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Is resilience socially constructed? Empirical evidence from Fiji, Ghana, Sri Lanka, and Vietnam

Christophe Béné[a,*], Ramatu M. Al-Hassan[b], Oscar Amarasinghe[c], Patrick Fong[d], Joseph Ocran[h], Edward Onumah[b], Rusiata Ratuniata[d], Truong Van Tuyen[e], J. Allister McGregor[a], David J. Mills[f,g]

[a] Institute of Development Studies, University of Sussex, UK
[b] Department of Agricultural Economics & Agribusiness University of Ghana-Legon,Ghana
[c] Faculty of Agriculture, University of Ruhuna, Sri Lanka
[d] Institute of Applied Science, Faculty of Science and Technology, University of the South Pacific, Fiji
[e] Hue University of Agriculture and Forestry, Vietnam
[f] WorldFish Center, Penang, Malaysia
[g] ARC CoE for Coral Reef Studies, James Cook University, Townsville, Australia
[h] Department of Sociology University of Ghana-Legon, Ghana

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ABSTRACT

The objective of this paper is to better understand the various individual and household factors that influence resilience, that is, people's ability to respond adequately to shocks and stressors. One of our hypotheses is that resilience does not simply reflect the expected effects of quantifiable factors such as level of assets, or even less quantifiable social processes such as people's experience, but is also determined by more subjective dimensions related to people's perceptions of their ability to cope, adapt or transform in the face of adverse events. Data collected over two years in Fiji, Ghana, Sri Lanka and Vietnam confirms the importance of wealth in the recovery process of households affected by shocks and stressors. However our results challenge the idea that within communities, assets are a systematic differentiator in people's response to adverse events. The findings regarding social capital are mixed and call for more research: social capital had a strong positive influence on resilience at the community level, yet our analysis failed to demonstrate any tangible positive correlation at the household level. Finally, the data confirm that, like vulnerability, resilience is at least in part socially constructed, endogenous to individual and groups, and hence contingent on knowledge, attitudes to risk, culture and subjectivity.

1. Introduction

Since the 1980s, a growing body of evidence has pointed to the debilitating impacts that unexpected changes, shocks and extreme events can have on the lives and wellbeing of poor people in developing countries (Morduch, 1995; Baulch and Hoddinott, 2000; Sinha et al., 2002; Yamano et al., 2003; Dercon et al., 2005; IPCC, 2012). Small events such as a delay in rainfall, individual illness, or more severe idiosyncratic or covariate shocks such as the death of the household head, consecutive harvest failures, or the devastating impact of seasonal tropical storms, can have irreversible consequences on people's lives, affecting their income, food security and health, and possibly driving them deeper into poverty.

In this context – because it holds particular appeal to the idea of people being able to endure shocks and stressors and bounce back- resilience has emerged as a concept that could help academics and practitioners better understand the links between shocks, responses and development outcomes (Constas et al., 2014a). "Resilience offers a lens with which to explore stressors and shocks and to understand livelihood dynamics" (Marschke and Berkes, 2006, p.2). As such resilience thinking is now becoming a central component in the planning and implementation of interventions in many sectors including humanitarian activities (DFID, 2011), disaster risk reduction (Klein et al., 2003), climate change adaptation (Boyd et al., 2008), social protection (World Bank, 2011), and food security and nutrition (von Grebmer et al., 2013; Constas et al., 2014b).

* Corresponding author. Current address: International Center for Tropical Agriculture (CIAT), Km 17, Recta Cali-Palmira Apartado Aéreo 6713 Cali, Colombia.
E-mail addresses: c.bene@cgiar.org (C. Béné), ramatu_mahama@yahoo.com (R.M. Al-Hassan), oamarasinghe@yahoo.com (O. Amarasinghe), patrick.fong@usp.ac.fj (P. Fong), tvtuyen@huaf.edu.vn (T.V. Tuyen), j.a.mcgregor@sheffield.ac.uk (J. A. McGregor), D.Mills@cgiar.org (D.J. Mills).

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Using this concept is not without challenges, however (Béné et al., 2012). Resilience has been recognized to be multi-scale, context and shock specific, and highly dynamic (Constas et al., 2014a) – characteristics that make it hard to measure through simple proxies (Berkes and Folke, 1998; Walker et al., 2002; Kallstrom and Ljung, 2005; Béné, 2013). Besides, improving our understanding of the factors that affect people's (or communities') resilience requires more than just the development and field-testing of robust and measurable indices of resilience. As with the rapidly growing literature on social barriers to adaptation (e.g. Østergaard and Reenberg, 2010; Jones and Boyd 2011), better insights are needed into the social, institutional and economic mechanisms that make people vulnerable and the contextual factors that influence individual and collective capacity to respond to shocks and stressors (Turner et al., 2003; Ayers and Forsyth, 2009). This in turn requires a better understanding of knowledge, perceptions and motivations of individuals and households in order to identify factors that influence behaviour and decisions (Coulthard, 2011; Schwarz et al., 2011). There is a need therefore to 'expand' resilience analysis beyond descriptive analysis of the frequency and severity of unexpected shocks or the types of responses adopted within particular socio-economic groups in specific contexts, into a more nuanced analysis of the individual and collective processes that mediate people's ability to respond and adapt to such shocks (Béné et al., 2011).

This research uses empirical data collected over two years from coastal fishing communities in Fiji, Ghana, Sri Lanka and Vietnam to better understand the various individual and household factors and processes that influence (positively or negatively) people's resilience. We focused on fishing communities as those are recognized to be exposed to a wide range of diverse shocks and stressors, a number of which appear to be common and comparable among the four focus countries, while others are more case-specific or idiosyncratic. Of particular relevance for this study is the current general context of the world's fisheries. Starting in the early 1990s, at about the time of the collapse of the Canadian cod stocks, many media headlines, scientific papers and environmental campaigns have been framed around the narrative that the world's fisheries resources are overexploited and on the edge of collapsing (see e.g. Pauly et al., 1998; Myers and Worm, 2003). This "World fisheries crisis", that is, the rapid decline in fish resources globally, is also often presented as a major potential source of poverty and vulnerability for fishing communities (e.g. Belhabib et al., 2015). Internally driven by over-investment in the fishery sector, and affecting the income and wellbeing of almost every fisheries-dependent communities in both developed and developing countries, overexploitation of fish resources may eventually reduce fishers' ability to face other shocks and stressors. This crisis context provides therefore an additional dimension to the analysis for fishing communities in terms of understanding how people adapt and respond to adversity.

2. Working hypotheses

Three central working hypotheses structured our work and the way the research was designed.

Wealth matters: It is often hypothesized (e.g. Zimmerman and Carter, 2003) that households may respond differently to shocks depending on their level of asset holdings. Hoddinott (2006) provided empirical support to this hypothesis when he observed that in the aftermath of the 1994/95 drought in Zimbabwe only wealthier households were able/willing to sell some of their livestock to cope with the drought—while the poorest with only one or two oxen were unwilling to draw down their livestock assets. Beyond this specific example, the empirical literature tends to agree that wealth (and in particular level of household assets) is a particularly important factor to consider in relation to the ability of households to respond to adverse events (see e.g. Carter et al., 2007; Heltberg et al., 2009). However, only limited examination of the dynamic and differentiated nature of the mechanisms involved in these processes is available. In particular it is not clear whether the eventual difference in resilience outcome (if any) between the poorest and the wealthiest in a community comes effectively from the initial difference in assets or from some covariate factors such as ability to access formal credit, or even less tangible factors such as status, reputation, or social connections, which are often related to wealth levels. This last point leads to our next hypothesis.

Social capital is a critical element of resilience: Social capital in its various and diversified guises is often argued to be important for resilience (Adger, 2003; Bernier and Meinzen-Dick, 2014). Social cohesion, mechanisms of reciprocity, 'positive' social norms, strong social fabric, local 'good' governance, or capacity for collective actions are just some examples of these social elements that are usually postulated to contribute to resilience building. The literature reveals, however, that social capital can be less 'positive' and leads for instance to create or entrench exclusion and marginalization (Putzel, 1997; Wood, 2003; Cleaver, 2005). Beyond this "dark side" of social capital, empirical analyses also reveal that in some circumstances, even 'positive' dimensions of social capital can become constraining and may reduce household's or community's ability to adjust, adapt or transform. Coulthard (2011), for instance, shows how certain rural communities in India characterized by a very strong social identity built around traditional customary management system (called the Padu system), were less resilient than other groups with lower level of social cohesion: "The high social values attributed to the Padu system, alongside complex power structures, [had] hinder[ed] institutional adaptation' and prevented the community from transforming their livelihood, as was necessary to "survive" the drastic changes they were facing (Coulthard, 2011). In a more urban context, Pelling and Manuel-Navarrete (2011) demonstrated how power and existing institutional structures can also undermine the transformative capacities of communities: "By closing down imagination, discussion of alternative values, and organization, dominant structures, and social agency simultaneously support and undermine resilience' (Pelling and Manuel-Navarrete, 2011, p.19). Yet in other circumstances, analysis shows that leadership and good governance at the local level can be critical in unlocking the capacities of communities to adapt to change. Schwarz et al. (2011) for instance stress the critical role that participation, community self-support and local leadership play in the creation of the appropriate social environment for resilience building and adaptation.

Our third hypothesis is about perception: Although shocks, unforeseen adverse events, and changes affecting people's lives and livelihoods are part of a tangible reality, individual and collective responses and adaptation are also influenced by the perceptions people have about that reality (Camfield and McGregor, 2005; McLaughlin and Dietz, 2007; Weber, 2010). Perceptions of risk and vulnerability, as well as knowledge and experience are important factors in determining whether and how responses take place at the individual, community and societal levels. Research in Norway, for example, shows that well-developed disaster compensation funds have contributed to a perception that the government will cover the costs of extraordinary climate events. As a consequence, little if any action is undertaken by households (O'Brien et al., 2006). In a less developed country context, in Bangladesh, field data showed that, once households lost their house and assets following a severe river erosion or flood event, they chose either to stay and rebuild their lives (i.e. to resist) or to migrate to Dhaka (i.e. to give up), and that this decision partially depended on their level of self-

confidence and the perception they had of their own ability to restore their livelihood (Béné et al., 2015a). In these circumstances, it becomes as important to understand people's perceptions about a particular event, as it is to assess the actual objective impacts of that particular event (Tansey and O'Riordan, 1999). The third key hypothesis explored in this study was therefore that resilience is subjectively constructed or, at least, is strongly influenced by social and individual self-perception, norms, values and self-confidence in people's ability to handle future events.

