Enhancing the resilience of those most vulnerable to (food) system shocks

Clarifying and unpacking key concepts

Seerp Wigboldus and Judith Jacobs

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The COVID-19 pandemic, and especially its responses such as lockdowns and transport restrictions shocked the world in 2020. Rapid assessments of the crisis showed that especially poor people were hit hard, facing immediate threats to their food and livelihood security. Varies UN agencies indicated that progress towards achieving SDGs is likely to be set back by decades. The people suffering from hunger is on the increase. With that context in mind a research was started at Wageningen University to assess impact of shocks such as COVID-19 on the **most vulnerable** groups of people, anticipated to suffer even more.

The research assignment developed three methodologies that allows both academic as well as support organisations to better understand how more vulnerable groups in society respond to crisis and what room there is to enhance their resilience. These methodologies were tested in two case studies (migrant labourers in the sesame sector in Ethiopia, jobless migrant youth from pastoral communities in Somaliland). Concepts and methodologies are described in seven reports that to a large extent build on each other.

1. Guijt, J. and N. Rozemeijer. Enhancing the resilience of those most vulnerable to (food) system shocks – Synthesis paper. https://doi.org/10.18174/543741
2. Wigboldus, S. and J. Jacobs. Enhancing the resilience of those most vulnerable to (food) system shocks – Clarifying and unpacking key concepts. https://doi.org/10.18174/543742
3. Wigboldus, S. and J. Jacobs. Enhancing the resilience of those most vulnerable to (food) system shocks – Towards a sense-making framework and assessment methodology. https://doi.org/10.18174/543743
4. Roo, N. de and J. van der Lee. Exploring vulnerability and resilience from a multifaceted and systemic perspective – Case studies in Ethiopia and Somaliland. https://doi.org/10.18174/543744
5. Wattel, C.J., M. Sopov and M.A.J.M. van Asseldonk. Responsible finance for vulnerable groups under COVID-19. https://doi.org/10.18174/543745
6. Wattel, C.J., M. Sopov and M.A.J.M. van Asseldonk. Finance for Resilience Tool (FORTE) – A rapid assessment tool. https://doi.org/10.18174/543746
7. Fonteijn, H., J. Groot and X. Guo. Analysing the resilience of food systems with scenario analyses and reverse stress tests – Concepts and an application on the Ethiopian sesame value chain. https://doi.org/10.18174/543747

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Report WCDI-21-141

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Contents

1 Introduction

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The purpose and focus of this research is to identify useful ways of assessing vulnerability and resilience in connection to the situation of the most vulnerable in society. Before looking into methodological options and a related choice of assessment approach, we need to clarify concepts, notably vulnerability and resilience, but also the concept of "the most vulnerable". Rather than trying to define such concepts, we will focus on exploring and unpacking related dimensions and dynamics.

Since they are central in this research, we start with a reflection on who we are talking about when we refer to *the most vulnerable* (section two). In section three we explore what analytical and sense-making approach is needed to be able to understand the specific dimensions and dynamics of vulnerability and resilience. In section four, we then zoom in on specific concepts and discuss them one by one. Because of the focus of this research, we continue in section five with a brief identification of the way in which finance options feature in the context vulnerable groups. Section six provides a brief overview of challenges in deciding on appropriate indicators and metrics for assessing vulnerability and resilience. These sections are meant to help create overview in order to know what needs to be taken on board in developing an appropriate assessment methodologies and how assessment findings may be interpreted towards strategic guidance for addressing vulnerability and resilience of the most vulnerable.

2 The most vulnerable, who are they and why are they vulnerable?

The "most vulnerable" relates to a scale running from the least vulnerable to the most vulnerable (Bohle, 2007; Kasperson et al. 2005). But it leaves many questions unanswered: what does vulnerability in this context mean, and in what sense can people be vulnerable? We will address such questions in more detail in the following sections. Here, we briefly explore in general terms *what kind of situations* we may be referring to, and what may be potential causes for their vulnerability. This is related to, but not the same as extreme poverty. Poverty has often become defined by a certain income level (e.g. those having less than 1.90$ per day[1]). Vulnerability focuses on the consequences or implications of poverty, where poverty may related to different types of poverty, not just financial. The Sustainable Livelihood Approach (Bebington, 1999; Knutsson, 2006) used to be one of the ways to unpack such poverty in terms of amongst others human capital, social capital, financial capital, physical capital, and natural capital. One may therefore say that a vulnerability perspective adds granularity to a poverty perspective (Tigre, 2019; Tschakert et al. 2013).

