# Subjective measures of climate resilience: what is the added value for policy and programming?

**Abstract**

Subjective approaches to resilience measurement are gaining traction as a complementary approach to the standard frameworks that typically contain objective measures. Proponents suggest that subjective approaches may add value to existing measures in three areas: by improving our understanding of the drivers of resilience, reducing the questionnaire burden on respondents, and potentially offering more valid cross-cultural comparisons. This perspective assesses the potential, evidence and uncertainties around each of these claims, drawing from decades of research using subjective techniques in the wellbeing and psychological resilience literatures. Overall we find that subjective approaches can theoretically add value in each of these three areas. However the design of appropriate indicators must proceed with specificity and rigour for subjective measures to add value to programming and policy for climate resilience.

## 1 Introduction to subjective measures

Subjective measures are those that gauge the perceptions, opinions, preferences or self-assessments of individuals (Maxwell et al. 2015) and there is growing interest in their application to measuring climate resilience (Maxwell et al. 2015; Béné, Frankenberger, et al. 2016; Carletto et al. 2015; Jones & Tanner 2016; Constas, Frankenberger & Hoddinott 2014). This primarily stems from the premise that people have a strong understanding of their own resilience, and that this may be distinct from the landscape of resilience that emerges using standard resilience measurement tools, which tend to deconstruct resilience into its component capacities, measure each capacity individually, and then re-construct an index from these measures (FAO 2015; FAO 2014; Smith & Frankenberger 2015; DFID 2014).

Across the literature on subjective resilience measures to date (Béné, Frankenberger, et al. 2016; Béné, Al-Hassan, et al. 2016; Jones & Tanner 2016; Nguyen & James 2013), there are three key proposed benefits. In comparison with existing resilience measurement frameworks, it is hoped that subjective resilience measures can:

- Improve our understanding of the drivers of resilience
- Reduce the questionnaire burden on respondents
- Provide more cross-culturally valid comparisons of resilience

Given the attraction of these claims, and the speed with which subjective measures of climate resilience are generating interest, it is important to distil our knowledge on the merits, limitations and potential for added value of this approach. We first present a brief overview of the salient characteristics of resilience, after which the following three sub-sections examine the evidence base for each proposed benefit and assess the potential of subjective resilience measures to add value to existing objective measures of resilience.

## 2 A brief history of resilience

The concept of resilience has historic roots in a number of disciplines including engineering, ecology and psychology (Alexander 2013). The term has recently gained traction within the climate and development communities as a guiding framework for the design of climate-resilient development policies and programmes (Tanner et al. 2015; Brown 2016; Béné et al. 2012; Barrett & Constas 2014).

Although many definitions exist for climate resilience in this context (hereafter referred to simply as 'resilience'), it can be broadly considered as 'the capacity of all people across generations to sustain and improve their livelihood opportunities and wellbeing despite environmental, economic, social

and political disturbances' (Tanner et al. 2015, pg. 23). Importantly, this definition highlights the difference between resilience and wellbeing. Where wellbeing is taken as the ultimate goal for human flourishing, resilience is seen as a set of capacities that are evaluated in the present time and that mediate the impacts of shock and stressor events on current and future wellbeing (Barrett & Constas 2014; Constas, Frankenberger & Hoddinott 2014). As a result, resilience requires a separate set of measurement tools to those that already exist for wellbeing (OECD 2013; Boarini et al. 2014; Diener et al. 1985).

As resilience is not directly observable, it must be inferred from the measurement of items that can be observed, whether they are objective indicators about, for example, the presence of flood defences, or the subjective opinions of respondents about the adequacy of such defences in protecting them against shocks and stressors. As such, resilience is a latent variable and, with a broad range of definitions in existence, quantitative measurement of resilience therefore poses a significant challenge. Numerous methodologies and frameworks have been designed to date, each subtly different but often sharing a core set of methodological steps. Firstly the concept of resilience is usually broken down into multiple capacities that are deemed relevant, often through a combination of local consultative exercises, external elicitation and expert judgement. The capacities are then assigned proxy indicators as measures, data on which are collected via surveys or accessed through secondary databases. Often these indicators are objective, i.e., they are observable characteristics of the external environments in which people live, covering items such as income, social networks, infrastructure and resource access (FAO 2016; FAO 2015; Barrett 2015). Finally the data on these indicators are combined either through simple averages, weighting or more complex statistical procedures such as factor analysis, to derive a single-value measure of overall resilience.

There are many well-documented drawbacks to this approach (Levine 2014; Jones & Tanner 2015; Béné, Al-Hassan, et al. 2016). Firstly, when selecting the resilience capacities to measure, experts are unlikely to know *a priori* which aspects of a given environment make the people within it resilient to climate-related shocks and stressors. Secondly, even if all the relevant resilience capacities are known for a given situation, they are often difficult to measure objectively and/or meaningfully. Finally, even if all relevant resilience capacities are known *and* validly measurable, a composite resilience indicator necessitates their combination into a single value. This process is fraught with complexity in terms of standardising the indicators, weighting their relative influence, and accounting for interactions between them.

## 3 Applying subjective approaches to climate resilience

Another approach that may provide complementary information is the use of subjective resilience measures. There is some overlap between what constitutes an objective and a subjective measure, and in many ways subjectivity and objectivity can be conceptualised along a spectrum rather than as distinct binary classifications. However there are two key features of subjective measures that tend to distinguish them from objective measures. The first is that subjective measures seek to evaluate a personal perception, evaluation or opinion of a topic. The answer format could be qualitative (for example, free form speech) or structured (for example, using a Likert scale to rate agreement). This contrasts with objective measures, which rely heavily on the use of indicators that are externally verifiable. Importantly, subjectivity is not necessarily the same as asking for a self-report. For example, "How many children do you have?" is a self-report question, but wouldn't typically be considered as subjective in nature. It asks for an objectively verifiable quantity, rather than an opinion or perception, even though there may be some degree of subjectivity in the answer provided. The second distinguishing feature of subjective questions is the topic itself. Some topics are inherently subjective, for example happiness, whereas others may be measured objectively and subjectively, for example measuring stress severity through number of sick days taken or through subjective ratings of stress levels (Rammstedt 2009). As such, some questions may be classed as

subjective due to the topic alone, or due to a combination of the topic and the request for an opinion/perception.

