better response to changes and dealing with susceptibility (Narayan 1997) and take advantage of new opportunities (Isham and Kähkönen 1999).

Working for resilience needs collaboration among stakeholders in the social-ecological system. A certain network structural characteristic affects the dynamics of system through smoothing or hindering the processes of information distribution and resources accessibility, and chances to work collaboratively. Therefore, it is essential to examine the structural characteristics of social networks in a system as they can help us to understand the social relations among the stakeholders, and whether they facilitate or impede governance attempts.

3.2 Collaborative Governance

The community is built under various rules, some formal like organizations, laws, policies, regulations, others informally such as traditional institutions (customary law) and local non-traditional initiatives for sustainable resource management (Resilience Alliance 2010). These rules, which is also called institutions, are used as reference by community members in interacting with the ecological systems. The governance system encompasses various organizations and actors that takes in various segments and scales. The interaction between these organization, stakeholders, and traditions influence the process of decision making and power sharing in the resources management. This suggests that people need a clear understanding of governance in order to understand the socio-ecological relations within a system.

Some attributes that are part of good governance, for example, participation, accountability, and organizational features such as multilayered and polycentric deals with the capacity to manage resilience. Public participation often extends the range of interests and issues to consider, as different stakeholders represent different values for different ecosystem services and risks. The presence of gender inequality and social exclusion in society can hamper the capacity of women, indigenous groups, and other parties to strengthen the resilience of the systems they are in (Ravera et al. 2016). For indigenous peoples, resilience is fundamentally linked to efforts to protect traditional subsistence and cultural heritage.

Accountability refers to whether the authorities are obliged to provide information and clarify decisions and whether they can be penalized when the answer disappoints stakeholders (Agrawal and Ribot 1999). Accountability can be comprehended through mechanisms of transparency, independent monitoring, polycentric, separation of powers, legal sources, budget supervision, and media availability (Ribot 2002). Polycentric institutions have many authorities, which are thought to create opportunities to understand and serve needs in a heterogeneous spatial context (Imperial 1999). The institutional arrangements of polycentric systems are also layered, making them important to address governance challenges that depend on scale and cross-scale interactions (Berkes and Folke 2002). Although polycentric and multi-layered arrangements may lead to overlapping inefficient coordination and administrative responsibilities, this governance creates the possibility to moderate vertical interactions between institutions (Berkes and Folke 2002; Lebel et al. 2006).

Social, economic, and political changes and pressures in a system tend to be responded differently by diverse organizations. Although their governance systems have overlapping or distributed functions, as long as their communities are well connected, they tend to create various options in respond to changes and pressures they experience. The creativity and flexibility of the community

as a result of overlapping or distributed governance is an advantage because it helps to build resilience. Examples are like those that take place in a system with decentralized policy-making at various stages linked over the network instead of a centralized authority. Responses to disturbances and pressures can be recognized autonomously and executed immediately at the utmost appropriate level if the limits of power are clearly defined through existing social networks. So, distributed governance and involvement of different participants in decision making process create the self-organization and reorganization capacity, which is essential to resilience (Lebel et al. 2006)

Good governance systems in response to change across scales are important because of the strong linkage between SES with organizations and practices that frequently operate on dissimilar spatial and temporal scales. The implementation of good governance principals can improve resilience because they promote flexible, inclusive, diverse, and innovative approaches, that can facilitate the various function existence such as experiments, innovation in collaboration, as well as new arrangements of institution and organization (Olsson and Galaz 2012). In distributed governance, collaboration among governments, local community, NGO's, and private sectors, stimulate participant involvement in the existing networks. Therefore, collaboration create innovative approaches of self-organizing and reorganizing when dealing with changes and respond to stress and uncertainty.

3.3 Learning and Knowledge

Learning and knowledge are tools for building resilience. Communities strengthen resilience by learning, innovating, and experimenting within and between systems of knowledge, tradition, and fellow members of society. Knowledge in community is reflected in the habitual use of resource, local languages, cultural values and traditions, and social institutions that have grown since the time of their ancestors. There are times when a society ignores or loses their knowledge of local resources and historical events that have shaped the landscape in which they live. The awareness and willingness of the older and younger generation to document and disseminate knowledge will determine the maintenance and utilization of knowledge continually. Younger generations should appreciate traditional knowledge and as much as possible integrate it with the knowledge they gain through formal education or social media.