We may categorise vulnerable groups in different ways, such as in relation to socio-economic characteristics (e.g. street vendors, migrant workers), socio-cultural characteristics (e.g. bonded labourers, "low-caste" groups), socio-political characteristics (e.g. refugees, internally displaced people), or personal characteristics (e.g. gender, age). They may all be vulnerable, but they will not be vulnerable in the same way. Figure 1 provides a general categorisation in relation to vulnerability. It categorises types of vulnerability along the lines of two axes: 1) how fragile (very fragile then means that not much is needed to cause collapse), and 2) in how many ways fragile (e.g. related to how many types of assets). The conditions of any group or individual may be characterised by positioning them in relation to the two axes in Figure 1. Those positioned in the quadrant of "the most vulnerable" are the ones we focus on in this research. They are the ones who are very fragile/sensitive in a number of different ways (e.g. economically, socially, and in relation to environmental conditions). This means that they will quickly be negatively impacted by the effects of shocks like war, drought, or a pandemic (Lauvrak and Juvert, 2020).

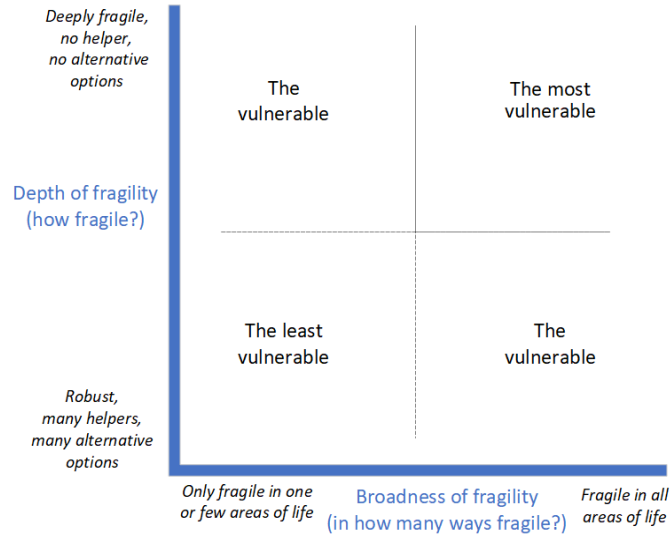

Figure 1 *A simplified categorisation of levels of vulnerability (the authors)*

[1] https://www.worldbank.org/en/news/press-release/2015/10/04/world-bank-forecasts-global-poverty-to-fall-below-10-for-first-time-major-hurdles-remain-in-goal-to-end-poverty-by-2030

This is, however, indeed a simplified perspective. In this paper we will further unpack different dimensions of vulnerability. We will discuss how being vulnerable relates to a number of interacting factors, notably the risk of exposure to extreme events (both natural shocks, such as droughts, storms, or a pandemic, and man-made shocks, such as land grabbing and being paid unfair prices for labour and produce), the level of available assets, and the level of access to societal services and provisions (Adger, 2006; Alwang et al. 2001; Moret, 2014).

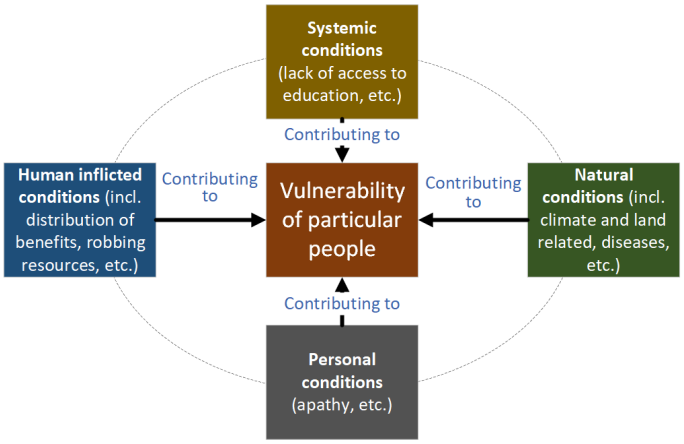

Figure 2 *Possible causes of vulnerability (the authors)*

There is a tendency in assessments of vulnerability and resilience to focus on the vulnerable group itself, their own livelihood related vulnerabilities, and their own resilience capacity. Figure 2 broadens this perspective by also considering how external conditions may cause vulnerability, and then not just in terms of natural (environmental) conditions (Jackson et al. 2020):

1. Personal conditions. E.g. limited assets, such as human capital. Examples are lack of education and poor health;
2. Natural conditions. E.g. living in an area which is prone to droughts, storms, etc.
3. Man-made conditions. E.g. land grabbing, receiving low prices for produce, refusing access to public goods/benefits, unreliable payment for services, no attitude of caring and sharing, usury, bonded labour, etc.
4. Systemic (institutionalised) conditions: This may relate to the above, but they are more difficult to pin down on particular actors. This is about how a society is organised and functions, about the rules of the game (institutions), etc. It includes, for example, the custom of paying dowry, and the way markets and trade are organised.