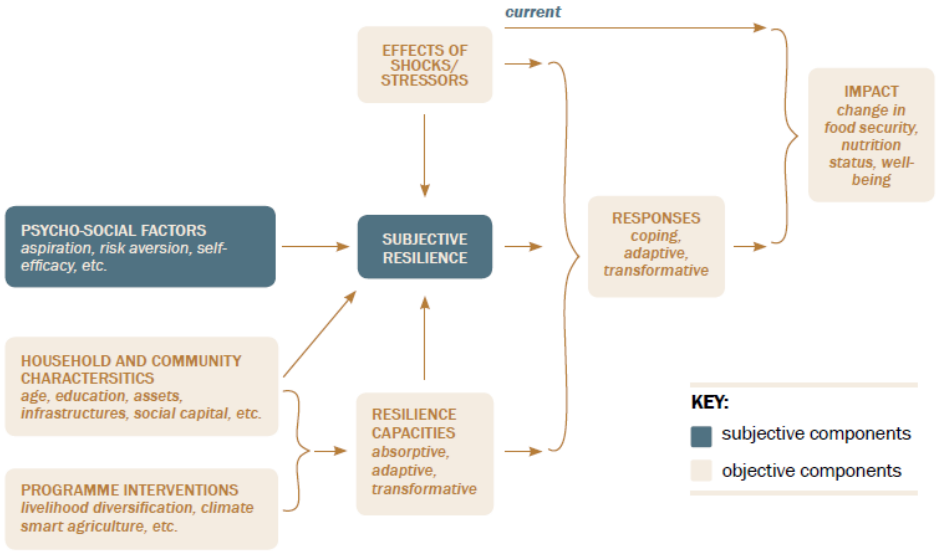
In the case of climate resilience, subjective measures are being used in two ways. The first is as a measure of the overall resilience 'level' of a household or individual. This means that, instead of deconstructing resilience into a number of proxy indicators, measuring them, and then constructing a single index, subjective resilience measures are used to assess people's perceptions of their overall perceived resilience to shock/stressor types, typically within a specified timeframe. For example, Nguyen & James (2013) ask respondents the extent to which they agree with statements such as "I am confident that my household has enough rice to eat during the flood season" and "I am confident that the health of my family members will not be negatively affected during the floods".

The second application of subjective measures is to investigate the psycho-social characteristics of individuals as resilience capacities, and their relationship to overall resilience, as illustrated in Figure 1, from Béné, Frankenberger, et al. (2016). There is increasing evidence that psycho-social characteristics such as self-efficacy, perceived adaptive capacity, sense of place and risk perception affect resilience and adaptive capacity (Béné, Al-Hassan, et al. 2016; Burnham & Ma 2016; Kuruppu & Liverman 2011; Marshall 2010; Grothmann & Patt 2005; Jones & Boyd 2011; Lockwood et al. 2015; Adger et al. 2013) and therefore the use of subjective measures in this context is to explore how these subjective elements may contribute to variations in overall resilience of individuals and/or households. Thus, rather than measuring an overall resilience level, this application of subjective measures investigates the component drivers of resilience.

Importantly, the use of subjective measures to explore the *drivers* of resilience is distinct from the use of subjective measures to understand overall *levels* of resilience. In this perspective we focus on subjective measures of resilience *levels* for two reasons. Firstly because subjective measures of resilience levels are a very new concept and must be developed from scratch, whereas psychometrically-validated scales for subjective concepts such as self-efficacy, fatalism, hope, and strength of faith have been developed in other disciplines for many decades (Sherer et al. 1982; Shen et al. 2017; Herth 1992; Plante & Boccaccini 1997). Moreover, subjective measures of resilience levels have been the main focus of the subjective climate resilience measurement field to date

With this in mind, we now assess the evidence base for each of the three proposed benefits that subjective measures of resilience levels may offer, compared to existing objective measures.

*Figure 1 – Conceptual framework of objective and subjective components of resilience (Source; Béné et al. 2016)*




### *3.1 Improving our understanding of the drivers of resilience*

As resilience is a latent concept whose measures cannot be objectively verified, the preferred way to assess the value of a resilience measure is its ability to predict an outcome of interest, usually relating to food security, nutrition status or other measures of wellbeing (Constas, Frankenberger & Hoddinott 2014). Therefore, if subjective resilience measures are proven to be valid measures of overall resilience levels, they could be used as the mediating variable of interest between measures of resilience drivers and ultimate wellbeing outcomes.

At present no data are available on the predictive power of subjective resilience level measures, however there is evidence from the fields of wellbeing and psychological resilience that subjective approaches can yield valid and reliable data that are predictive of and/or associated with positive life outcomes. For example, in the psychological resilience field, a number of psychometrically robust subjective scales are in use, often reflecting different target populations, risk factors or definitions of resilience. Examples include the Resilience Scale for Adults (Friborg et al. 2003), a brief and extended Children and Youth Resilience Measure (Liebenberg et al. 2013) and the Resilience Scale (Wagnild 2009). Evidence shows that scores on these subjective scales are predictive of objective wellbeing measures. For example, in diabetic adults psychological resilience scales are predictive of glycaemic control and self-care behaviours (Yi et al. 2008) whilst in children exposed to prolonged violent conflict they are predictive of prosocial behaviours, alongside the absence of psychiatric symptoms such as posttraumatic stress, depression and anxiety (Jordans et al. 2010).

In the context of climate and development, the predictive value of subjective resilience level questions will depend strongly on their design, which is in very early stages of development. However much can be learned from past work to develop scales that measure subjective wellbeing (Diener et al. 1985) and psychological resilience (Ungar et al. 2008). Comparing these literatures with that of subjective climate resilience measures, two key differences in approach are apparent.

Firstly, many existing subjective climate resilience measures tend to be shock-specific, relating to events such as floods, droughts or storms, whereas psychological resilience and subjective wellbeing measures include appraisals of resilience/wellbeing that span across life domains. Experience from the psychological resilience literature suggests that some indicators of resilience can be relevant across multiple risks, leading to the development of (1) a *cross-risk* approach, which seeks

conceptual and applied knowledge across and between risk factors, varying from exposure to war to living with chronic illness and (2) a *risk-specific* approach that identifies processes exclusively or mainly relevant to specific risk factors. This has identified mechanisms that tend to promote resilience regardless of the risk factor under question, such as the presence of a strong and positive relationship with an adult, perceived social support, and effective coping skills (Graber et al. 2015). In contrast, other mechanisms are more domain-specific, such as the availability of stable housing and information sharing among children with parents living with HIV/AIDS (Betancourt et al. 2013; Rodriguez-llanes et al. 2013). Overall this suggests that it is worth exploring both cross-risk and risk-specific approaches to subjective resilience measures in the climate and development context, in order to thoroughly test their predictive value of wellbeing in comparison to objective measures.