3. Methods and data

3.1. Analytical framework

The last three to five years have seen rapid progress in the understanding of what (individual, household, community) resilience is about, supported by a growing body of primary and grey literature – see Frankenberger and Nelson (2013) for a recent review. Drawing on this literature, we developed an analytical framework to clarify the types of information needed to assess people's resilience. This framework, which is shown on Fig. 1, includes four main components: (i) a shock and stressor inventory, and their impacts; (ii) a household characteristics and wellbeing assessment; (iii) a households' response typology; and (iv) an outcome analysis.

Information was collected at both household and community levels on the nature, intensity and characteristics (frequency, duration, date of occurrence) of the various *shocks and stressors* experienced (idiosyncratic and co-variant events). The stochastic characteristics of these events were expected to influence the type of responses employed. Accordingly, a distinction was made between three types of events: (i) rapid shocks, defined as short and unpredictable adverse events affecting the lives and/or livelihoods of one or more members of the household; (ii) medium-term stressors, defined as adverse events that last several months and/or occur recurrently; and (iii) long-term trends that occur gradually/incrementally and have potentially negative (or positive) effect on people's lives and livelihoods.

The *household characteristics and wellbeing* analysis covered demographics and resource base (level of education, age, and gender of the head, size of the household, etc.), and socio-economic status (economic wealth, number and nature of income-generating activities, etc.). Wealth was proxied by the level of household assets, as questionnaire-based assessment of household income is notoriously unreliable and often provides an incomplete picture of wealth (Morris et al., 2000). In addition to these more conventional variables, data on ten domains of quality of life were collected to capture and reflect the multiple dimensions that are considered to affect the wellbeing of households. These ten domains were collected because these dimensions, and the level of satisfaction that people experience in relation to them, were thought to be important factors influencing people's perception of their ability to handle shocks/stressors. The analysis was therefore expected to illuminate in greater detail what might be driving the choice of the strategies that households make in an effort to respond to shocks/stressors. The various types of *responses* to shocks and stressors adopted by households were recorded and coded into four main categories, based on commonalities in responses among households across the four countries (see below).

Finally our framework was based on the premise that the ultimate *outcomes* (general wellbeing, food security or nutrition status of a household) following an adverse event do not merely result from the direct impact of that initial shock (e.g. destruction of assets, losses of livestock, physical injuries), but instead are the result of that shock's impact combined with the responses employed by individuals/households or communities to counteract that shock – as illustrated in Fig. 1. To use a concrete example, when a household decides to send their eldest son to the capital city, following the loss of the latest harvest (or in our case, say, the loss of fishing gear) due to a strong tropical storm, the ultimate outcomes of this event is not merely the impact of the storm and subsequent loss of fishing gear, but rather is the combination of that impact with the consequences of the response put in place by the household (sending the son away). A neighbour in the same community who would have experienced the exact same event (loss of fishing gear due to the same tropical storm) might have decided to respond differently (say by borrowing money). The outcome for this second household will be different – even though exposed to the same initial shock.

3.2. Data collection and statistical analyses

In the four focus countries – Fiji (Pacific), Vietnam and Sri Lanka (Asia) and Ghana (Africa) – small-scale fisheries are known to be an important basis for livelihoods in a large number of coastal

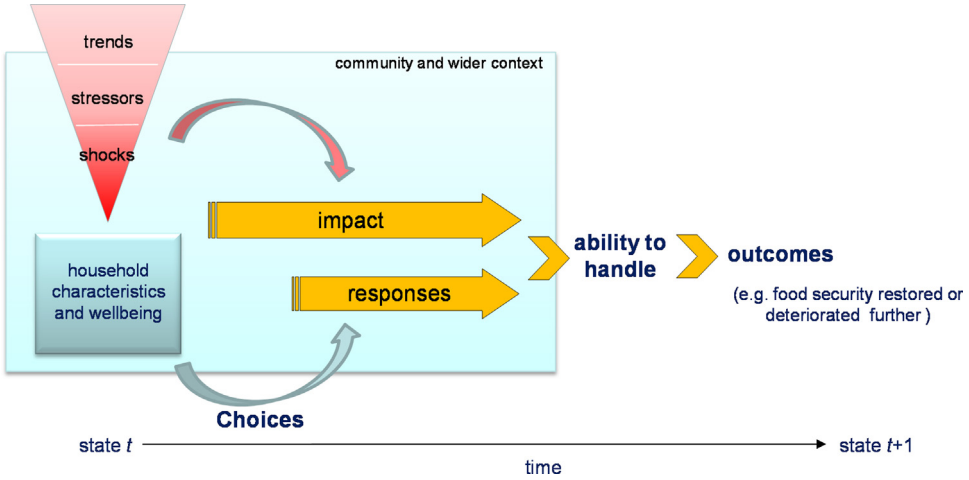

Fig. 1. The analytical framework used for this resilience analysis, made of four components: (i) a shock and stressor inventory; (ii) an household characteristics and wellbeing assessment; (iii) a response typology; and (iv) an outcome analysis where the ultimate outcome is measured in terms of change in household wellbeing (e.g., food security or nutrition –for the justification of this, see Constas et al., 2014b or Béné et al., 2015b). Note that as an analytical tool, this framework is not intended to represent the full suite of processes and feedback loops that are associated with learning.

communities. In each country, two case-study communities were selected based on a combination of criteria including a high dependence on fishing-related activities, familiarity of the research team with the socio-political context of the area, and logistical accessibility (the eight communities being within a 2–6 h drive range from the location of the research team).

In each community the research was first contextualized through two sets of gender-disaggregated focus group discussions (FGDs) conducted with both fishers and non-fishers. The first set of FGDs (May-June 2013) focused on issues of adverse events and responses, while the second (April-May 2014) focused on what people perceived as important for their wellbeing and general quality of life in their communities. This information was then used to design two household questionnaires: one on resilience, and one on quality of life. Within each community, 60 households were then randomly selected, making a total of 480 households across the four countries. The two questionnaires were administered to the same households over two different periods: Aug-Sept 2013 for the resilience questionnaire and July-Aug 2014 for the quality of life questionnaire. The surveys were conducted in local languages by the country research teams and translated back into English at the data entry stage.

3.2.1. Resilience questionnaire

The resilience questionnaire included four sections built around the analytical framework presented in Fig. 1. The first was a household roster where the conventional household demographic (composition of the household, age, gender, education, etc.) and socio-economic (economic activities of the active members) information was recorded. A subsection was included to assess the wealth of households based on a local-specific roster of household assets identified during the initial FGDs, and productive assets (including fishing assets: boats, engine, fishing gear).

The second section of the questionnaire covered the nature of adverse events experienced by the household in the last five years. An initial list of common shocks, stressors, and long-term trends was assembled by the research team based on outcomes of the initial FGDs. In addition, a set of specific events was identified for each of the four countries. Overall the analysis includes therefore some adverse events common to the four countries (for example loss/destruction of fishing gear) but also some particular local (context specific) events. Note that the number of event which have affected the households in the last 5 years (N = 2104) is larger than the initial number of households surveyed (N = 480). Cluster analyses (at the household level) were therefore used whenever necessary.

The third section of the resilience questionnaire covered strategies adopted by households to respond to these different shocks, stressors and trends. For analysis purposes, these strategies were then grouped into 4 major categories: (i) coping strategies; (ii) 'social relation-based' strategies; (iii) 'fishery-specific' strategies; and (iv) 'non-fishery-related' strategies. Each of these main categories was further broken down into specific sub-categories, resulting in a set of 11 possible responses (details provided in Table 1).

The final section of the resilience questionnaire covered resilience outcomes. In the absence of high-frequency panel data (an ideal but rare situation – see Béné et al., 2015b), resilience outcomes were assessed using psychometric techniques (self-reporting evaluation using Likert scale) whereby households were asked to assess the degree of recovery they managed to achieve for each adverse event they had experienced in the past 5 years (see details in Table 2). The self-assessment process was based on 3 distinct questions: (i) self-recovery from past events; (ii) self-recovery compared to the rest of the community, and (iii) community recovery from past events. For each question, respondents selected appropriate answers from a 5 or 6 point Likert scale systems –in line with Krosnick and Fabrigar's (1997) which suggests that 5–7 point-scales are optimal in terms of reliability and validity for measurement surveys. In addition to these 3 questions, a fourth question explored people's *subjective* resilience (see below), which we proposed to assess through respondents' perception of their own ability to handle *future* adverse events.

3.2.2. Quality of life questionnaire

The quality of life questionnaire elicited information on people's perceptions about their quality of life. Questions were structured around an adapted version of the OECD Better Life framework (Boarini et al., 2014). The framework identifies ten

Table 1
Categorisation of types of responses reported by respondents.

Type of responses	Sub-categories
Coping Strategies	• Reduce food consumption of the family
	• Reduce family general expenses
	• Borrow money from friends, relative, money lenders, banks, etc.
	• Sell family assets
Social-relation-based responses	• Develop new collaboration within the community
	• Seek for support from friends and peers
Fishery-related responses	• Change fishing strategies (change fishing gear, targeted species, fishing ground, fishing calendar, etc.)
	• Increase fishing effort (number of days at sea, number of fishing gear, gear efficiency, etc.)
Non-fishery-related strategy	• Migrate (temporary, permanently, one or several members of the family, etc.)
	• Diversification (develop/invest in non-fishery activities)
	• Exit the fishery, start a new job/livelihood

Table 2
List of 4 coded questions used for the Resilience outcome analysis.