The four conditions are connected, such as that lack of education may be the result of institutionalised lack of attention for (girls') education. We consider this an important part of the scope for this research.

3 The need for integrated and contextualised perspectives

In the following we further explore the nature of vulnerability in relation to the companion concept of resilience. We then explore some key principles that we need to apply to be able to get to grips with understanding vulnerability and resilience in a specific context.

3.1 Vulnerability and resilience as two intertwined characteristics

Vulnerability and resilience are both about the ability to deal with adverse circumstances (Bachelet et al. 2019; Matyas and Pelling, 2012). Vulnerability may be considered the passive side of the ability to do so, and resilience the more active side of it. Vulnerability may then be considered the lack of ability to endure shock and stress, and resilience the ability to manoeuvre out of harm's way in the face of being exposed to shock and stress. These are actually two complementary characteristics.

Taking robustness as the opposite of vulnerability, we may consider robustness as the first line of defence against the impact of shocks and stress. Like the walls and gates of a castle under siege. But just having tall and thick walls is not enough. Supplies need to be managed or maybe a counterattack undertaken. And, in case the walls are breached, there are still options for trying to outmanoeuvre the attackers. That is what resilience is about. Different strategies may be adopted. Some will focus on building strong fortresses (focus on ensuring robustness) while others will focus on maximum mobility, not living in fortresses, but rather keep moving around (focus on maintaining resilience).

3.2 The need for applying an integrated perspective

Figure 2 points to the multifaceted causes for and nature of vulnerability, and section two discussed how vulnerable groups can be vulnerable in different ways and for different reasons. These different ways and different causes are part of an interconnected and dynamic reality of actors and factors that should not be treated in isolation. This points to the need for developing integrated perspectives on types of vulnerability, types of causes for vulnerability, and types of possible ways to improve related conditions in order to sufficiently come to terms with that interconnected and dynamic reality. Appendix 1 outlines a wide variety of possible types of shocks, types of vulnerability, and types of resilience. Though not easy to operationalise, it does alert to the fact that an appropriately broad perspective needs to be applied to prevent reductionist approaches to understanding vulnerability and resilience, but also to options for providing support (investments/interventions). It also alerts to the fact that trade-offs will need to be considered. A responsible investment strategy, for example, may have positive effects on economic vulnerability and resilience while undermining social resilience.

3.3 The need for a coherent and contextualised perspective

Coherent perspectives are about the need to not consider vulnerability or resilience in itself, but to develop an understanding about the way in which related dimensions and dynamics connect. Figure 3 is an attempt at doing so. It presents core concepts as a formula (adapted from McKinsey, 2020). In this perspective, resilience addresses the combined implications of the (potential) effects of a shock and the consequences of related vulnerability. It reiterates our earlier observation that a strategy may focus on reducing vulnerability, on strengthening resilience, or both. This figure only presents a generic view; it matters what type of shock or vulnerability applies in a particular situation. There is

therefore no general standard regarding what makes for good resilience. Part of a vulnerability and resilience assessment will involve being more specific about this (Adade et al. 2018; Schipper and Langston, 2015; Moret, 2014).

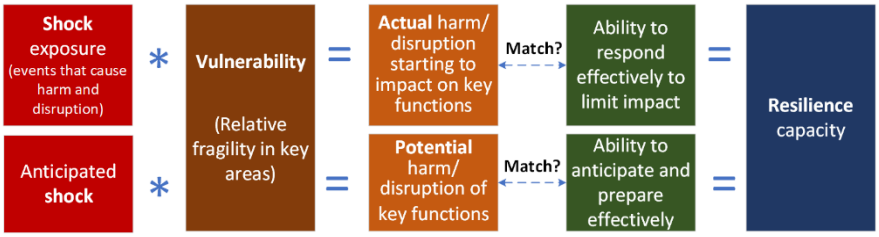

Figure 3 *Considering the connectedness of core concepts and related dynamics (elaborated by the authors, based on McKinsey, 2020)*