The second difference is that existing subjective resilience measures typically ask people to predict their resilience at a future time or in comparison to a past event. By contrast, measures of psychological resilience and subjective wellbeing ask about present perceptions. Prospective memory and retrospective memory tasks require recruitment of distinct memory processes, which complicates their use within a single questionnaire item (Crawford et al. 2003). In psychometric assessment, it is accepted practice to include a specific time frame within the response (such as "within the next 6 months" or "within the last month") to minimise issues with recall and variations in interpretation. This has been noted in discussions of subjective resilience question design (Jones & Tanner 2016), however the effects of such recall issues on measure validity have yet to be thoroughly appraised.

Overall, there is a significant amount of work to do before we can say with confidence that subjective climate resilience measures, in a specified format, are a) good predictors of future wellbeing and b) better predictors of wellbeing in the face of shocks and stressors than objective measures. However evidence from the psychological resilience and subjective wellbeing fields suggests that there is potential for subjective approaches to measure latent concepts that can predict wellbeing.

### *3.2 Reducing the questionnaire burden on respondents*

If subjective resilience level measures are found to be valid predictors of wellbeing in the face of shocks and stressors, they might theoretically reduce the resilience questionnaire burden on respondents. This is especially relevant where the main goal of a questionnaire is to investigate the level, rather than the drivers, of resilience. This may be the case where a detailed baseline survey has been completed to determine resilience drivers and levels, and subsequent monitoring of resilience levels is required going forwards.

Existing resilience measurement frameworks are notably data-intensive, largely arising from two characteristics of resilience operationalisation. First is the drive to measure all relevant components of resilience at all appropriate levels. Resilience is a multi-faceted construct, and can be characterised at individual, household, community, regional and/or national levels, quickly leading to large numbers of measures being used in models and surveys (Smith & Frankenberger 2015).

Second, resilience is often measured in relation to the experience of shock/stressor events (Barrett & Headey 2014), and is seen as a dynamic process, which implies constant monitoring to remain informed of changes. This inevitably places a significant time burden on respondents.

Whether subjective measures of resilience levels can reduce this questionnaire burden depends on the aim of measurement. If subjective measures are consistent, valid and at least equally good predictors of wellbeing compared to objective measures, they could be used to monitor resilience levels with a lower questionnaire burden, as they do not deconstruct overall resilience in to its

component capacities. However if the measurement aim is to elucidate the drivers of resilience, objective resilience measures will still be needed to explore the relationships between socio-environmental characteristics and resilience. Thus, subjective resilience measures may reduce the questionnaire burden where the focus is resilience levels only, but not where the question is on understanding the functional drivers of resilience levels (Béné, Al-Hassan, et al. 2016).

### *3.3 Providing valid cross-cultural comparisons of resilience*

Significant emphasis has been placed on finding culturally transferable measures of resilience that provide valid comparisons across contexts (Jones & Tanner 2016; Barrett & Constas 2014; Constas, Frankenberger, Hoddinott, et al. 2014). Objective approaches to resilience capacity measurement tend to struggle in this regard as the nature and relative importance of objective indicators for resilience capacities vary between shock/stressor types, livelihood contexts and cultures (Béné, Al-Hassan, et al. 2016; Choularton et al. 2015; Jones & Tanner 2016). For example, the factors that contribute to the resilience of a pastoralist in rural Kenya are likely to be very different to those needed to support the resilience of a coastal fisher; a wholly new set of indicators and characteristics may be needed to assess and compare them directly.

Subjective appraisals of resilience level may be more appropriate for cross-cultural comparisons, as they measure an individual's perception of whether their overall resilience capacities are sufficient to maintain and/or improve wellbeing within the context of shocks and stressors that they currently experience and are likely to experience in future. Critically, it is perceptions about the gap between what currently is and what is required in future to maintain/improve wellbeing that could be compared across cultures.

In order to develop a measure of this 'gap', the questions must consider three components: the subjective rating, the circumstances, and the outcome. For the subjective rating, respondents are asked for their opinion about/confidence in their current perceived resilience capacities. This is asked with respect to a circumstance, which in Figure 2's example is heavy flooding. Finally the question must contain a resilience outcome about which the subjective perception is asked. In the case of Figure 2 this is full recovery from flood damage within 6 months. The rating element of the question can easily be made consistent across all questions using well-tested Likert scale formats. Moreover, the circumstance element of each question can be tailored to local situations using information on past experience of shocks and stressors, possibly combined with climatic model data. Crucially, it is the nature of the resilience outcome that will influence the cross-cultural comparability of subjective measures of resilience levels. Researchers now need to consider whether the resilience outcome of interest should be community-derived, generalised or individually-derived.

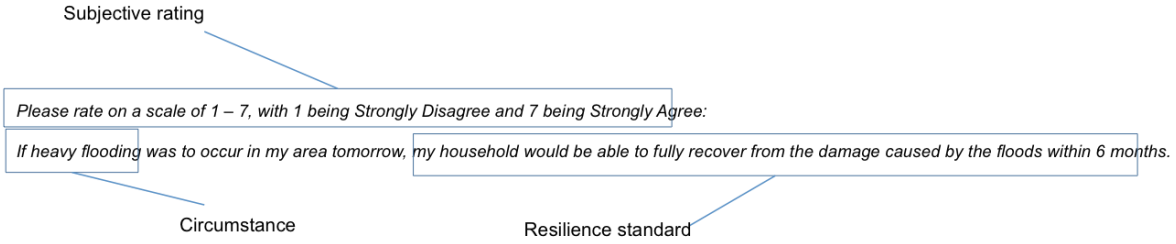



*Figure 2 – Deconstructing subjective resilience appraisals in to a subjective rating, a circumstance, and a resilience outcome*

Here we present and briefly discuss these three options for the design of resilience outcomes within subjective resilience level questions. It is too early to suggest which type(s) hold the most promise for cross-cultural comparability. However our intention is to spark discussion around which

resilience outcome designs are most suitable to the various knowledge-requirements that arise in studies of climate resilience.