Each community can build resilience by engaging, innovating, and learning continuously within and between the knowledge and cultural systems in which they grow (Allen et al. 2011). Strategies to adapt may be innovative or outdated, but generally build on existing traditional knowledge (Allen et al. 2011; Anderies et al. 2004). Continuous learning and experiments are needed to revise existing knowledge to enable adaptation to change and approaches to management. Learning is about building a deeper awareness of what risks actually infer in the event of disaster (Mayunga 2007). Learning means gaining knowledge and awareness the greater the threat faced. So, this involves the ability to weight lessons into readiness and recovery and come out stronger than ever (Djalante and Thomalla 2011). The ability to reflect can be a powerful learning tool especially when lessons can be drawn from previous experiences. Communities can learn from collective experiences, such as a natural disaster, and develop their resilience when faced with future disturbance. Resilient people and groups strive for opportunities for learning and development.

Social learning in principle involves the development of relational capacities, both between social representatives, in the form of learning how to collaborate and understanding the roles and capacities of others differently, and also between SES (Pahl-Wostl et al. 2008). Learning also comprises the ability of sharing information with others (Cabell and Oelofse 2012) and evaluating reliability and usefulness of information sources for the approached management. Social learning, in the context of natural resource management, requires the communication and interaction of diverse actors in a participatory setting to achieve a range of social outcomes, such as the generation of new knowledge, the mastery of technical and social skills and the development of trust and relationships, which underlie the general understanding of systems, and collective actions (Muro and Jeffrey 2008). So, learning through collaborative activity, where different knowledge and experiences are considered in decision making process, is an important mechanism for building resilience in social-ecological systems.

Institutional memory, learning, innovation and organizing resources to adapt to changing

environmental demands and connecting with others inside and outside the community to communicate experiences and lessons learned, determine the foundations of adaptation capacity at the community level (Longstaff et al. 2010). Innovation for resilience needs to be directed towards overcoming social change that will strengthen adaptive capacity and safeguard the benefits of natural services. Collaboration, empowerment for action and learning are key to adaptive organizational and governmental change, but they are also an important tool for leveraging deeper changes in how society responds to changes in the eco- social system. More pragmatically, they are an integral part of actions that strengthen building blocks for the resilience of diversity, sustainable infrastructure, distributed governance and learning.

Traditional knowledge of landscape management and ecological processes become an integral part of institutional structures that form the interaction of people with landscape and regulate resource use (Olsson et al. 2004). Indigenous peoples often master detailed knowledge relating to local agro ecological conditions, plant and animal characteristics, and resources in ecosystems and landscapes that they rely on for their life (Berkes et al. 2000). This knowledge comes from interactions between humans, animals, plants, spirits and land use for hundreds of years (Kassam 2009). Traditional ecological knowledge can be seen as a basis for continued innovation and sustainable use of resources conservation, and thus vital for the resilience of the socio-ecological system. Under the learning and innovation category, Table 1 defines three indicators, namely (1) Encourage learning; (2) Traditional knowledge related to environmental management; and (3) Innovation in environmental management for improved resilience.

3.4 Diversity

Promoting diversity is the main property of resilient system (Holling and Gunderson 2002) because it can serve as a buffer capacity, which can help changing systems to maintain their identity, functions and structures by providing a number of options for dealing with shocks and pressure (Darnhofer 2010). Resilient economy means generating economy with diverse businesses and employment opportunities, so that public welfare is not at stake in market luck from just one industry (Resilience Alliance 2010). For example, when small-scale farmers plant several different food crops then a harvest failure does not result in a catastrophic impact on food availability. More options in dealing with change and facing uncertainty and shock within the socio-ecological system can be provided by elements such as species, landscape types, knowledge systems, actors, and cultural institutions provide.

In an effort to bring economic prosperity to the area, rather than running a business through competition, communities work together to grow their business. Interdependencies between business and community actors characterize a diverse economy in a society, where they always try to keep businesses and consumers working together in creating more business and job market for the better life of community. The diversity of economy can build resilient business when facing crisis as it can facilitate the affected business restoration. This is because the diverse players in the business can build creative and innovative enterprises. The case of Restoring Resilience in Shinyanga Region, Tanzania demonstrates how collaborative framework can contribute to one of building blocks for resilience by enhancing diversity (Barrow 2014). Diverse players provide different ideas and bring various resources when facing change and dealing with surprise and uncertainty such as solution at local level that possibly can be synchronized at higher levels and scales.

Diverse stakeholders such as governments, NGOs and business groups in a governance system can overlay in function and offer a different of responses, because of the differences in their cultures, management philosophy, funding structures and mechanisms when facing disruption. In the resilience of social-ecological system, having various players with diverse roles is critical, because they can create various strengths of overlying functions that are needed for creativity and adaptability, particularly in a well-connected society.