3.4 The need for anticipating the unexpected

If resilience is built in view of specific anticipated, plausible shocks, we may lack readiness to deal with unanticipated shocks. Typically, conditions of shocks and their impact create new and often unanticipated conditions in terms of, e.g.:

- *Complexity*: many interconnected parts and variables influencing resilience, with the possibility of e.g. causing chain effects.
- *Volatility*: challenging conditions related to shocks are typically unstable (fluctuating), and the duration is unknown.
- *Uncertainty*: not everything can/will be anticipated and shocks typically introduce unknown situations – so what to prepare for?
- *Ambiguity*: since shocks typically introduce unknown situations, causal relations may be completely unclear, having no precedent, which does not just produce complexity, but also contested and conflicting ideas about how to respond.

How much can be anticipated? What potential shocks to be ready for? How much should we focus on general resilience, because we don't know what may cause disruption in the future, and how much should we build specific resilience in view of plausible shocks? In the case of technical systems (e.g. related to river/water management) this may not be so difficult to decide. But in the case of socio-ecological and socio-economic systems this will be more difficult (Eakin et al. 2006; Linkov et al. 2019; Ludy and Bird, 2007).

4 Unpacking key concepts

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In this section, we briefly discuss the meaning of five key concepts in a particular order:

1. What is the essential purpose of keeping vulnerability low and resilience high? This is about *system or livelihood functions* (desired outcomes of system functioning or livelihood strategies). It is about the purpose-orientation of a system or livelihood. The type of functions (desired outcomes) will depend on the scale level on which we focus.
2. What threatens such system functions? This is about *shocks and stresses* which (can potentially) have a negative impact (harm) on the realisation of these functions.
3. What causes concern in view of such threats and may jeopardise (continued) achievement of functions? This is about *vulnerability*. A shock is not a problem in itself, but becomes a problem because of vulnerability to that particular shock. Therefore, not every shock will lead to negative impact for all.
4. Given certain (potential impact of) shocks and the relevant vulnerabilities, what can be done to limit negative impact on desired system functions? This is about *resilience* – the ability to manoeuvre out of harm's way.
5. What dimensions of risks can be distinguished.

4.1 System functions/outcomes

We understand system in the broadest sense of the word here, independent of level or scale. So it may apply to a household system, but also to a food system. System functions (desired outcomes of system functioning) are sometimes called resilience functions (desired outcomes to be safeguarded

through resilience). So it is not about system activities or system characteristics, but about *the purpose* which is served through system performance. It is about what is threatened by shocks and stresses. Examples of such system functions may relate to such things as food security, productivity, and efficiency. But also to things as enjoying beauty and good relationships. We may summarise system functions in terms of a variety of securities one seeks to safeguard, such as food security, health security, energy security, and human security. The impact of a shock on e.g. securities will usually not be direct, but results from the impact on system properties (e.g reduction of available arable land to support food security).

Box 1: Illustrating what it means for vulnerable groups in Bangladesh when a shock (COVID-19 in this case) exposes their vulnerability and undermines their system functions.

"Due to lack of work, migrant workers are at risk of hunger, housing crises and infection, and are unable to repay loans. Vulnerable migrants and their family members are unlikely to have any savings or food stocks."

"Many women who worked as garment workers, domestic helpers or home-based workers are now jobless."

There will usually be priorities as well as trade-offs involved in terms of which functions need to be given preference, e.g. efficiency vs. equity. This has implications for resilience strategies in terms of what will be given priority in terms of safeguarding. A technocratic orientation may overemphasize the material side of system functions. A flourishing system is a system in which due attention is paid to the variety of possible system functions as outlined in Appendix 1.

Different groups in society will have different ideas about what functions should be prioritised. What functions are meant to be safeguarded involves the application of particular values, orientations, and preferences. It may also involve normative perspectives on economic growth, industrial agriculture, etc. Also, for the more vulnerable groups, priority functions will often be about basic needs, about basic survival. For the less vulnerable priority functions may be about relative levels of affluence and non-basic needs. On top of that, the way in which particular groups safeguard their particular priority functions may come at the expense of the way in which other groups try to safeguard their particular priority functions. This goes back to what we expressed in Figure 2 and underscores the importance of developing an integrated perspective. In other words, the ways in which different groups in society try to safeguard system functions do not exist independently of each other.

All this has clear implications for understanding vulnerability and resilience, because priorities regarding system functions will motivate decisions on how to reduce vulnerability and strengthen resilience in relation to (potential) shocks.