*3.3.1 A community-specific resilience outcome*

An approach taken by many resilience tools is to use participatory and community-based methods to elucidate which local characteristics are most relevant to resilience (Barrett 2015; FAO 2015; Bene et al. 2011). These are then used as resilience outcomes against which respondents compare their perceived resilience level (a subjective rating) or against which objective measures are compared (objective rating). The use of community-specific resilience outcomes has advantages for understanding the context-specificity of resilience and the extent to which respondents within those communities perceive that they fulfil locally-relevant resilience characteristics. However this approach results in varying resilience outcomes being used across different communities and locations, reducing the potential for cross-cultural comparability.

*3.3.2 A generalised resilience outcome*

Another option is to use a consistent or generalised resilience outcome across multiple contrasting contexts, against which respondents compare themselves. This may be helpful if, for example, the aim is to compare resilience in multiple contexts against an internationally agreed definition, such as full recovery within 6 months of a shock/stressor event (see Figure 2). Importantly, it is the fact that the same resilience outcome is used across multiple contexts that makes it 'generic', and not the content of the outcome which, as in the example given here, may be quite specific.

This definition of a resilience outcome is likely to be developed by experts in varying degrees of collaboration with local partners. A good example from the psychological resilience field is the International Resilience Project (Ungar 2008), which conducted an iterative mixed-method knowledge gathering and sharing process across 14 countries to develop a series of culturally-transferable statements that respondents rate their agreement with.

This type of resilience outcome may be helpful to programme planners interested in whether an intervention has increased a resilience capacity that they are targeting, i.e., speed of asset recovery post-shock event. However it also reduces the agency of respondents to express which resilience outcomes are most important to them. For example, it may be that recovery of assets to the pre-existing level is less important than the time taken until all family members are able to eat three meals per day.

*3.3.3 An individually-derived resilience outcome*

A further option is to allow respondents to individually define their own resilience outcome, thus addressing the aforementioned criticism of a generalised resilience outcome. This approach is used in the subjective wellbeing field, which faces similar challenges to resilience in deriving cross-culturally valid measures of the multi-faceted and context-specific nature of what it means to 'live a good life'. A good example for the use of individually-derived outcomes, in this case for wellbeing, is the Satisfaction with Life Scale (Pavot & Diener 1993; Diener et al. 1985). It is made up of the following five statements, which respondents rank their agreement with on a 7-point Likert scale from 1 (Strongly disagree) to 7 (Strongly agree).

- In most ways my life is close to my ideal
- The conditions of my life are excellent
- I am satisfied with my life
- So far I have gotten the important things I want in life
- If I could live my life over, I would change almost nothing

These statements aim to quantify the perceived gap between a respondent's current situation and their ideal/satisfactory life situation, the latter of which is defined by them rather than by external metrics provided by the researcher. For example, the first question probes how close the respondent's life is to their ideal, without specifying what characteristics of a life might make it ideal. Prompting the respondent to envision their own wellbeing standard and compare themselves against it is the key design feature that facilitates cross-cultural comparisons (Pavot & Diener 1993; Oishi et al. 1999).

Investigating this gap between what currently is and what is needed/wanted has similarities with subjective measures of resilience, which could aim to quantify the gap between current overall resilience and the resilience level that the respondent deems necessary to achieve a resilience outcome of their own choosing. This provides cross-cultural comparability in that it measures the gap between the current perceived situation and what is desired by the individual, rather than the current perceived situation and what is desired by the local-community overall (community-specific outcome) or by third parties external to the community (generalised outcome).

**Conclusions and recommendations**

Subjective approaches hold significant promise for improving our understanding of resilience from a number of perspectives. There are strong precedents in the fields of psychological resilience and wellbeing that psychometrically validated subjective scales can add value to objective measures, be predictive of objective wellbeing outcomes and facilitate valid cross-cultural comparisons. However the development of subjective measures of resilience in the climate and development field is in its early stages and key uncertainties must be addressed before this approach can be adopted widely by policy makers and programmers. Specifically, the structure and design of existing subjective resilience level measures tend to differ from those developed for psychological resilience and subjective wellbeing, in terms of their event-specificity and the future projections and/or back-casting asked of respondents. Moreover, these subjective resilience level measures have not yet been thoroughly tested for their validity, reliability, or their ability to predict future wellbeing.

As work expands in this area, we highlight the need to carefully consider the structure of subjective resilience level questions, to include them in longitudinal studies that can test their predictive value, to explore their relationship with other objective measures, and to pay attention to the resilience standards against which we ask respondents to compare themselves.

**Bibliography**


Adger, W.N. et al., 2013. Cultural dimensions of climate change impacts and adaptation. *Nature Climate ChangePublishing Group*, 3(2), pp.112–117. Available at: http://www.nature.com/doifinder/10.1038/nclimate1666\npapers3://publication/doi/10.1038/nclimate1666.

Alexander, D.E., 2013. Resilience and disaster risk reduction: An etymological journey. *Natural Hazards and Earth System Sciences*, 13(11), pp.2707–2716.

Barrett, C.B. & Constas, M.A., 2014. Toward a theory of resilience for international development applications. *Proceedings of the National Academy of Sciences of the United States of America*, 111(40), pp.14625–30. Available at: http://www.pnas.org/content/111/40/14625.short.

Barrett, C.B. & Headey, D., 2014. Measuring resilience in a volatile world: A proposal for a multicountry system of sentinel sites. *2020 Conference*, (May), p.36. Available at: http://www.ifpri.org/publication/measuring-resilience-volatile-world.

Barrett, S., 2015. *Cost and Values Analysis of TAMD in Cambodia*, International Institute for Environment and Development, UK.

Bene, C. et al., 2011. Testing resilience thinking in a poverty context: Experience from the Niger River basin. *Global Environmental Change*, 21(4), pp.1173–1184. Available at: http://dx.doi.org/10.1016/j.gloenvcha.2011.07.002.

Béné, C., Al-Hassan, R.M., et al., 2016. Is resilience socially constructed? Empirical evidence from Fiji, Ghana, Sri Lanka, and Vietnam. *Global Environmental Change*, 38, pp.153–170. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0959378016300267.