3.5 Leadership

Leadership is defined as a process to persuade actions of people to achieve their goal (Wondolleck and Yaffee 2000). Leadership plays central role in the success of collaboration as they can catalyze collaboration. An individual or organization can share their energy and vision that activates other

parties to participate (Selin and Chavez 1995). Leaders in collaboration often play as a group guardian of the collaborative processes, helping stakeholders do their work. They focus more on how to promote and maintain the process rather than as individual leaders that steer firmly without hearing the voices of the collaborators (Chrislip and Larson 1994). Leaders may play roles of process facilitator, convener, catalyst, and promoter, and should focus to achieve the common goals (Gray 1989; Wondolleck and Yaffee 2000).

There are some principles of collaborative leadership, which determine the success of collaboration process, namely motivating commitment and action of the participants, playing as a peer problem solver, ensuring the involvement of many parties, and caring for hope and participation (Wondolleck and Yaffee 2000). Collaborative leaders begin a process that unites people with action-oriented, but action involves convincing people that something can be done with their capacity and resources. Collaborative leaders should maintain a credible process of collaboration and assures that all participants respect each other. Trustable leadership can encourage solidarity in community to the senses of place and crisis that will ease the process of problem identification and goal setting together in collaboration. If these conditions can be built together in a participatory manner, it can lead to the willingness of each member of the collaboration involved to share their resources for the execution of collaborative activities in addressing their common problems. They do not provide solutions with command and control but facilitate the process of vision design and problem solving participatorily by bringing diverse key actors and guaranteeing all opinion and ideas will be accommodated. The presence of credible, collaborative leadership will support the process of continuous learning and experimentation, and adapting to the emergence of social ecological changes, thus enhance the resilience of the system.

3.6 Infrastructure and Support Services

Community resilience depends on the availability of efficient and functioning infrastructure to meet the various needs of the community. Livelihood improvements can be directly linked to the options and opportunities of community members to engage in sustainable income generation activities developed through their human resources (Scoones 1998). Infrastructure and support services such as safe and secure drinking water supply, public transport, health care, schools, telecommunications, and markets are important tools that enable people to carry out their daily activities. These facilities and services enable individuals and communities to function properly and recover from the difficulties they face. Support services provide everything from information and social support to food, housing, employment, and assistance to people with special needs. The absence of essential support facilities and services in a community destroys the quality of community life. A lack of infrastructure weakened community resilience by reducing the access to community's need or preventing person and groups from connecting with their social networks.

4 DISCUSSION AND CONCLUSION

Tourism-dependent small islands are very complex and dynamic systems. Emerging ideas and knowledge about resilience offer a conceptual framework to approach problems inherent in foreseeing and measuring responses of complex social-ecological systems in small islands. The novel contribution of such framework lies in its transdisciplinary approach to investigating factors affecting communities on small tourism islands respond to changes in their social-ecological system, by framing tourism-dependent small islands as SES and adopting resilience assessment principles. Our review indicates that there are six identifiable factors of resilience that reliably define community likely potential to cope with and adapt to probable social-ecological change in tourism-dependent small island. The benefit of this framework reclines in the ability to explicitly recognize and work with system change, complexity and uncertainty, in contrast to traditional methods that are based on linear assessment approaches. It is also intended to facilitate further explorations into the usefulness of resilience and complex systems thinking to small island tourism system.

The practical value of the framework is very meaningful. Understanding the factors affecting community resilience and their interlinkages should allow us, especially policy makers, to assess the relative resilience of community to external drivers such as climate changes, economic crisis, natural disaster event, and different policy options. By measuring the key resilience attributes such as the ability to learn, adapt, and self-organize, policy makers can measure the relative social

consequences of different policy options. With this information, they will have the capacity to reliably and defensibly design, select, and implement policies that minimize impacts on communities while maximizing sustainability of tourism in small islands.

However, although this conceptual is enlightening, the practical application of this conceptual framework requires validation to really assess its methodologies to investigate the impact of small island tourism on the community resilience. Research that refers to the framework developed in this paper, and at the same time to test its validity, will greatly help progress in the field relating to advancing resilience and complex systems thinking in the field of tourism research. However, the challenges of research on social-ecological resilience are numerous and include efforts to clarify feedback from factors that build resilience, and how they interact at all scales in this context. While the implications for policy are significant and require changes in mental models toward social-ecological perspectives of tourism-dependent small island system.

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