4.2 Shocks and stresses

Shocks are about unexpected events which have a disruptive/harming effect. These can have different origins and characters. E.g. a shock can be economic (e.g. loss of access to finance) or environmental (an earthquake) in character. *Stress* is about prolonged disruptive pressure. A shock may lead to stress, and stress may on the long run result in a shock.

Different types of shocks will expose different types of vulnerability and require different types of resilience (see Appendix 1). The biggest shock of COVID-19 may have been the fact that standard disaster risk preparedness had not anticipated the kind of shocks and ensuing shock impacts that COVID-19 set in motion. The most vulnerable groups were/are the ones suffering the most as a result, particularly because of measures put in place to reduce spreading of the disease, such as travel restrictions. At the same time, such harmful shock effects will not be the same for everyone as not everyone will be vulnerable to the same kind of shocks/stress in the same way and to the same degree.

One of the important lessons to be learnt from COVID-19 is the way in which gradually all aspects of life got affected by it (illustrated in Figure 4). This is about the two important sides of shocks: the shock event as such, e.g. an earthquake, and the shock impact: the effects that this earthquake has. Bené (2020) refers to this as the ripple effect. If we want to understand how COVID-19 affects the most vulnerable, we need to get to grips with the ripple pathways. The immediate shock impact may not be the one that creates the biggest impact on people's lives. In the case of COVID-19 it is not, however awful, the number of deaths caused by it, but rather the policy responses aimed at controlling its spread.

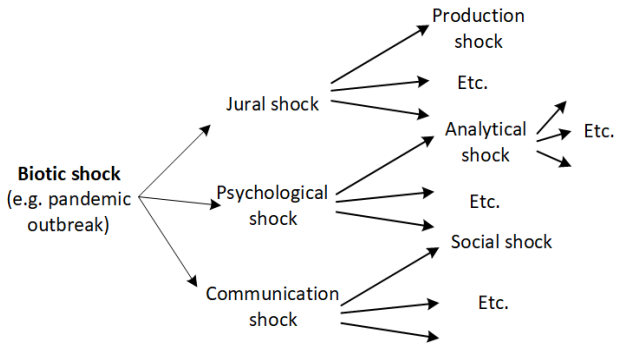

Figure 4 *Illustrating the phenomenon of ripple effects of gradually unfolding shock impacts (the authors)*

Conditions other than the shock itself may enhance the likelihood of being impacted by and the severity of the impact of shock/stress. This is what we discuss under vulnerability.

4.3 Vulnerability

A basic definition of vulnerability is: *the propensity or predisposition to be adversely affected* (Mitchell and Harris, 2012). The definition provides a general idea, but also begs many questions, such as "what is vulnerable exactly?" "how vulnerable is it?", and "why is it vulnerable?". As noted in section three, higher levels of vulnerability will usually correspond with lower levels of resilience and the other way around (Miller et al. 2010).

Box 2: Different types of shocks will expose different types of vulnerability and require different types of resilience – illustrations from Mali/ Bangladesh/ Ethiopia (de Roo and de Boef, 2020)

"Conventional extension services are not possible as a result of mobility restrictions." "Disruptions to the timely import, transportation and distribution of fertiliser and agro-chemicals, and lack of cash amongst farmers". "Mobility restrictions hamper effective seed production, which faces major challenges in transporting and accessing fertiliser, agro-chemicals and other inputs."

We discussed above how robustness may be considered the opposite of vulnerability. Robustness (lack of vulnerability) may be considered the "first line of defence" of a system, and resilience the "second line of defence". We used the metaphor of a castle where, e.g., the walls are robust (the static), but soldiers are still needed to cover that which cannot be covered through robustness (the dynamic).

One key outcome of vulnerability is insecurity, which connects vulnerability to system functions (Paloviita et al. 2016). There may also be a false sense of security. E.g. we may feel secure behind walls or dykes, or behind military power or financial assets, while unwittingly being exposed (vulnerable) in other aspects.

No man is an island and the same applies to systems. Therefore, vulnerability cannot be only considered for individuals or even specific groups. Vulnerability is the emergent property of a range of interacting dynamics. Broadly speaking, there is an endogenous part, which is about the entity itself, and an exogenous part, which is about conditions external to the entity which may enhance or diminish vulnerability (as discussed earlier in relation to Figure 2). An example of exogenous conditions exposing or exacerbating vulnerability: The type of contractual arrangements which apply to contract farmers, which means they bear most of the consequences of crop failures. An example of exogenous conditions reducing exposure of vulnerability would be safety nets and insurance policies.