1. Recovery from past event:	
With respect to [EVENT], how well do you consider you managed to recover?	Not at all and I don't think I will be able to recover = 1 Not yet fully recovered and it will be difficult/long = 2 Not yet but hope very soon = 3 Have fully recovered –but it was long and painful = 4 Have fully recovered –and it was not too difficult = 5 Have fully recovered and I am better off now = 6
2. Relative recovery from past event:	
With respect to [EVENT], how well do you consider you did, compared to the rest of the community?	Did worse than most of the others = 1 As bad as some people but better than others = 2 Like most of the others = 3 Did better than most of the others = 4 Did better than anyone else = 5
3. Community recovery from past event:	
With respect to [SHOCK NAME], how well do you consider the community recovered:	Not at all and I don't think we will be able to recover = 1 Not yet fully recovered and it will be difficult/long = 2 Not yet but hopefully very soon = 3 Have fully recovered –but it was long and painful = 4 Have fully recovered –and it was not too difficult = 5 Have fully recovered and we are now better off = 6
4. Capacity to handle future event:	
With respect to [EVENT], if it was to happen again in the near future how do you consider you would be able to recover?	Would be worse than last time = 1 As bad as last time = 2 More or less the same than last time = 3 As well as last time = 4? Would do better than last time = 5

domains under two generic dimensions: 'Material wellbeing' and 'Quality of life' (Table 3). For each domain, a series of questions was asked to help households self-assess two components: (i) the level of *importance* for their general wellbeing of different items in these domains (from 'very important' to 'not important at all'); and (ii) the level of *satisfaction* in relation to their personal achievement vis-à-vis these items (from 'very satisfied' to 'very dissatisfied'). The first component (importance) was then used to weight the second (satisfaction) using a technique similar to those developed in the growing literature on Quality of Life indices – see e.g. Camfield and Ruta (2007) McGregor et al. (2009). The resulting combined index represents the level of satisfaction in each of the domains that were considered important by the households for their general wellbeing.

The datasets generated through the two household questionnaires were then pulled together and numerical analyses performed. Statistical tests and model estimations were conducted using Stata© econometric package.

Table 3
Quality of life dimensions and components as used in the analysis.

Dimensions	Components
Material wellbeing	• Income and assets (including fishing assets) • Job and livelihood security • Housing and related infrastructure (toilet, access to tap water, electricity)
Quality of Life	• Education and skills • Health status and access to facilities • Social connections • Social connections in time of crisis • Empowerment and motivation • Empowerment in time of crisis • Meaning and spirituality

Derived from Boarini et al. (2014).

4. Empirical findings and analyses

4.1. Shock analysis

The descriptive adverse event analysis showed that the lives and livelihoods of fishing communities in the four countries are heavily affected by both short-term unpredictable shocks and long-term trends (Fig. 2). In Fiji and Sri Lanka hurricanes and tropical storms (short-term shock) were listed most prominently by the largest number of households, while in Ghana and Vietnam the most frequently listed events were the slow decline in fishery resources. All countries displayed a mix of both short and longer term shocks.

The data indicate that about 50% of the events were considered to be totally or quite 'predictable' while the other 50% were considered 'unpredictable' (with various degree of unpredictability –see Fig. 3**a**). Self-reported levels of severity were characterized by an almost-perfect exponential decline from 'very bad'-the most frequently reported category (57% of the responses across the four countries)- down to "eventually it brought some positive outcomes" (only 0.45% of the responses at the aggregated level) (Fig. 3**b**). This suggests that overall the respondents considered that the events they face have usually quite severe impact on their lives. There does not seem to be any specific correlation between severity and predictability however.

More generally, the shock analysis reveals that households in these communities have faced a non-stop 'barrage' of adverse events (long-term trends, medium term stressors, rapid shocks) characterized by relatively high frequency of occurrence. Annual and daily (continuous) events were the most frequently reported types of events (25% and 22% respectively) (Fig. 3**c**). On average

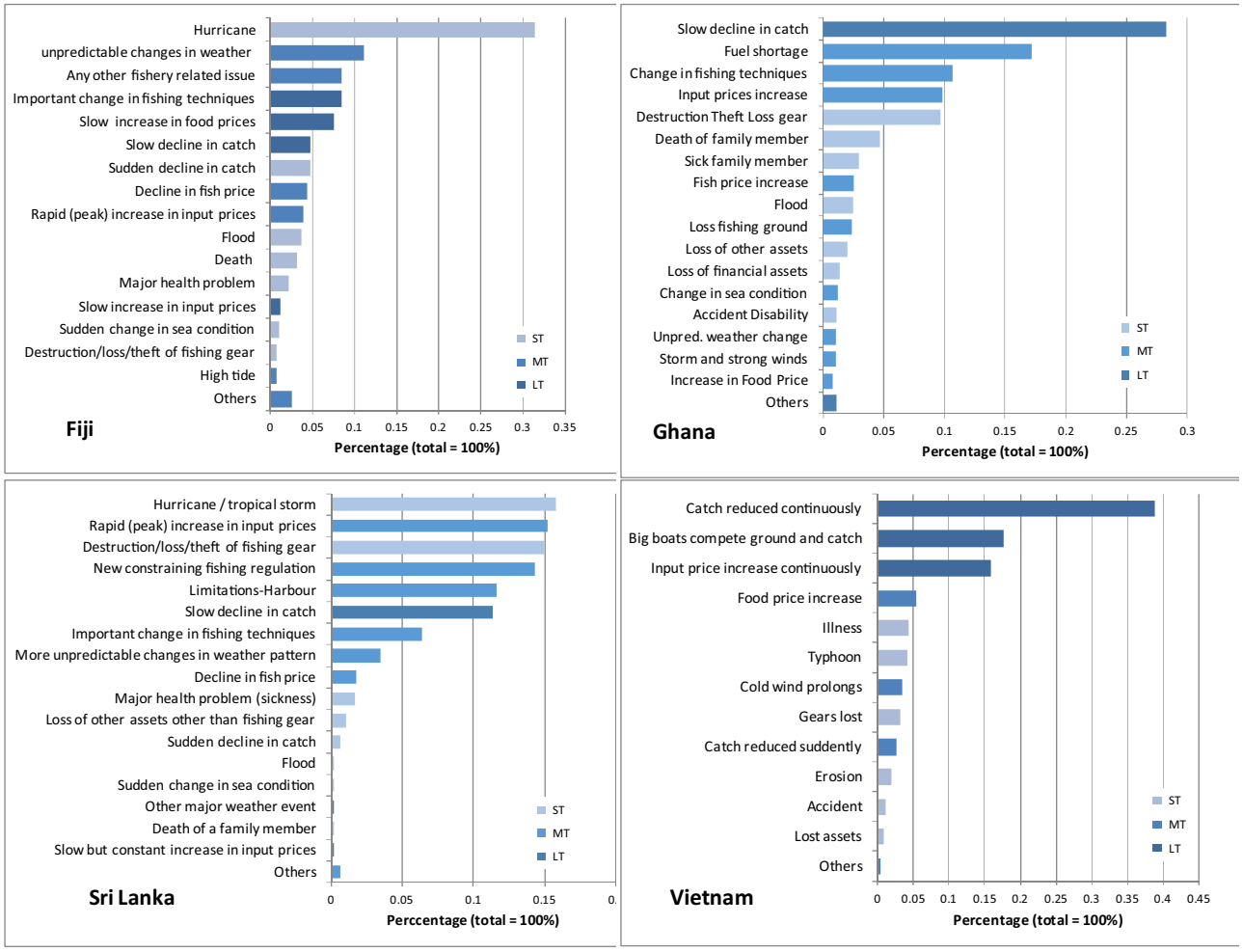

Fig. 2. Adverse event inventory for the four countries. Events have been grouped and colour-coded into three categories: short and unpredictable shocks (ST); (ii) medium-term stressors that last several months and/or are recurrent (MT); and (iii) long-term trends (LT).

when all events are aggregated, households are hit by a new event of some kind every 485 days, that is, every 16 months.

4.2. Household response analysis

The next step was to document and analyse the various types of strategies that households employed in the face of shocks and stressors. In the resilience analysis framework (Fig. 1), this corresponds to the 'response analysis' component.

Fig. 4 presents the event-response matrices for the four country case studies (computed for the ten most cited events per country). The colour codes correspond to the four categories described in Table 1: coping strategies, social-relation based strategies, fishery-related strategies, and non-fishery-related strategies.

The matrices show that coping strategies are the most frequent responses put in place by households. Amongst coping strategies, reduction of food consumption and reduction of general expenses were commonly adopted, while asset selling was notable for being seldom adopted –except in Ghana. Beyond the generic pattern of

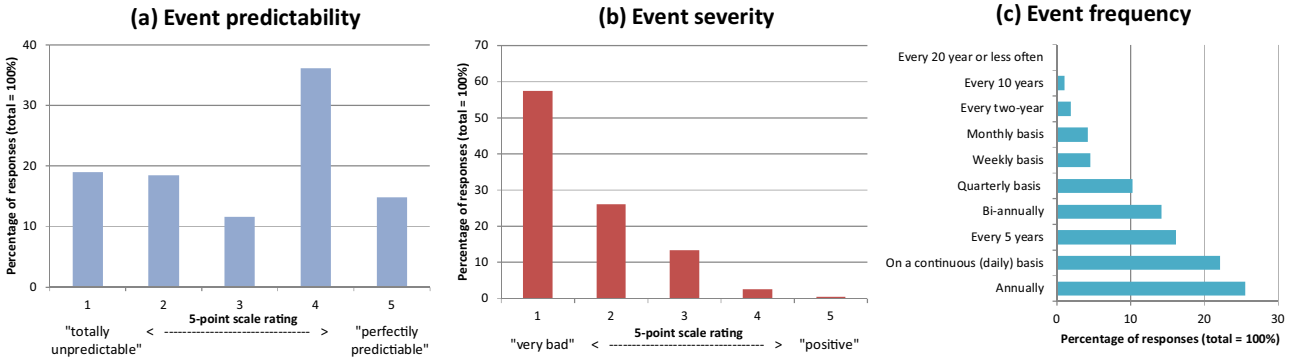

Fig. 3. Characteristics of adverse events as self-reported by the respondents: (a) predictability; (b) severity; (c) frequency, – aggregated across the eight communities.

these coping strategies, a number of other important observations emerge. First, 'non-fishery-related' strategies (diversification, migration and exit of the fishery sector) appear not to be considered by fishers as a way to cope with or respond to adverse events: this group of strategies was the least frequently adopted. Rather, in addition to coping strategies, households rely on a combination of 'fishing-related' and 'social-relation-based' strategies. The balance between these two categories varies: in Fiji the social-relation-based responses (get support, seek new collaboration) appear to be central to how people respond. In Vietnam – but also to a lesser extent in Ghana and Sri Lanka – a large part of the way the households respond is built around technical fishing responses –although social-capital-based responses remain important as well.

A further consistent pattern in our analysis is that the large majority of households do not adopt a single strategy in the face of one particular event but engage instead in a 'portfolio' of responses. On average households engage in 4.6 response per event. This number varies among communities (Table 4) but the observed average values are all greater than 1, confirmed by *t*-tests (not shown).