Béné, C. et al., 2012. *Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes*, Institute for Development Studies, Sussex UK.

Béné, C., Frankenberger, T., et al., 2016. *Technical Report Series No 2: The Influence of Subjective and Psycho-social Factors on People ' s Resilience : Conceptual Framework and Empirical Evidence*, Report prepared by the Technical Consortium, a project of the CGIAR. Technical Report Series No. 2: Strengthening the Evidence Base for Resilience in the Horn of Africa. Kenya. International Livestock Research Institute (ILRI) and TANGO International.

Betancourt, T.S. et al., 2013. Annual research review: Mental health and resilience in HIV/AIDS-affected children - A review of the literature and recommendations for future research. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 54(4), pp.423–444.

Boarini, R., Kolev, A. & McGregor, A., 2014. Measuring well-being and progress in countries at different stages of development: Towards a more universal conceptual framework. *OECD Development Center Working Papers*, 325(325), pp.1–59.

Brown, K., 2016. *Resilience, development and global change*, Routledge.

Burnham, M. & Ma, Z., 2016. Climate change adaptation: factors influencing Chinese smallholder farmers' perceived self-efficacy and adaptation intent. *Regional Environmental Change*. Available at: http://link.springer.com/10.1007/s10113-016-0975-6.

Carletto, G., Banerjee, R. & Zezza, A., 2015. *Household Data Sources for Measuring and Understanding Resilience*, Technical Series No. 3. Resilience Measurement Technical Working Group; Food Security Information Network.

Choularton, R. et al., 2015. *Measuring Shocks and Stressors as Part of Resilience Measurement*, Technical Series No. 5. Resilience Measurement Technical Working Group; Food Security Information Network.

Constas, M.A., Frankenberger, T.R., Hoddinott, J., et al., 2014. *A Common Analytical Model for Resilience Measurement: Causal framework and methodological options*, Technical Series No. 2. Resilience Measurement Technical Working Group; Food Security Information Network.

Constas, M.A., Frankenberger, T.R. & Hoddinott, J., 2014. *Resilience Measurement Principles: Toward*

411 *an agenda for measurement design*, Technical Series No. 1. Resilience Measurement Technical
412 Working Group; Food Security Information Network.
413 Crawford, J.R. et al., 2003. The Prospective and Retrospective Memory Questionnaire (PRMQ):
414 Normative data and latent structure in a large non-clinical sample. *Memory*, 11(3), pp.261–75.
415 Available at: http://www.ncbi.nlm.nih.gov/pubmed/12908675.
416 DFID, 2014. Methodology for reporting against KP14 – Number of people whose resilience has
417 improved as a result of project support. London: Department for International Development.
418 Available at: (https://www.gov.uk/government/uploads/
419 system/uploads/attachment_data/file/328254/BRACED-KPI4-methodology-June2014.pdf.
420 Diener, E. et al., 1985. The satisfaction with life scale. *Journal of Personality Assessmemt*, 49(1),
421 pp.71–75.
422 FAO, 2014. *Resilience Index Measurement and Analysis Model*, FAO, Rome.
423 FAO, 2016. *RIMA-II: Resilience Index Measurement and Analysis Model*, Food and Agriculture
424 Organisation of the United Nations, Rome.
425 FAO, 2015. *SHARP: A participatory tool to assess climate resilience*, Food and Agriculture
426 Organisation of the United Nations, Rome.
427 Friborg, O. et al., 2003. A new rating scale for adult resilience: what are the central protective
428 resources behind healthy adjustment ? *International Journal of Methods in Psychiatric*
429 *Research*, 12(2), pp.65–76.
430 Graber, R., Pichon, F. & Carabine, E., 2015. *Psychological resilience: State of knowledge and future*
431 *research agendas*, Working Paper 425, Overseas Development Institute, London. Available at:
432 www.odi.org\nwww.odi.org/facebook\nwww.odi.org/twitter.
433 Grothmann, T. & Patt, A., 2005. Adaptive capacity and human cognition: The process of individual
434 adaptation to climate change. *Global Environmental Change*, 15, pp.199–213.
435 Herth, K., 1992. Abbreviated instrument to measure hope: development and psychometric
436 evaluation. *Journal of Advanced Nursing*, 17, pp.1251–1259.
437 Jones, L. & Boyd, E., 2011. Exploring social barriers to adaptation: Insights from Western Nepal.
438 *Global Environmental Change*, 21(4), pp.1262–1274.
439 Jones, L. & Tanner, T., 2015. *Measuring "subjective resilience" using people's perceptions to quantify*
440 *household resilience*, Overseas Development Institute, London, UK.
441 Jones, L. & Tanner, T., 2016. Subjective resilience: using perceptions to quantify household resilience
442 to climate extremes and disasters. *Regional Environmental Change*, pp.1–15. Available at:
443 "http://dx.doi.org/10.1007/s10113-016-0995-2.
444 Jordans, M.J.D. et al., 2010. Evaluation of a classroom-based psychosocial intervention in conflict-
445 affected Nepal: A cluster randomized controlled trial. *Journal of Child Psychology and*
446 *Psychiatry and Allied Disciplines*, 51(7), pp.818–826.
447 Kuruppu, N. & Liverman, D., 2011. Mental preparation for climate adaptation : The role of cognition
448 and culture in enhancing adaptive capacity of water management in Kiribati. *Global*
449 *Environmental Change*, 21(2), pp.657–669.
450 Levine, S., 2014. Assessing resilience: why quantification misses the point. *HPG Working Paper*,
451 (July). Available at: http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-
452 files/9049.pdf.
453 Liebenberg, L., Ungar, M. & Leblanc, J.C., 2013. The CYRM-12: A brief measure of resilience.
454 *Canadian Journal of Public Health*, 104(2), pp.131–135.
455 Lockwood, M. et al., 2015. Measuring the dimensions of adaptive capacity: a psychometric
456 approach. *Ecology and Society*, 20(1).
457 Marshall, N.A., 2010. Understanding social resilience to climate variability in primary enterprises and
458 industries. *Global Environmental Change*, 20(1), pp.36–43.
459 Maxwell, D. et al., 2015. *Qualitative Data and Subjective Indicators for Resilience Measurement*,
460 Technical Series No. 4. Resilience Measurement Technical Working Group; Food Security
461 Information Network.