Box 3: Not only who is vulnerable but why. Illustrations form Ethiopia (de Roo and de Boef, 2020)

During the COVID-19 pandemic in Ethiopia, the mobility restrictions affected certain groups of farmers more severe than others.

For example, seasonal labourers were more vulnerable to mobility restrictions as they move from the high lands to lowlands during the sesame season to work and earn their yearly income for their families.

Farmers living in remote areas were also extra vulnerable, as they could not be reached by extension workers or financial institutions forcing them to make use of informal money lenders who charge very high interest rates.

Vulnerability usually has a history. Being born in a particular place in the world in a particular family, will influence the state of vulnerability that someone finds herself in. Similarly other events in the past, such as a history of conflict and war, will shape the state of vulnerability. Understanding vulnerability will therefore require a historical analysis as well.

Finally, as explored in Figure 2, vulnerability may have a number of causes. Vulnerability assessments should therefore not just focus on what and who is vulnerable, but also why. This will be a key insight to inform what may be considered *responsible* investments to reduce vulnerability.

Since dynamics of vulnerability and resilience are closely related, some of the more elaborate explorations of the concept of resilience also apply to vulnerability, such as a contextual/multi-level perspective.

4.4 Resilience

Common elements in definitions of resilience that are relevant for the context of vulnerable groups include 1) ability to ensure the (continued) provision of functions, 2) in the face of shocks and stresses, and 3) through available capacities (adapted from Meuwissen et al. 2019). To operationalize resilience, it is better to unpack its dimensions rather than trying to capture it in a single-sentence definition. Authors like Meuwissen et al (2019) suggest to unpack related dimensions and dynamics in descriptions regarding the resilience of what, resilience to what, resilience for what purpose, what enhances resilience, etc. This helps more for operationalizing the concept of resilience than definitions can do.

In the following sub-sections we will unpack the concept of resilience in the following ways:
1. Understanding resilience in context
2. Understanding what resilience capacity involves
3. Understanding what resilience strategy and operations are about

Understanding resilience in context
No man is an island and few are resilient only because of their own capacity. Being part of a particular group means having access to group support (social capital). Being part of a value chain means benefitting from the efforts of all actors who make the chain work. In terms of vulnerability, we all

suffer the consequences of conditions shaped by others. But we also benefit from conditions shaped by others.

A multi-level perspective on resilience is therefore useful to consider resilience across levels and scales (Figure 5). Box 4 explores a number of contextual perspectives on resilience. This includes a perspective on potential trade-offs involved in resilience response.

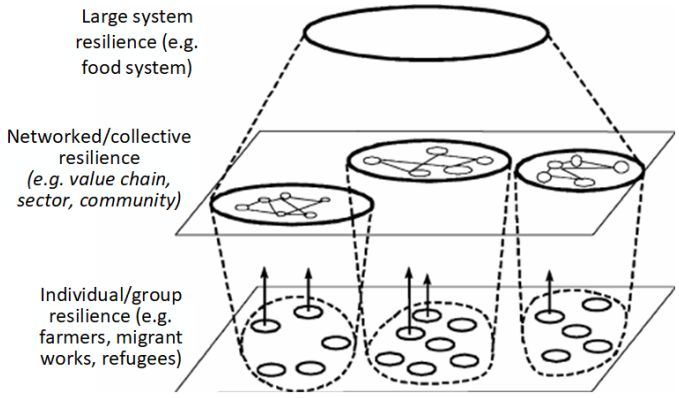

Figure 5 *Multi-level perspective on resilience (the authors)*

Support to resilience building will involve choices in terms of focus: who will be supported and whose resilience will be disregarded? Often, there will be a tendency towards building the resilience of those whose resilience is easier to build.

Box 4: Activating contextualised perspectives on resilience

Resilience is the result of (complex) interactive resiliences. The following are examples of contextualised perspectives:

Collective (or compound, or **systemic**) **resilience**: A view on resilience as group (or system) rather than on individual (component) resilience. This closely relates to a perspective on collective capabilities.

Networked **(cross-scale) resilience**: A view on resilience as the result of interconnected resiliences. E.g. some actors or organisations may not be resilient on their own, but as part of a wider network they may still be resilient.

Responsible/sustainable resilience: A view on preparedness to deal with shocks without harming the resilience of others (or other components), and with a view on the ability to retain resilience in the long term.