The third important finding was about wealth. One of our initial interrogations was: Does economic wealth affect the types of strategies that households put in place to respond to particular events? To test this hypothesis, we ranked households in each community by wealth level (using asset holding as a proxy for wealth) and split them into two groups – the bottom 40% (the two lowest quintiles) and the top 40% (the two highest quintiles) – and compared the probabilities of these two groups adopting different responses. The data shows that there was little difference between the two groups (Fig. 5 illustrates this result for Vietnam and Fiji). The same test was also performed on the lowest and highest quintiles (20% poorest and 20% wealthiest of the communities) for the four countries, and shows the same overall pattern: irrespective of assets level, households engage in the same type of responses.

This suggests that in contrary to what we initially expected, wealth does not appear to be a predominant factor in the choice of households' responses: irrespective of whether they are in the top or bottom 40% of the community, households tend to engage in the same types of responses. In fact the main differences occur between countries, or between responses. This last result seems to suggest that in addition to wealth, other local factors, perhaps relating to social convention and norms, seem to be predominant in influencing the types of responses that households adopt.

In relation to this last point, one of the factors which we were specifically interested in exploring was subjective resilience, which we assessed in this research through people's perception about their own ability to handle particular shocks/stressors in the future. One specific question had therefore been included in the resilience component of the questionnaire (cf. Table 2 above – fourth question) to assess households' level of subjective resilience, using a 5-point scale. We used the households' answers to distinguish two groups within each community: the households with subjective resilience above the community's average value (high subjective resilience), and these with subjective resilience below the community's average (low subjective resilience). We then computed the propensities of these two groups to engage in specific responses and statistically tested whether the two groups (high/low subjective resilience levels) display different propensities to engage in different response categories.

Table 4
Average number of responses per event at the community level.

Country	Community	Mean	Std. Err.	[95% Conf. Interval]	
Fiji	A	2.7	0.22	2.32	3.17
	B	2.6	0.07	2.44	2.72
Ghana	C	4.3	0.18	3.89	4.61
	D	3.9	0.16	3.59	4.21
Sri Lanka	E	5.5	0.20	5.14	5.94
	F	7.6	0.26	7.07	8.09
Vietnam	G	3.4	0.12	3.19	3.67
	H	3.5	0.19	3.08	3.83
Total (N = 1868)		4.6	0.05	4.51	4.74

The analysis (top part of Table 5) reveals that the households with lower subjective resilience are more likely to engage in coping strategies and are less likely to adopt non-fishery related strategies (migration, diversification, exiting the fishery) than households with higher subjective resilience (*t*-test $P < 0.0001$ for both tests). The same two groups however are not statistically different in their propensities to engage in social-relation-based strategies (*t*-test $P = 0.60$) and in fishing-related strategies (*t*-test $P = 0.74$).

We further tested the possibility that the observed differences between households were not only the result of differences in subjective resilience, but could be confounded by other socio-economic characteristics. Tests for asset levels, age, and education of the household head were therefore performed, but turned out to be all negative (bottom part of Table 5), adding substantive weight to the finding that level of subjective resilience was an important determinant of response.

Fiji	Reduce expenditures	Get support	Reduce Food	Seek new collaboration	Borrow money	Diversification	Change fishing strategy	Migration	Increase fishing effort	Exit the fishery	Sell assets	Total (N)
%	20.0%	17.3%	14.8%	10.9%	10.0%	9.6%	7.4%	4.3%	4.2%	1.3%	0.2%	973

Ghana	Reduce Food	Reduce expenditures	Borrow money	Change fishing strategy	Get support	Sell assets	Increase fishing effort	Migration	Diversification	Seek new collaboration	Exit the fishery	Total (N)
%	22.0%	21.8%	17.3%	10.5%	10.4%	6.8%	3.9%	3.6%	1.7%	1.1%	1.0%	1990

Sri Lanka	Borrow money	Get support	Reduce expenditures	Reduce Food	Increase fishing effort	Change fishing strategy	Seek new collaboration	Diversification	Exit the fishery	Migration	Sell assets	Total (N)
%	14.3%	13.5%	13.2%	11.3%	10.8%	10.7%	8.4%	6.2%	4.7%	4.7%	2.0%	4794

Vietnam	Reduce expenditures	Borrow money	Reduce Food	Change fishing strategy	Get support	Increase fishing effort	Diversification	Seek new collaboration	Migration	Exit the fishery	Sell assets	Total (N)
%	21.7%	17.5%	15.9%	11.6%	8.0%	6.9%	6.6%	5.7%	3.0%	1.8%	1.1%	1311

coping strategies
(fishing) adaptive-transformative strategy
(social-relation based) adaptive strategy
(non-fishery) adaptive-transformative strategy

Fig. 4. Event-response matrices for the four country case studies. The numbers in the column are percentage of total responses, ranked from the most (left) to the least (right) adopted, and colour-coded using the typology presented in Table 1. Full details are provided in Appendix A.

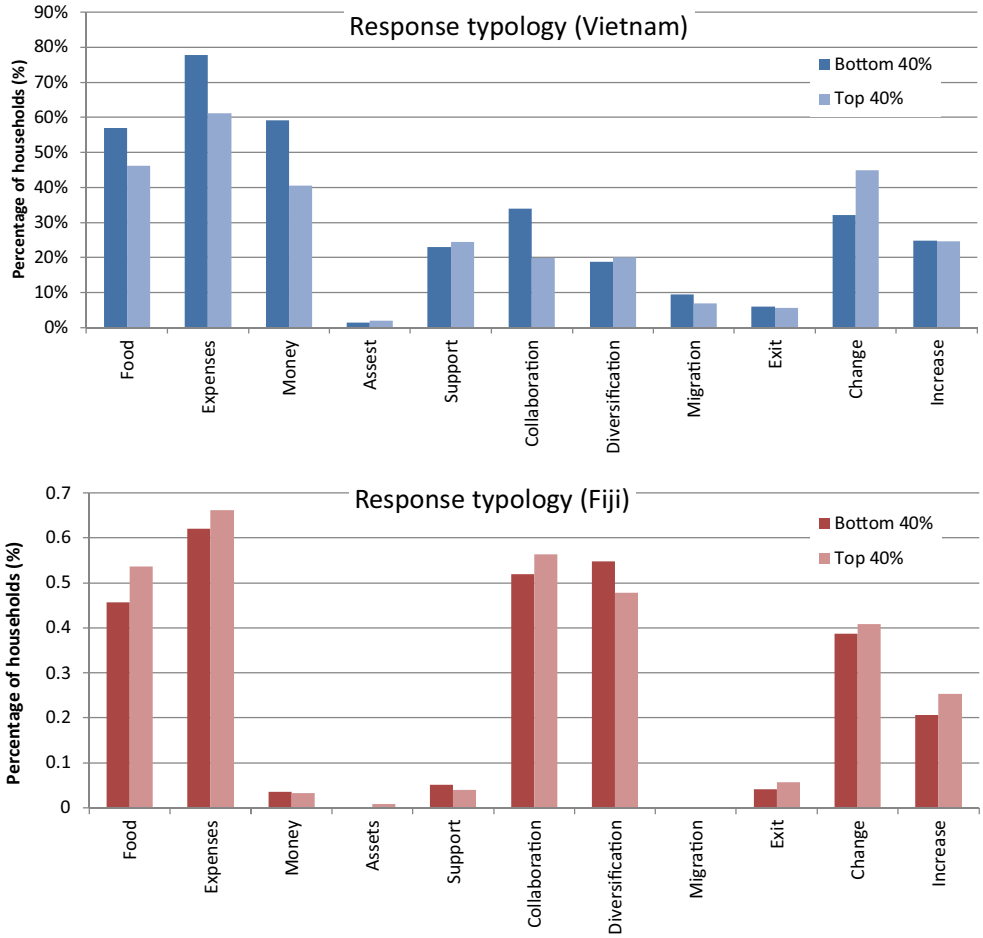

Fig. 5. Comparative analysis of the responses adopted by the bottom (poorest) and top (wealthiest) 40% of the households when affected by the same event – illustration from Vietnam and Fiji. Code of the responses: "Food" = Reduce food consumption; "Expenses" = Reduce family general expenses; "Money" = Borrow money; "Assets" = Sell family assets; "Support" = Seek for support from friends and peers; "Collaboration" = Develop new collaboration within the community; "Diversification" = Invest in non-fishery activities; "Migration" = Temporary, permanently migration one or several members of the family; "Exit" = Exit the fishery, start a new job/livelihood; "Change" = Change fishing strategies; "Increase" = Increase fishing effort.

4.3. Resilience analysis

Resilience outcomes were explored using psychometric techniques where households were asked to self-assess the degree of recovery they managed to achieve for each of the adverse events they had experienced in the past (see details in Table 2). The answers provided by the respondents to the first two questions of the resilience analysis (self-recovery from past event; and self-recovery compared to the rest of the community) were used to create a resilience index (*RI*) computed as the product of the two scores. As a result of the calculation process, RI is an integer varying between 1 and 30, where low values indicate low level of resilience to a specific event while higher values indicate higher levels of resilience.

We then used this resilience index to explore the last remaining working hypothesis of this research, that is that 'social capital is important'- i.e. the (intuitive) idea that households or communities characterized by higher level of social capital are able to draw on social capital to help themselves (and others) in the aftermath of an adverse event. To analyse the resilience outcomes and explore in particular this last hypothesis a three-level mixed effect linear model was run where the resilience index was tested against a series of fixed and random factors used as independent explanatory variables. Because the communities are nested within the countries, a three-level (hierarchical) model was fitted with random intercepts at both country and community-within-country levels. Random coefficients were also accounted for at the country level on the Quality of Life (QoL) factors to reflect country specific effects. More specifically the model was of the form

$$RI_{vc} = \beta_0 + \beta_1 Shock_{vc} + \beta_2 Resp_{vc} + \beta_3 QoL_{vc} + \beta_4 HH_{vc} + \gamma_1 W_c + \gamma_2 Z_{vc} + \varepsilon_{vc}$$

where the subscripts v and c hold for village (community) and country respectively, $Shock_{vc}$ is the covariate matrix for the fixed effect β_1 of the impacts of event e on individual household; $Resp_{vc}$ is the covariate matrix for the fixed effect β_2 of the responses put in places by the household; QoL_e is the covariate matrix for the fixed effect β_3 of the Quality of Life scores recorded for each household; HH_e is the matrix of variables and dummies controlling for household characteristics; W_c is the covariate matrix for the cluster random effect at the country level; and Z_{vc} is the covariate matrix for the cluster random effect at the community level. The details of the different categories of variables included in the model are provided in Table 6.