462 Nguyen, K. V & James, H., 2013. Measuring Household Resilience to Floods : a Case Study in the
463 Vietnamse Mekong River Delta. *Ecology and Society*, 18(3).
464 OECD, 2013. *OECD Guidelines on Measuring Subjective Well-being*, Available at: http://www.oecd-
465 ilibrary.org/economics/oecd-guidelines-on-measuring-subjective-well-being_9789264191655-
466 en.
467 Oishi, S. et al., 1999. Cross-Cultural Variations in Predictors of Life Satisfaction: Perspectives from
468 Needs and Values. *Personality and Social Psychology Bulletin*, 25(8), pp.980–990.
469 Pavot, W. & Diener, E., 1993. Review of the Satisfaction with Life Scale. *Psychological Assessment*,
470 5(2), pp.164–172.
471 Plante, T.G. & Boccaccini, M.T., 1997. The Santa Clara Strength of Religious Faith Questionnaire.
472 *Pastoral Psychology*, 45(5), pp.375–387.
473 Rammstedt, B., 2009. *Subjective Indicators*, German Council for Social and Economic Data.
474 Rodriguez-llanes, J.M., Vos, F. & Guha-sapir, D., 2013. Measuring psychological resilience to
475 disasters: are evidence-based indicators an achievable goal ? *Environmental Health*, pp.1–10.
476 Shen, L., Condit, C.M. & Wright, L., 2017. The psychometric property and validation of a fatalism
477 scale. *Psychology & Health*, 24(5), pp.597–613.
478 Sherer, M. et al., 1982. The Self-efficacy Scale: Construction and validation. *Psychological Reports*,
479 51, pp.663–671.
480 Smith, L. & Frankenberger, T., 2015. *Ethiopia Pastoralist Areas Resilience Improvement and Market*
481 *Expansion (PRIME) Project Impact Evaluation: Baseline Survey Report*, Feed the Future, US
482 Agency for International Development.
483 Tanner, T. et al., 2015. Livelihood resilience in the face of climate change. *Nature Climate Change*, 1,
484 pp.23–26.
485 Ungar, M., 2008. Resilience across Cultures. *British Journal of Social Work*, 38, pp.218–235.
486 Ungar, M. et al., 2008. The study of youth resilience across cultures: Lessons from a pilot study of
487 measurement development. *Research in Human Development*, 5(3), pp.166–180.
488 Wagnild, G., 2009. *The Resilience Scale User's Guide for the US English Version of the Resilience Scale*
489 *and the 14-Item Resilience Scale (RS-14)*, Worden, MT: The Resilience Centre.
490 Yi, J.P. et al., 2008. The role of resilience on psychological adjustment and physical health in patients
491 with diabetes. *British journal of health psychology*, 13(2), pp.311–325.
492

**Bibliography**


1. Maxwell D, Constas MA, Frankenberger TR, Klaus D, Mock N. Qualitative Data and Subjective Indicators for Resilience Measurement. Technical Series No. 4. Resilience Measurement Technical Working Group; Food Security Information Network; 2015.

2. Béné C, Frankenberger T, Langworthy M, Mueller M. Technical Report Series No 2: The Influence of Subjective and Psycho-social Factors on People ' s Resilience : Conceptual Framework and Empirical Evidence. Report prepared by the Technical Consortium, a project of the CGIAR. Technical Report Series No. 2: Strengthening the Evidence Base for Resilience in the Horn of Africa. Kenya. International Livestock Research Institute (ILRI) and TANGO International; 2016.

3. Carletto G, Banerjee R, Zezza A. Household Data Sources for Measuring and Understanding Resilience. Technical Series No. 3. Resilience Measurement Technical Working Group; Food Security Information Network; 2015.

4. Jones L, Tanner T. Subjective resilience: using perceptions to quantify household resilience to climate extremes and disasters. Reg Environ Chang [Internet]. Springer Berlin Heidelberg; 2016;1–15. Available from: "http://dx.doi.org/10.1007/s10113-016-0995-2

5. Constas MA, Frankenberger TR, Hoddinott J. Resilience Measurement Principles: Toward an agenda for measurement design. Technical Series No. 1. Resilience Measurement Technical Working Group; Food Security Information Network; 2014. (Technical Series). Report No.: 1.

6. FAO. SHARP: A participatory tool to assess climate resilience. Food and Agriculture Organisation of the United Nations, Rome; 2015.

7. FAO. Resilience Index Measurement and Analysis Model. FAO, Rome; 2014.

8. Smith L, Frankenberger T. Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation: Baseline Survey Report. Feed the Future, US Agency for International Development; 2015.

9. DFID. Methodology for reporting against KP14 – Number of people whose resilience has improved as a result of project support. London: Department for International Development. [Internet]. 2014. Available from: (https://www.gov.uk/government/uploads/ system/uploads/attachment_data/file/328254/BRACED-KPI4-methodology-June2014.pdf

10. Béné C, Al-Hassan RM, Amarasinghe O, Fong P, Ocran J, Onumah E, et al. Is resilience socially constructed? Empirical evidence from Fiji, Ghana, Sri Lanka, and Vietnam. Glob Environ Chang [Internet]. Elsevier Ltd; 2016;38:153–70. Available from: http://linkinghub.elsevier.com/retrieve/pii/S0959378016300267

11. Nguyen K V, James H. Measuring Household Resilience to Floods : a Case Study in the Vietnamse Mekong River Delta. Ecol Soc. 2013;18(3).

12. Alexander DE. Resilience and disaster risk reduction: An etymological journey. Nat Hazards Earth Syst Sci. 2013;13(11):2707–16.

13. Tanner T, Lewis D, Wrathall D, Bronen R, Cradock-Henry N, Huq S, et al. Livelihood resilience in the face of climate change. Nat Clim Chang. 2015;1:23–6.

14. Brown K. Resilience, development and global change. Routledge; 2016.

15. Béné C, Godfrey-Wood R, Newsham A, Davies M. Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes. Vol. 2012, IDS Working Paper. Institute for Development Studies, Sussex UK; 2012.