Resilience capacity

Many authors refer to absorption, adaptation, and transformation as key examples of resilience capacity. We argue here that those are not the capacities itself, but rather the particular ways in which resilience capacity is activated through responding to a shock. In a resilience assessment we will therefore be interested in two aspects of resilience capacity (Figure 6):

1. What is the basis for such capacity, or what shapes such capacity, and
2. How is such capacity activated through a particular way of responding to a shock.

The first is something which we may assess directly and is about a potential for being resilient, and the second is about how in a particular shock exposure the capacity is applied. The second does not flow automatically out of the first. For example, having a large bank account may be considered a basis for being resilient, but if it is not used, or even cannot be accessed, it will not make a difference in responding to the shock.

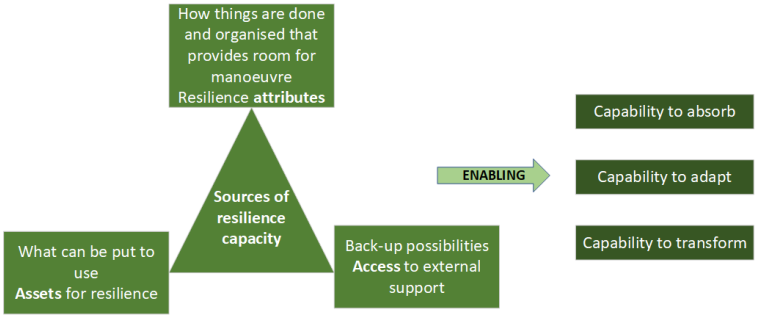

Figure 6 *Two dimensions of resilience capacity*

1) The sources of resilience
As for the first way of understanding resilience capacity, we suggest that resilience capacity is based on three things: 1) The status of **assets** which enable resilience in a particular way, 2) The **characteristics** (attributes) of systems, system assets, and practices which enable resilience in a particular way, and 3) the possibilities of **access** to external support capacity provided through institutions, processes, and structures.

In short, resilience **assets** are about human capital, social capital, physical capital, financial capital, and natural capital. Resilience **characteristics** are about such things as diversity (enabling a shifting to other options if one is ruled out[2]), redundancy (having surplus which allows for incurring loss), flexibility (enabling adaptation), and mobility (enabling moving out of harm's way). Robustness, which we presented as the opposite of vulnerability, may in fact also be considered a system characteristic that supports resilience. **Access** to external support relates to such things as social security, bank loans, and (relief) interventions.

2) The application of sources of resilience
Resilience only shows in a particular response to a shock. In that sense it is an emergent property that cannot be fully assessed prior to such response. For example, many countries thought they were ready to respond to an outbreak of a pandemic such as COVID-19, but they found the capacity to do so wanting. Every shock and the subsequent ripple effects will affect people and systems in a particular way. We can learn from how this happened in the past and how people responded in the past, but there will be a level of surprise involved in a new shock event. There are basically three ways of responding to shocks: **absorb** the effects at first and recover afterwards, **adapt** so as to reduce shock impact, or **transform** to also reduce future vulnerability (Figures 7 and 8 illustrate this).

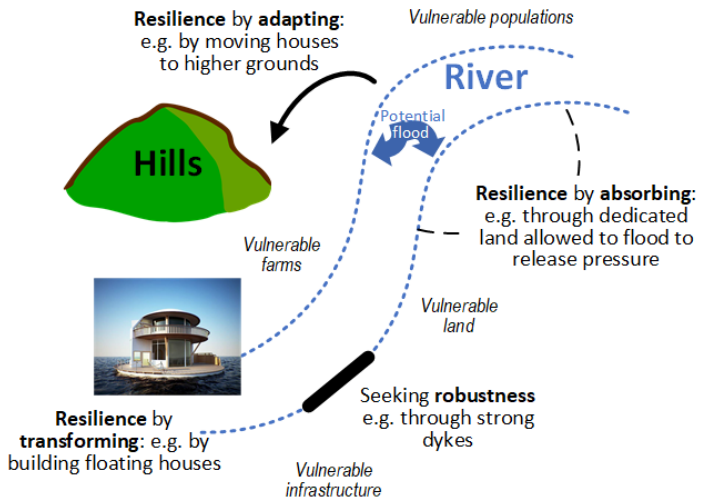

Figure 7 *A metaphor to illustrate options for applying resilience capacity (source: SNV and WUR, forthcoming)*

[2] For example, for a smallholder, a cow can be an insurance for in case of, e.g., a drought, because the cow can be sold when yields drops. But this might be happening for may smallholders at the same time, causing cow prices to go down. Having access to another income source (e.g. off-farm) enhances resilience.