Results of the model estimations –including details of both fixed and random effect specifications and diagnostic checking- are presented in Table 7. The model highlights a series of important findings. First, the degree of severity of the shock and the disruptive impact on income are the two shock variables that have

Table 5
Top: comparison of propensities to adopt particular types of responses for households characterized by high (N = 224) and low (N = 235) subjective resilience. Bottom: comparison of the two same groups in terms of asset levels, education and age of the household head.

Responses	subjective resilience level	Mean	[95% Conf. Interval]		test result[a]
• Coping strategies	High	1.98	1.840	2.136	t = −4.3037 Pr(|T| > |t|) = 0.000***
	Low	2.45	2.311	2.596	
• Social-relation-based strategies	High	0.83	0.738	0.927	t = −0.5187 Pr(|T| > |t|) = 0.604
	Low	0.86	0.787	0.943	
• Fishing-related strategies	High	0.83	0.732	0.935	t = 0.3267 Pr(|T| > |t|) = 0.744
	Low	0.81	0.715	0.906	
• Non-fishery strategies	High	0.67	0.559	0.794	t = 3.5599 Pr(|T| > |t|) = 0.000***
	Low	0.42	0.341	0.502	
Household characteristics					
• Asset	High	7.68	7.218	8.157	t = 0.8882 Pr(|T| > |t|) = 0.374
	Low	7.39	6.938	7.848	
• Education	High	7.96	7.338	8.599	t = 1.0186 Pr(|T| > |t|) = 0.308
	Low	7.50	6.857	8.147	
• Age	High	46.88	45.377	48.391	t = −0.1332 Pr(|T| > |t|) = 0.894
	Low	47.02	45.570	48.482	

*p < 5%.
**p < 1%.
***p < 1%.
[a] mean difference unpaired *t*-test Ho: Diff = 0; Ha: diff ≠ 0.

a statistically significant impact on the degree to which households felt they were able to recover from these events. To our surprise, the degree of predictability of the events does not appear to have any significant impact on the resilience of households, nor does the type of event (long term trend versus short term shock). Time of occurrence of the event was included in the model to test whether the time-lag since the event influenced people's memory and therefore their self-assessment, but this does not seem to be the case. Finally, events that lead to family and income disruptions have negative impacts on household resilience, but only income disruption appears statistically significant ($P < 0.0001^{***}$).

The type of responses adopted by households was included in the model to test whether the level of resilience of households is effectively influenced by those responses. Amongst the 11 types of responses tested, three have statistically significant signs: engaging in new collaboration (negative sign, $P = 0.001^{**}$); increasing fishing effort (positive; $P < 0.0001^{***}$); and quitting the fishery (negative $P = 0.047^{*}$). The negative correlation found between household resilience and the strategy that consists of forming new collaboration may be difficult to interpret as it can reflect many highly contextual factors. The two others responses and the signs of their correlations (one negative sign for leaving the sector; and one positive sign for increasing fishing effort) are initially disturbing, but eventually not too surprising. Disturbing first because this finding does not lead to the type of long-term behaviours that appeal to policy makers and fishery managers. On the contrary, they would rather see fishing effort reductions and exit strategies more often adopted by fishers, in particular in the context of the current world fishery crisis. Not surprising however, because this result is in line with what one could expect from fisherfolks after an adverse event: in the face of a long-term stress (such as the drop in income following a continuous decline in fish catch), or a sudden need for cash/revenues (as a consequence of, e.g., destruction of fishing gear induced by bad weather, or the need to pay health bills), fishers are often observed to alter their fishing activities to make up for these events, usually by changing/adjusting their fishing strategy (e.g. switching between targeted species and/or fishing gear) or increasing their fishing effort (e.g. investing in more efficient fishing gear, increasing the quantity of gear used, or increasing the number of days at sea) in an attempt to generate more cash. In that context it is not surprising that the majority of fishing households interviewed in this research consider that their ability to 'bounce back' following an adverse event was enhanced when they increase their fishing effort. Additionally, given what we know about their strong sense of identity (Kelty and Kelty, 2011; Trimble and Johnson, 2013) but also the importance of peer-pressure and reputation (see e.g. Béné and Tewfik, 2001), quitting the fishery would certainly be perceived by many fishers as a failure –thus the negative correlation between (perceived) resilience and leaving the sector.

The next category of variables which was investigated through the model was the Quality of Life indicators (see Table 3 for a recall). A reasonable hypothesis –although not explicitly formulated in the 'working hypotheses' section above- is that some of these QoL indices may have a positive effect on the ability of households to handle and recover from adverse events. One can indeed assume that households satisfied in many of the dimensions of wellbeing which they considers important (such as, say, access to health services or to public infrastructure) may feel better equipped to react/respond to any particular event, than

Table 6
List of explanatory variables included in the resilience outcome regression model.[a]

Short name	Full name/definition	Comment
shock characteristics		
sev_event	severity of the event – ordinal variable coded [1–5]	1 = most severe; 5 = less severe
cat_event	category of event – ordinal variable coded [1–3]	1 = LT change; 2 = MT stressor; 3 = ST shock
predict	predictability – ordinal variable coded [1–5]	1 = totally unpredictable; 5 = totally predictable
time	event occurrence – integer variable	number of year since event occurrence
loss_asset	household losses induced by the event	value of assets losses due to event impact
inc_disrup	income disruption induced by the event	dummy; 1 = yes
fam_disrup	family disruption induced by the event	dummy; 1 = yes
types of response		
reduc_food	food consumption reduction	dummy; 1 = yes
reduc_exp	expense reduction	dummy; 1 = yes
borrow	money borrowing	dummy; 1 = yes
sell_asset	distress selling assets	dummy; 1 = yes
support	seek for support	dummy; 1 = yes
new_coll	develop new collaboration	dummy; 1 = yes
fish_strat	change fishing strategy	dummy; 1 = yes
fish_eff	increase fishing effort	dummy; 1 = yes
diversif	non fisher diversification	dummy; 1 = yes
exit_fish	exit the fishery sector	dummy; 1 = yes
migrat	migrate	dummy; 1 = yes
quality of life indices		
index_incom	income index – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
index_livelih	livelihood index – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
index_housing	housing and infrastructure index – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
index_educ	education index – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
index_soc	social capital index – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
index_health	health index – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
ind_emp	empowerment index – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
index_soc_cris	social capital index in time of crisis	–6 = very poor; +6 = very strong
index_emp_cris	empowerment index in time of crisis	–6 = very poor; +6 = very strong
index_spirit	index of spirituality – ordinal variable coded [-6 +6]	–6 = very poor; +6 = very strong
household characteristics		
HH head sex	sex of household head	dummy; 1 = female
HH head age	age of household head	age in years
HH head educ	level of education of the household head	0 = no education; 20 = post-graduate level
HH size	size of household	number of members (not adjusted for age)
log_asset	household assets (log-transformed)	value of household assets (proxy for wealth level)
community resilience		
comm_recov	level of recovery of the community – ordinal variable coded [1–5]	1 = poor recovery; 5 = good recovery
model		
const	constant	model intercept

[a] Fitting a three level model requires two random-effect equations, one for level three (country) and one for level two (community), with $i = 1 \ldots n_{vc}$ first level of observation (households) nested within $k = 1, \ldots, 8$ s level cluster (community), nested within $j = 1, \ldots, 4$ third level cluster (country).

households that are less satisfied. Whether this is effectively the case and, if so, which dimension(s) of these quality of life is/are important, was however totally open.

The results indicate that the 'story' is more complex and less clear-cut than anticipated. First, out of the ten QoL indices, three display negative correlations, suggesting that QoL indices are not systematically positively correlated with resilience. Second, none of the four QoL indices which were considered to capture some household's social capital dimensions (that is: (i) social capital; (ii) social capital in time of crisis; (iii) empowerment; and (iv) empowerment in time of crisis) were significantly correlated with household resilience. A closer look even reveals that the coefficient of the QoL 'social capital' index is negative and just above the 5% significance threshold ($t = -1.92$, $P = 0.055$). These results therefore call for some reconsiderations of our hypothesis. We shall come back to this point in the discussion.

Among the household characteristics, age appears to be negatively correlated and wealth positively correlated with resilience. Both these results make intuitive sense. If resilience is somehow linked to the ability of people not simply to resist but also to adapt (or to transform), being young may indeed be an advantage. Younger individuals are expected to be characterized by less social, familial and financial commitments than older households (*ceteris paribus*), a capacity which can be decisive in the context of adaptation/transformation to change. The model also shows that better-off households are associated with higher levels of resilience than poorer households but that size of the household, and education and sex of the head do not appear to influence the level of household resilience.

The final variable included in the model was the community recovery level as scored by the households (third question in Table 2). The model shows that this variable is strongly correlated with household resilience (in particular poor recovery scores at the community level (comm_recov1 and 2) are correlated with poor household resilience, while good community recovery scores (comm_recov4, 5 and 6) are positively correlated with household higher resilience (all with a very high significance level, $P < 0.0001^{***}$). A 'resilience-enthusiastic' interpretation of this result

would be that these correlations confirm the multi-level nature of resilience (at individual, household, community) and suggest that these different levels are complementing or reinforcing each other. One could even think of resilience at the community level being an "emergent property" of resilience at the household level. An alternative and simpler interpretation would be that events with a lower severity are easily recovered from by most members of the community –thus the correlation between household and community levels- while more severe events affect everyone more deeply.

In line with this last result, a final analysis was performed where community level indices were computed for the six QoL indices for which random coefficients had been identified in the mixed effect model: income; livelihood; housing; social capital; social capital in time of crisis; empowerment; empowerment in time of crisis. The idea was to investigate whether some degree of correlation could be identified from the field data between community resilience and these QoL indices. For this, we averaged the six household QoL scores at the community level and tested for correlation degrees with the resilience index also computed at the community level (the resilience index was computed at the

Table 7
Resilience outcome analysis[a,b]; three-level mixed effect model. Variables detailed in Table 6.