16. Barrett CB, Constas MA. Toward a theory of resilience for international development applications. Proc Natl Acad Sci U S A [Internet]. 2014;111(40):14625–30. Available from: http://www.pnas.org/content/111/40/14625.short

17. OECD. OECD Guidelines on Measuring Subjective Well-being [Internet]. Report. 2013. 3-265 p. Available from: http://www.oecd-ilibrary.org/economics/oecd-guidelines-on-measuring-subjective-well-being_9789264191655-en

18. Boarini R, Kolev A, McGregor A. Measuring well-being and progress in countries at different stages of development: Towards a more universal conceptual framework. OECD Dev Cent Work Pap. 2014;325(325):1–59.

19. Diener E, Emmons R, Larsen J, Griffin S. The satisfaction with life scale. J Personal Assessmemt. 1985;49(1):71–5.

20. FAO. RIMA-II: Resilience Index Measurement and Analysis Model. Food and Agriculture Organisation of the United Nations, Rome; 2016.

21. Barrett S. Cost and Values Analysis of TAMD in Cambodia. International Institute for Environment and Development, UK; 2015.

22. Rammstedt B. Subjective Indicators. German Council for Social and Economic Data; 2009.

23. Burnham M, Ma Z. Climate change adaptation: factors influencing Chinese smallholder farmers' perceived self-efficacy and adaptation intent. Reg Environ Chang [Internet]. Springer Berlin Heidelberg; 2016; Available from: http://link.springer.com/10.1007/s10113-016-0975-6

24. Kuruppu N, Liverman D. Mental preparation for climate adaptation : The role of cognition and culture in enhancing adaptive capacity of water management in Kiribati. Glob Environ Chang. Elsevier Ltd; 2011;21(2):657–69.

25. Marshall NA. Understanding social resilience to climate variability in primary enterprises and industries. Glob Environ Chang. 2010;20(1):36–43.

26. Grothmann T, Patt A. Adaptive capacity and human cognition: The process of individual adaptation to climate change. Glob Environ Chang. 2005;15:199–213.

27. Jones L, Boyd E. Exploring social barriers to adaptation: Insights from Western Nepal. Glob Environ Chang. Elsevier Ltd; 2011;21(4):1262–74.

28. Lockwood M, Raymond CM, Oczkowski E, Morrison M. Measuring the dimensions of adaptive capacity: a psychometric approach. Ecol Soc. 2015;20(1).

29. Adger WN, Barnett J, Brown K, Marshall N, O'Brien K. Cultural dimensions of climate change impacts and adaptation. Nat Clim Chang Gr [Internet]. Nature Publishing Group; 2013;3(2):112–7. Available from: http://www.nature.com/doifinder/10.1038/nclimate1666\npapers3://publication/doi/10.1038/nclimate1666

30. Sherer M, Maddux J., Mercandante B, Prentice-Dunn S, Jacobs B, Rogers RW. The Self-efficacy Scale: Construction and validation. Psychol Rep. 1982;51:663–71.

31. Shen L, Condit CM, Wright L. The psychometric property and validation of a fatalism scale. Psychol Health. 2017;24(5):597–613.

32. Herth K. Abbreviated instrument to measure hope: development and psychometric evaluation. J Adv Nurs. 1992;17:1251–9.

33. Plante TG, Boccaccini MT. The Santa Clara Strength of Religious Faith Questionnaire. Pastoral Psychol. 1997;45(5):375–87.

34. Friborg O, Hjemdal O, Rosenvinge JANH, Martinussen M. A new rating scale for adult resilience: what are the central protective resources behind healthy adjustment ? Int J Methods Psychiatr Res. 2003;12(2):65–76.

35. Liebenberg L, Ungar M, Leblanc JC. The CYRM-12: A brief measure of resilience. Can J Public Heal. 2013;104(2):131–5.

36. Wagnild G. The Resilience Scale User's Guide for the US English Version of the Resilience Scale and the 14-Item Resilience Scale (RS-14). Worden, MT: The Resilience Centre; 2009.

37. Yi JP, Vitaliano PP, Smith RE, Yi JC, Weinger K. The role of resilience on psychological adjustment and physical health in patients with diabetes. Br J Health Psychol. 2008;13(2):311–25.

38. Jordans MJD, Komproe IH, Tol WA, Kohrt BA, Luitel NP, MacY RD, et al. Evaluation of a classroom-based psychosocial intervention in conflict-affected Nepal: A cluster randomized controlled trial. J Child Psychol Psychiatry Allied Discip. 2010;51(7):818–26.

39. Ungar M, Liebenberg L, Boothroyd R, Kwong WM, Lee TY, Leblanc J, et al. The study of youth resilience across cultures: Lessons from a pilot study of measurement development. Res Hum Dev. 2008;5(3):166–80.

40. Graber R, Pichon F, Carabine E. Psychological resilience: State of knowledge and future research agendas [Internet]. Working Paper 425, Overseas Development Institute, London; 2015. Available from: www.odi.org\nwww.odi.org/facebook\nwww.odi.org/twitter

41. Betancourt TS, Meyers-Ohki SE, Charrow A, Hansen N. Annual research review: Mental health and resilience in HIV/AIDS-affected children - A review of the literature and recommendations for future research. J Child Psychol Psychiatry Allied Discip. 2013;54(4):423–44.

42. Rodriguez-llanes JM, Vos F, Guha-sapir D. Measuring psychological resilience to disasters: are evidence-based indicators an achievable goal ? Environ Heal. 2013;1–10.

43. Crawford JR, Smith G, Maylor E a, Della Sala S, Logie RH. The Prospective and Retrospective Memory Questionnaire (PRMQ): Normative data and latent structure in a large non-clinical sample. Memory [Internet]. 2003;11(3):261–75. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12908675

44. Barrett CB, Headey D. Measuring resilience in a volatile world: A proposal for a multicountry system of sentinel sites. 2020 Conf [Internet]. 2014;(May):36. Available from: http://www.ifpri.org/publication/measuring-resilience-volatile-world

45. Constas MA, Frankenberger TR, Hoddinott J, Mock N, Romano D, Bene C, et al. A Common Analytical Model for Resilience Measurement: Causal framework and methodological options. Technical Series No. 2. Resilience Measurement Technical Working Group; Food Security Information Network; 2014.