Dependent variable:	Resilience index				Number of obs	695
Log restricted-likelihood: −1715.18					Wald chi^2(45)	593.14
					Prob > chi^2	0.000
Fixed-effects parameters[c]	Coef.	Std. Err.	t	P > |t|	[95% Conf. Interval]	
shock characteristics						
sev_event1	−0.81	0.50	−1.64	0.101	−1.787	0.158
sev_event2	−0.82	0.48	−1.70	0.089	−1.763	0.124
sev_event4	3.19	0.76	4.21	0.000***	1.705	4.670
sev_event5	1.90	2.18	0.87	0.382	−2.366	6.174
cat_event1	0.24	0.31	0.78	0.436	−0.365	0.846
cat_event3	0.29	0.39	0.74	0.460	−0.481	1.065
predict1	−0.13	0.44	−0.30	0.762	−0.987	0.723
predict3	0.70	0.52	1.35	0.176	−0.312	1.708
predict4	−0.27	0.34	−0.80	0.426	−0.939	0.396
predict5	0.11	0.44	0.24	0.812	−0.766	0.978
time	−0.11	0.08	−1.29	0.198	−0.273	0.056
loss_asset	0.36	0.35	1.02	0.307	−0.331	1.054
inc_disrup	−1.88	0.47	−4.02	0.000***	−2.791	−0.961
fam_disrup	−0.45	0.35	−1.27	0.205	−1.135	0.243
types of response						
reduc_food	−0.01	0.35	−0.03	0.974	−0.704	0.681
reduc_exp	−0.09	0.44	−0.21	0.836	−0.951	0.769
borrow	0.11	0.32	0.35	0.726	−0.514	0.738
sell_asset	−0.51	0.36	−1.45	0.148	−1.212	0.183
support	0.40	0.31	1.30	0.192	−0.202	1.006
new_coll	−0.96	0.30	−3.22	0.001**	−1.551	−0.378
fish_strat	−0.42	0.29	−1.45	0.148	−0.997	0.151
fish_eff	1.34	0.34	3.98	0.000***	0.678	1.994
diversif	−0.16	0.30	−0.53	0.595	−0.748	0.428
exit_fish	−0.77	0.39	−1.99	0.047*	−1.535	−0.011
migrat	0.37	0.32	1.16	0.239	−0.247	0.992
quality of life indices						
index_incom	0.35	0.27	1.30	0.194	−0.177	0.874
index_livelih	−0.29	0.29	−1.00	0.315	−0.863	0.278
index_health	0.11	0.11	0.96	0.338	−0.111	0.324
index_housing	0.10	0.07	1.39	0.164	−0.040	0.238
index_soc	−0.48	0.25	−1.92	0.055	−0.960	0.009
index_soc_cris	0.08	0.10	0.81	0.416	−0.112	0.270
index_emp	0.28	0.43	0.64	0.520	−0.565	1.118
index_emp_cris	−0.01	0.10	−0.10	0.922	−0.216	0.195
index_educ	0.09	0.12	0.71	0.475	−0.149	0.319
index_spirit	0.12	0.06	2.05	0.040*	0.005	0.232
household characteristics						
HH head sex	0.51	0.63	0.81	0.416	−0.719	1.740
HH head age	−0.04	0.01	−3.19	0.001**	−0.061	−0.015
HH head educ	0.01	0.03	0.53	0.598	−0.039	0.067
HH size	−0.01	0.06	−0.20	0.838	−0.137	0.111
log_asset	1.87	0.42	4.42	0.000***	1.042	2.704
community resilience						
comm_recov1	−3.31	0.45	−7.40	0.000***	−4.182	−2.431
comm_recov2	−1.86	0.31	−6.00	0.000***	−2.465	−1.251
comm_recov4	2.29	0.57	4.02	0.000***	1.170	3.400
comm_recov5	4.43	0.66	6.75	0.000***	3.147	5.721
comm_recov6	8.89	1.07	8.31	0.000***	6.798	10.992
model						
const	219.8	168.7	1.30	0.193	−110.89	550.63

Table 7 (*Continued*)

Random-effects parameters	St. Dev	Std. Err.	[95% Conf. Interval]	
country level				
index_incom	0.43	0.24	0.146	1.266
index_livelih	0.51	0.27	0.175	1.464
index_housing	0.13	0.13	0.018	0.962
index_soc	0.39	0.24	0.119	1.303
index_soc_cris	0.78	0.38	0.300	2.009
index_educ	0.15	0.13	0.028	0.834
const	0.90	0.67	0.209	3.861
community level				
const	0.32	0.26	0.066	1.534
residuals	2.77	0.08	2.617	2.923
LR test vs. linear regression	$chi^2(7)$ =	39.16	Prob > chi^2 = 0.000	

* $p < 5\%$.
** $p < 1\%$.
*** $p < 1‰$.
[a] Fitting a three level model requires two random-effect equations, one for level three (country) and one for level two (community), with $i = 1 \ldots n_{vc}$ first level of observation (households) nested within $k = 1, \ldots, 8$ second level cluster (community), nested within $j = 1, \ldots, 4$ third level cluster (country).
[b] The likelihood-ratio (LR) test comparing the nested mixed-effects model with the corresponding fixed effect model confirms the appropriate use of the mixed effect model ($chi^2(7) = 39.16$; Prob > $chi^2 = 0.000$) and the Wald test confirms that the independent variables are valid predictors (Wald $chi^2(45) = 594.14$; Prob > $chi^2 = 0.000$). A specification test performed on the fixed effect model using a Pregibon's goodness-of-link test shows good results ($t = 0.77$; $P > |t| = 0.439$).
[c] The dummy variables sev_event3, cat_event2, predict2, and comm_recov3 were omitted from the fixed effect component for estimation purpose.

community level in the same way than the QoL indices, that is, by averaging the scores obtained at the individual household level). The best correlation was obtained with the QoL index of social capital in time of crisis ($R^2 = 0.77$, $F = 0.004$) –see Fig. 6- suggesting that communities with higher social capital in time of crisis are also characterized by higher level of resilience.

5. Discussion

Resilience has been increasingly recognized as a potentially useful concept to help practitioners, academics and policy-makers better understand the links between shocks, response and longer-term development outcomes (Constas et al., 2014a; Béné et al., 2014). Incorporating resilience alongside vulnerability analysis can contribute an essential element to societal ability to better prepare for future shocks and stressors. This paper argues that improving our understanding of what contributes to, or constitutes, people's resilience requires not only the development and field-testing of robust and measurable indices (Béné, 2013; Constas et al., 2014b), but also a better insight into the social factors –including knowledge, perceptions and motivations- that influence and affect individual and collective capacity to respond to shocks and stressors.

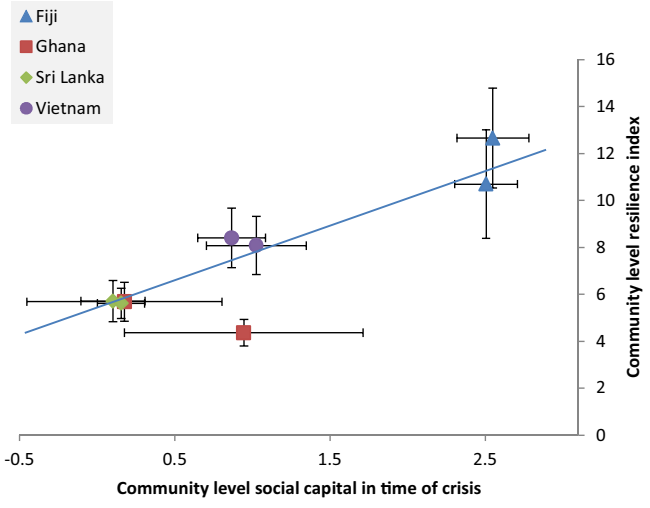

Fig. 6. Correlation between social capital in time of crisis and resilience index across the eight communities. The straight line represents the linear relation ($R^2 = 0.77$, $F = 0.004$) and the bars are 95% confidence intervals for each community.

Our analysis conducted in eight fishery-dependent communities from Fiji, Ghana, Sri Lanka and Vietnam reveals a series of notable results in relation to these questions. In considering these outcomes, it is important to first take stock of potential limitations, pitfalls or biases in the study methodology. Given the nature of the findings, two potential issues require further consideration. First is the question of how representative our sampling methodology was. It could be argued for instance that the observed low adoption rates of non-fishery strategies– and in particular the low score of the 'exiting the fishery' – was driven by our sampling method underrepresenting these groups as those who had effectively left the fishery were not included in the sample.

The FGDs that preceded the household survey specifically addressed this issue. In Sri Lanka for instance, the opening question prompted participants (both men and women) to discuss whether "fishers in their community had ever left fisheries due to their inability to cope with adverse events". The answer was that it generally does not happen, with the notable exception of some young fishers who attempted to migrate to Australia through illegal means. If it occurred, exiting the fishery was said to be temporary: "they may leave the village or fishing, but will come back when the situation is favourable". In Vietnam, the sampling was specifically designed to cover both fishers and ex-fishers in proportions represented in the community. As a result, 9 ex-fishers were included in the sample. Overall therefore, although we were unable to conceive of a completely representative sampling design (in the statistical sense), the parallel information that was collected in the FGDs and the individual households converge to suggest that exiting the fishery was not an option envisaged by the members of these different communities –and consequently that our sampling was not too severely biased.

The second potential limitation in our methodology relates to the way the level of resilience of the households was assessed. While psychometric measurements are reliable and their results replicable and testable when correctly implemented (Vigderhous, 1977), one could fear that their use in the specific case of resilience measurement could be subject to the effect of adaptive preference, that is, the deliberate or reflexive process by which people adjust their expectations and aspirations when trying to cope with deterioration in living conditions (see, e.g. Nussbaum, 2001; Teschl and Comim, 2005). In our case, this means that households undergoing a degree of adaptive preference could have over-estimated their ability to recover. Although this risk is present, we tried to mitigate (or to reduce) it by introducing a qualifying element in each of the coded answers of the resilience questionnaire, so that respondents would have to associate the first part of their answer "I have fully recovered" with a particular 'frame of reference' or qualifier (e.g. "and it was not too difficult"). This frame determined how they comprehend the questions being asked, and reduced the risk of the respondent simply relying on emotional elements to answer these questions.

Keeping in mind these potential limitations, we now turn to what we consider the most notable results of this research. First is the 'cumulative and continuous effect' of shocks and stressors, whereby the impacts and disturbance of sequential shocks, stressors and trends during the last five years combine and coalesce to create a constant, non-stop stress. We saw that the nature and the source of events that were identified by the respondents in the four countries are all highly varied and composite, and reveal no specific clear pattern. The events are a combination of idiosyncratic and covariant, sudden shocks and long-term continuous trends. Some are predictable while others are totally unexpected. All affect households simultaneously and on an almost continuous basis. The data suggests in particular that on average households are hit by a new event every 16 months.

This result calls into questions the framework generally used to conduct shock or vulnerability assessment. Often the approach has been to disaggregate the problems people face, and focus on single threats, such as e.g. flood or increase in food prices, in order to develop a clearer understanding of the impact of these particular shocks and the ways people respond to them. This approach has been challenged however by a growing number of scholars who argue that the reality households face on a daily basis is not linear and mono-dimensional (O'Brien and Leichenko, 2000; Eriksen and Silva, 2009; Quinn et al., 2011; McGregor 2011). Instead, they argue, risks and vulnerability are often the product of multiple stressors (Turner et al., 2003; O'Brien et al., 2009) where social, economic, political, and biophysical factors interact, combine and reinforce each other to create a complex and dynamic multi-stressor, multi-shock environment (Reid and Vogel, 2006; Adger, 2006). Our results corroborate this new interpretation.

In line with this, our analysis also shows that most households engage in a suite of responses to a given shock. On average households adopted more than 4 types of responses to a particular event. This last result does not simply imply a rethinking of the way shock or vulnerability assessments are conceptualized and conducted –see e.g. Turner et al. (2003) or Leichenko and O'Brien (2008). It also demonstrates that the mental model (shock –> response –> recovery) which is widely accepted in the resilience literature is too simplistic, and possibly misleading, in the sense that a state of (full) recovery may not exist. This is at least what was observed for the households included in our research: these households did not seem to have the chance or the time to fully recover from one particular event before being affected by the next. Instead they were caught in what we could characterize as "a constant state of incomplete recovering" from new shocks and stressors as illustrated in Fig. 7.

The next entry point in this discussion is wealth. Our mixed effect model (Table 7) shows that wealth was positively correlated with household resilience. Wealth has been identified in the literature as a key factor in strengthening the resilience of households (Prowse and Scott, 2008; WFP, 2013). Analysis of rural Ethiopian households hit by drought for instance showed that while better-off households could sell livestock to smooth consumption, the poorer often tried to hold on to their livestock at the expense of food consumption to preserve their options for rebuilding herds. The same study also shows that in the aftermath of the hurricane Mitch in Honduras the relatively wealthy households were able to rebuild their lost assets faster than the poorest households for whom the effects of the hurricane were of longer duration and felt much more acutely (Carter et al., 2007). In

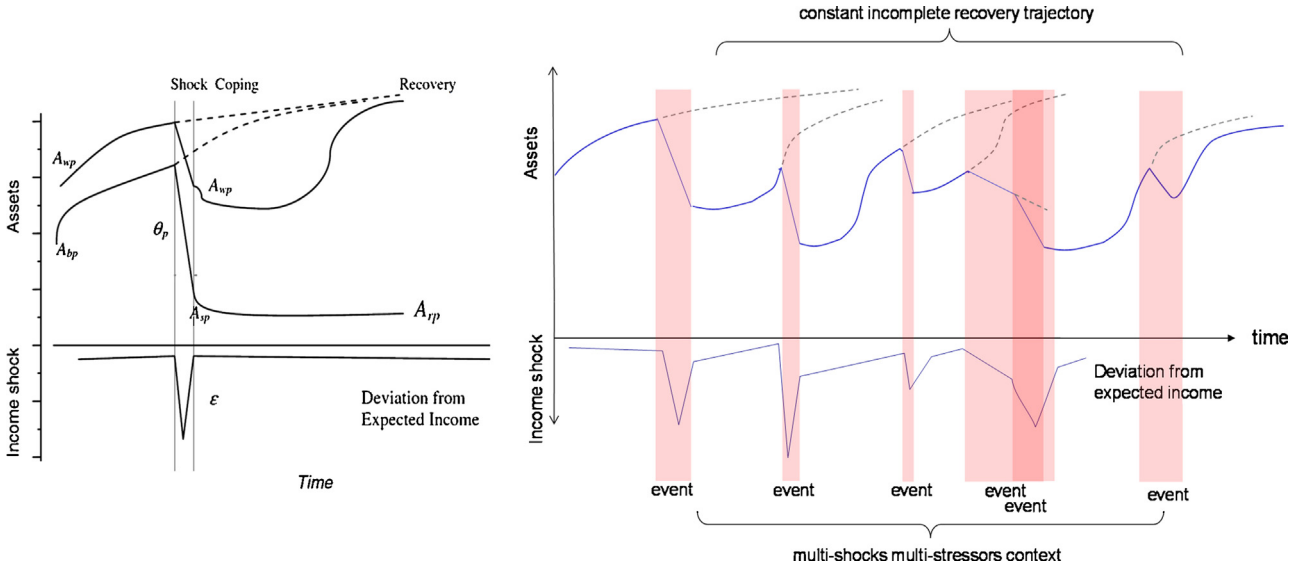

Fig. 7. Left: Current conceptualisation of resilience: shock –> response –> recovery as presented in the literature [here redrawn from Carter et al., 2007]; Right: actual situation where the multi-stressor multi-shock environment induces that households are in a trajectory of continual and incomplete recovery. Not represented here are the multi-response strategies put in place by households to respond to these adverse events.

the same vein, Mills et al. (2011) showed that while wealthiest households among shrimp farmers in Aceh Province, Indonesia experienced the greatest losses due to the 2004 Indian Ocean tsunami, they were also the first to recover.

Several possible foundations for this link between wealth/assets and increased resilience can be hypothesized. Firstly, ability to respond – or even to anticipate – the effect of an adverse event often has an investment cost, which more assets and higher income may help to cover. Also, assets that are easily liquidated and are not vital to daily household existence in essence function as a form of insurance. Another possible causal pathway rests on the idea that poorer households have, at least in some circumstances, less adaptive/transformative capacity because they are more risk-averse (Dercon, 1996). Higher income (in cash or food) could raise risk horizons, opening up innovation space. Adaptive/transformative capacity would thus be improved through a link between assets (and livelihood outcomes, or income) and innovation. Alternatively better-off households may be able to bounce back better or more rapidly not because of their level of assets or income *per se*, but because of the indirect consequences of improved income/assets – e.g. more travel and exposure to ideas and information, better social status and a more influential voice in the community, or even more self-confidence.

Beyond the clear link to outcome, the response analysis reveals however that wealth was not a predominant factor in influencing the households' choice of responses to adverse events: irrespective of whether they are in the top or bottom 40%, households in the same community tend to engage in the same types of responses. This result illustrates the importance of distinguishing between two steps in the resilience process: the choice of responses by the households, and their capacity to recover. While we hypothesized that the second (capacity to recover) was a direct result of the first (the type of responses) the analysis failed to demonstrate this link empirically. Our results suggest that the factors that influence the choice of responses are not necessarily the same as those which determine the success (or the speed) of the recovery phase.

It could be argued, however, that the ultimate impact of a resilience intervention should not be measured in term of the speed at which people or households get back to their original level of income/assets (especially if this level of wealth is strongly correlated to a highly vulnerable livelihood strategy) but rather by the *types of adequate responses* put in place by the households in the face of adverse events. In our case, an underlying motivation behind this research was to understand some of the drivers of the current "world fishery crisis" – broadly defined as a systematic overinvestment in fishery activity worldwide despite global declines in resources. We found that increasing fishing effort was the only strategy that was (statistically) positively related to successful recovery –at least across the eight communities included in this analysis. Obviously many would argue that this reflects a rather short-term maladaptive response by the households that may eventually lead to the total collapse of the system. Yet, in situations where local fish stocks are perhaps well managed or under relatively low fishing pressure, this represents a logical deployment of existing capital (skills and physical assets) to recover from a shock. Clearly, in order to provide policy makers with relevant advice on building resilience, a better understanding is required of factors that influence people's choices of recovery strategies.

In this context the analysis of subjective resilience presented earlier may be seen as a critical element in this discussion. The analysis shows that, in these fishing communities, higher subjective resilience was associated with a lower propensity to engage in coping strategies (cf. Table 5). This characteristic is certainly a feature which development practitioners or policy makers would like to reinforce, since these coping strategies (reducing expenses or food consumption, borrowing money, or selling assets) are generally recognized to be detrimental in the long-term (Roncoli et al., 2001). The same analysis (Table 5) also revealed that households with high subjective resilience are also more likely to engage in non-fishery adaptive/transformative strategies. Set in the context of the 'world fishery crisis', these non-fishery adaptive/transformative strategies, which help households and communities to move away from reliance on fishing, would certainly be viewed as highly desirable by many. Overall therefore strengthening the perception that people in these fishing communities have of their own ability to handle future adverse events would likely lead to positive outcomes in terms of choice of responses.

More generally these results are important because they address directly our starting hypothesis that resilience does not simply reflect the effects of tangible factors (such as income or, say, level of education), but also has more subjective dimensions. Our analysis confirms the relevance of this assumption, as it shows that people's perception about their own ability to handle adverse events affects the type of response(s) they adopt. To some extent this finding should not come as a surprise. Behavioural psychology and social sciences have long demonstrated that decisions are often (if not always) based on the perception that people have about reality, not on that reality *per se* (Bandura, 1977; Jackson, 2005). In the context of climate change, Wolf and her colleagues for instance showed how the low perception of heat wave risks amongst elderly people in UK limits their ability to engage in adequate response (Wolf et al., 2010). More generally O'Riordan and Jordan (1999) highlight how individuals' preferences closely reflect the views they have of 'their' world –and how in this context cultural theory is a useful tool in exploring these processes –see also Leiserowitz et al. (2006). In other words, as Adger et al. (2009 point out, people's decisions and actions in relation to risk are "socially constructed, subjective and mutable" and shaped in part by deeply-embedded cultural and societal norms and values. Some of these processes operate at the individual level; others at the 'higher' community level. So far, however, a large majority of the literature that discusses those questions has focused on vulnerability and risk and on how different levels of risk perception lead to different responses. What this paper demonstrates is that this discussion needs to be extended to resilience. Resilience, like vulnerability, is socially constructed, endogenous to individual and groups (households, communities), and hence contingent on knowledge, attitudes to risk, culture and subjectivity.