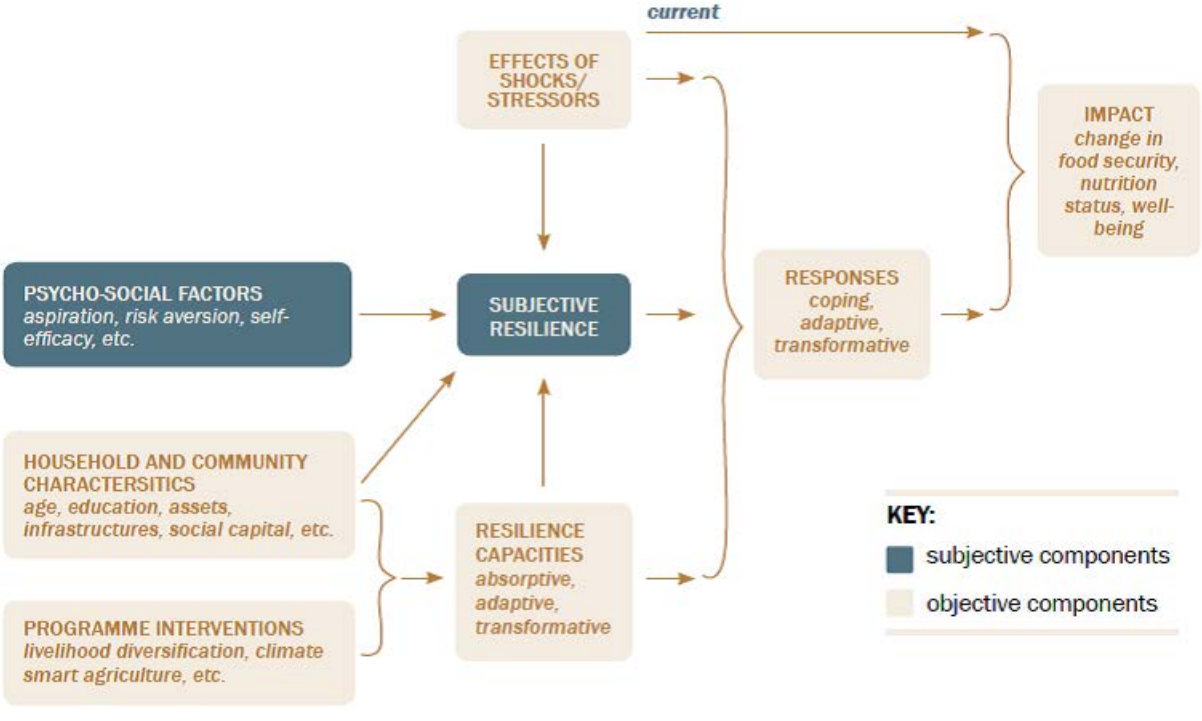
46. Choularton R, Frankenberger T, Kurtz J, Nelson S. Measuring Shocks and Stressors as Part of Resilience Measurement. Technical Series No. 5. Resilience Measurement Technical Working Group; Food Security Information Network; 2015.

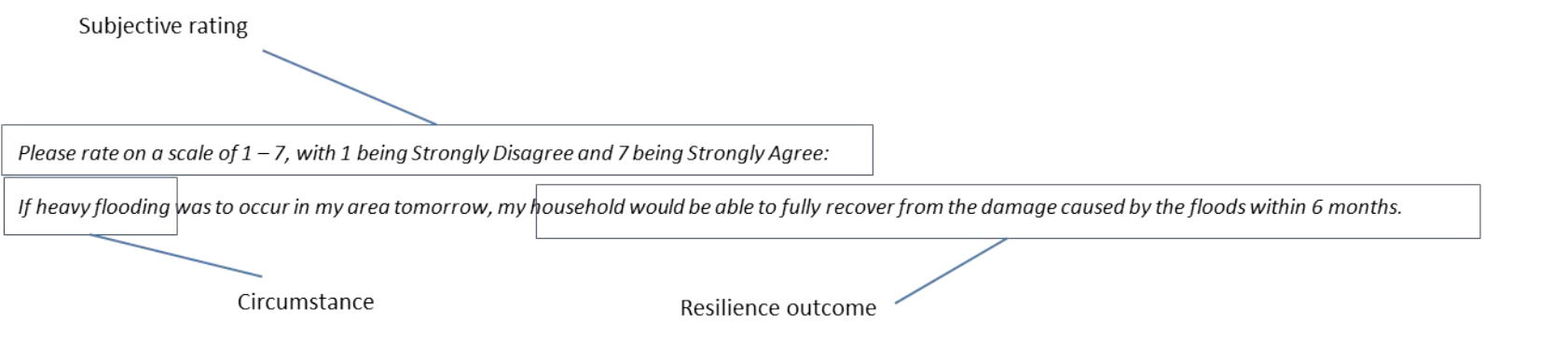
47. Bene C, Evans L, Mills D, Ovie S, Raji A, Tafida A, et al. Testing resilience thinking in a poverty context: Experience from the Niger River basin. Glob Environ Chang [Internet]. Elsevier Ltd; 2011;21(4):1173–84. Available from: http://dx.doi.org/10.1016/j.gloenvcha.2011.07.002

48. Ungar M. Resilience across Cultures. Br J Soc Work. 2008;38:218–35.

49. Pavot W, Diener E. Review of the Satisfaction with Life Scale. Psychol Assess. 1993;5(2):164–72.

50. Oishi S, Diener EF, Lucas RE, Suh EM. Cross-Cultural Variations in Predictors of Life Satisfaction: Perspectives from Needs and Values. Personal Soc Psychol Bull. 1999;25(8):980–90.


current
EFFECTS OF SHOCKS/ STRESSORS
IMPACT
change in food security, nutrition status, well-being
PSYCHO-SOCIAL FACTORS
aspiration, risk aversion, self-efficacy, etc.
SUBJECTIVE RESILIENCE
RESPONSES
coping, adaptive, transformative
HOUSEHOLD AND COMMUNITY CHARACTERSITICS
age, education, assets, infrastructures, social capital, etc.
RESILIENCE CAPACITIES
absorptive, adaptive, transformative
PROGRAMME INTERVENTIONS
livelihood diversification, climate smart agriculture, etc.
KEY:
subjective components
objective components


Subjective rating
Please rate on a scale of 1 – 7, with 1 being Strongly Disagree and 7 being Strongly Agree:
If heavy flooding was to occur in my area tomorrow, my household would be able to fully recover from the damage caused by the floods within 6 months.
Circumstance
Resilience outcome