Another important finding of this research is the recognition that assets are not in themselves sufficient to ensure resilience. Rather, to a large extent, successful coping, adaptation or transformation depends also on the capacity of individuals, communities and societies to coordinate decision-making, to act collectively, foster innovation and experimentation, and exploit new opportunities. All those processes assume or rely on strong social fabric and social capital. In that context the importance of social capital emerged at two different places in this analysis.

First in a positive way, in the resilience analysis where the computation of the 'social capital in time of crisis' index revealed a very strong positive correlation with resilience at the community level (cf. Fig. 6). These findings support other recent empirical work that highlights the positive influence of social capital on the capacity of communities or societies to handle and recover from disasters, shocks or changes. Drawing on the experiences of the Tokyo 1923 and Kobe 1995 earthquakes, the Dec 2004 tsunami, and hurricane Katrina in New Orleans in 2005, Aldrich (2010) found that communities with robust social networks were better able to coordinate recovery in the immediate aftermath of the disasters. Consequently they were able to minimize the migration of people and valuable resources out of the area in the medium-term, thus

facilitating the longer-term full recovery. Beyond this particular example in relation to disasters (see also Nakagawa and Shaw, 2004; ARC, 2012; Meyer, 2013), scholars have long highlighted the importance of good leadership, broad-based collective action, and community cohesion in relation to uncertainty and change (Boyd et al., 2008; Duit et al., 2010; Schwarz et al., 2011). Social capital also plays an important role in individual, household, and community risk-smoothing and risk-sharing practices (Fafchamps and Lund, 2003; Hoddinott et al., 2009) and has been identified as a vital component of adaptive capacity (Adger, 2003). In their recent review of community-based risk management, Bhattamishra and Barrett (2010) identified several different risk-management functions such as mutual insurance, insurance for major life events, savings and credit facilities, social assistance facilities, and public goods and services. Within these functions and groups, a diversity of arrangements exists, from those with more formal codified rules to informal organizations that depend on social enforcement mechanisms. All these, however, are based upon bonds of trust and interpersonal relationships. The results presented in this paper seem to confirm these findings but recast them within a wider framework that goes beyond risk management and make an explicit link to resilience.

Yet, the absence of any (positive) statistical correlation between the key social capital indices included in the mixed effect model (Table 7) and household resilience is puzzling. If social capital was having such positive effect on household resilience, we would expect this positive impact to appear more clearly in the correlations analysis (in fact as pointed out earlier in this paper, the mixed effect model even reveals that the QoL index on social capital displays a nearly significant negative correlation with the household resilience index). Some degree of moderation/caution in interpreting these results seems therefore required.

The importance of social capital was also emphasized in the response analysis where we found that social relation-based strategies (getting support and seeking new collaboration) were central components in people's response strategies, especially in Fiji, but also in Sri Lanka and in Vietnam (see Fig. 4). Although many would interpret the prominence of these types of strategies as evidence of the positive role of reciprocity and social cohesion in building resilience, the existing literature suggests some caution. Indeed while social cohesion, mechanisms of reciprocity, 'positive' social norms, strong social fabric, or capacity for collective actions are often considered as 'good things' (Duit et al., 2010; ARC, 2012; Bernier and Meinzen-Dick, 2014), in-depth empirical analyses have also shown that these bounding social relations may not always be so positive (e.g. McGregor, 1994; Putzel, 1997; Wood, 2003; Cleaver, 2005). Pain and Levine (2012), reflecting on the role of social capital in the context of disaster and humanitarian interventions, remark "Where there is (. . .) an environment of acute risk and uncertainty, households have to seek security and welfare through informal means. This informal security regime is frequently characterized by pervasive and deep patron–client relations marked by strong hierarchies and inequalities of power" (Pain and Levine, 2012). As a consequence the final outcome of the adoption of these 'social-relation-based' strategies cannot be assumed to be positive, simply based on the frequency of adoption. Further analysis is required.

6. Conclusion

This paper started with a question: "Is resilience socially constructed?" and subsequently revisited and assessed empirically some of the assumptions which increasingly underlie the literature, such as the importance of assets, or the role of individual and collective social capitals, in building resilience. It also explored the idea that resilience is not simply reflecting the mechanistic effects of quantifiable factors such as level of education, or even less quantifiable processes such as people's ability to engage in particular types of responses, but is also determined by more subjective dimensions related to the perception that people have about their own ability to cope, adapt or transform. In parallel the paper revisited and assessed empirically some of the assumptions which underlie the resilience literature, such as the importance of wealth or the role of individual and collective social capitals.

Our findings confirm that wealth is an important factor in the recovery process of households affected by shocks and stressors but challenge the idea that within communities, assets are a systematic differentiator in people's response to adverse events. These findings stress the importance of distinguishing between response and recovery.

Our results also call for caution in making assumptions about the role of social capital in building resilience, and stress a need to resist the temptation to join too rapidly the current narratives/models proposed in the literature. Further carefully targeted empirical research is needed to reach a better understanding about the nature and role of different forms of social capital and the conditions under which these can contribute effectively/positively to building people's resilience at different levels.

Finally, although these results are derived from only eight communities in four countries and, as such, don't have any pretention to be universal, the variety of cultural and social environments encountered in these four countries was rich and diversified enough for the conclusions to be reasonably robust and considered as applicable beyond a one-case-study context only. Besides, the field-testing and demonstrated applicability of the framework and methods in these quite diverse environments suggest that both framework and methods could certainly be applied to other locations, situations and socio-economic groups, and as such help exploring important new areas of research in relation to the social and subjective dimensions of resilience.

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Appendix A.

Details of the events-responses matrices for the four country case studies. The first column on the left hand side is the list of specific events (short-term short, medium-term stressors, long-term trends) reported by the households (these correspond to the results presented in Fig. 2 in the text – only the 10 most cited events per country are presented here). The rest of the matrices are the frequencies of the different strategies reported by the households, ranked from the most (left) to the least (right) adopted.

Event type (Fiji)	Reduce expenditures	Get support	Reduce Food	Seek new collaboration	Borrow money	Diversification	Change fishing strategy	Migration	Increase fishing effort	Exit the fishery	Sell assets	**Total**
Others (aggregated)	16	20	3	16	16	12	7	9	8	4	0	111
Flood	2	5		2	7	10	7	1	1	1		36
Rapid (peak) increase in input prices	11	2	10		6	5	1		2		1	38
Decline in fish price	14	3	11			9	5		1			43
Sudden decline in catch	9	27	9					1				46
Slow decline in catch	24	5		5	2	3	2	2	1	1	1	46
Slow increase in food prices	24	2	22	1	24	1						74
Important change in fishing techniques	1	3	1	22	5	3	25		22			82
Any other fishery related issue	23		23	1	23	6	7					83
unpredictable changes in weather	6	30	5	12	9	24	12	5	3	2		108
Hurricane	65	71	60	47	5	20	6	24	3	5		306
Total	195	168	144	106	97	93	72	42	41	13	2	973

Event type (Ghana)	Reduce Food	Reduce expenditures	Borrow money	Change fishing strategy	Get support	Sell assets	Increase fishing effort	Migration	Diversification	Seek new collaboration	Exit the fishery	Total
Others (aggregated)	45	46	36	13	23	14	3	1	3	4	0	188
Loss fishing ground	7	7	6	7	5	4	6	4			1	47
Flood	12	11	9	5	6	5	1					49
Fish price increase	9	12	8	6	5	4	2	2	1	1		50
Sick family member	15	16	10	4	8	3			1	1	1	59
Death of family member	26	25	18	4	13	6				2		94
Destruction Theft Loss gear	42	41	38	24	25	19		1	1	1		192
Input prices increase	52	46	38	19	16	11	4	4	3		2	195
Change in fishing techniques	51	52	32	18	21	11	8	11	3	3	2	212
Fuel shortage	86	79	62	39	31	21	5	10	3	3	3	342
Slow decline in catch	93	99	87	70	53	37	49	39	18	7	10	562
Total	438	434	344	209	206	135	78	72	33	22	19	1990

Even type (Sri Lanka)	Borrow money	Get support	Reduce expenditures	Reduce Food	Increase fishing effort	Change fishing strategy	Seek new collaboration	Diversification	Exit the fishery	Migration	Sell assets	Total
Others (aggregated)	27	28	28	22	10	13	15	5	4	2	6	160
Major health problem (sickness)	13	13	12	9	7	7	6	5	4	1	5	82
Decline in fish price	10	9	9	8	9	9	8	6	8	7		83
More unpredictable changes in weather pattern	26	24	22	13	18	18	14	9	9	12	2	167
Important change in fishing techniques	52	50	46	40	33	34	30	10	1	2	9	307
Slow decline in catch	74	69	69	68	64	60	42	35	27	26	12	546
Limitations-Harbour	74	67	68	60	62	59	48	41	35	36	9	559
New constraining fishing regulation	96	88	89	77	79	75	52	43	35	37	14	685
Destruction/loss/theft of fishing gear	101	101	96	81	76	75	64	53	32	26	14	719
Rapid (peak) increase in input prices	104	97	96	81	80	82	60	44	35	37	13	729
Hurricane/tropical storm	110	103	100	85	82	79	66	46	37	37	12	757
Total	687	649	635	544	520	511	405	297	227	223	96	4794

Event type (Vietnam)	Reduce expenditures	Borrow money	Reduce Food	Change fishing strategy	Get support	Increase fishing effort	Diversification	Seek new collaboration	Migration	Exit the fishery	Sell assets	Total
Others (aggregated)	4	7	4	6	3	0	1	3	0	0	2	30
Erosion	2	4	2	1	6	2	2	2	3		1	25
Catch reduced suddenly	8	4	6	7	1	2	4	2				34
Gears lost	10	18	6	5	1	2		1				43
Cold wind prolongs	15	7	11	3		1	7	2				46
Typhoon	12	11	10	2	4	2	3	5	4	1	1	55
Illness	11	14	6	2	11	2	2	4	1	1	2	56
Food price increase	20	17	19	2	8	5				1		72
Input price increase continuously	47	39	33	21	40	5	6	16			1	208
Big boats compete ground and catch	54	39	32	40	9	19	11	15	8	3	2	232
Catch reduced continuously	102	70	80	63	22	51	51	25	23	17	6	510
Total	285	230	209	152	105	91	87	75	39	23	15	1311

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