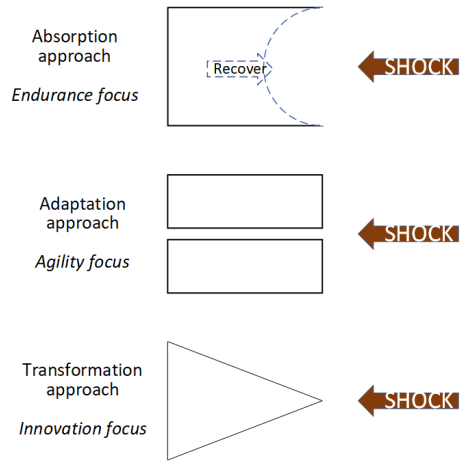

Figure 8 *Basic repertoire of possible resilience responses (the authors)*

Resilience strategy and operations

Resilience strategy is about making decisions on how to build and/or activate resilience capacity. In relation to assets, at household level, it may mean selling a cow to buy agricultural implements; in relation to attributes it may mean taking on an extra job, or growing more than one crop; in relation to access, it may mean applying for a loan.

Resilience strategy is about considering and weighing the various conditions and options, and choosing how to be ready for and responding to shocks, both in terms of direction and nature or response (Wardekker, 2018; Linkov et al. 2019). Resilience operations are about how strategy is translated into concrete response activities.

Resilience strategy can relate to both actual shocks and their impact and to potential shocks and their potential impact. This is about the temporality of resilience as illustrated in Figure 9 and involves three main strategy perspectives: Before a shock (anticipation), during shock exposure (response), and after shock exposure (recovery).

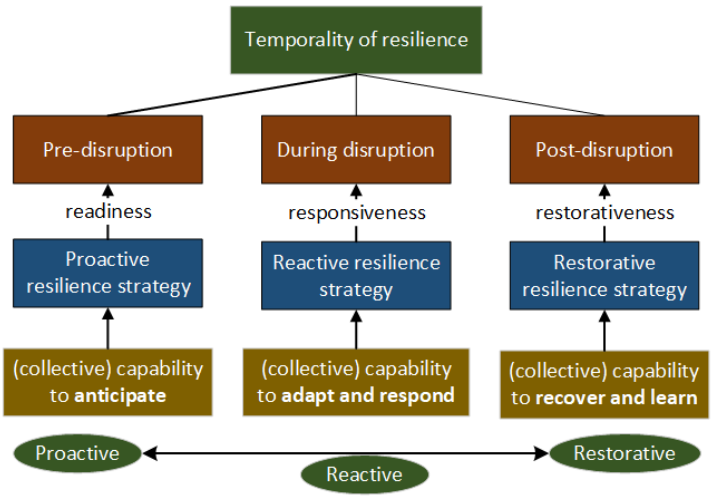

Figure 9 *Between proactive and reactive resilience (adapted from Ali et al. 2017)*

When we consider resilience at the level of e.g. a food system or wider society, different visions will be competing. Calls for resilience may for instance involve a focus on self-reliance, hence a plea for letting the market rule and letting the fittest (most resilient) survive. This calls for awareness about the possibility of politics being used in relation to the concept of resilience to gain acceptance for particular approaches and strategies. It may involve agendas such as stimulating commercialisation of agricultural production. Moving from subsistence farming into commercial farming may make a farmer

more vulnerable in some ways (situations) and less vulnerable in other ways (situations). Commercialisation as such can therefore not necessarily be presented as a resilience-building attribute. As noted in relation to system functions, what/who we want to be resilient, what type of resilience we want, and what is considered to make for resilience may involve serious debate.

4.5 Risk

Risk is about a likelihood or potential for something to happen. A risk may be characterised along a scale from low risk to high risk. There are different ways of considering risk in relation to shocks and vulnerability (Beccari, 2016). First there is the risk that certain shocks could happen (risk as (level of) probability). Then there is the risk that a system is exposed to the effects and found susceptible to it (risk as (level of) susceptibility). And finally there is the risk that the shock, because of particular vulnerabilities to exposure, causes negative effects on system functions (outcomes) (risk as level of potential impact). In developing a risk profile for a particular system or group, all three dimensions are relevant, which means a compound risk profile needs to be made. For different systems and different groups, different risk profiles will apply. Hence the need to make a specific risk profiles for the most vulnerable since average risk profiles in a particular country may very well not characterise their situation appropriately.

Defining relevant risks supports the ability of proactive action. This is the field of (strategic) foresight. The saying ‘forewarned is forearmed’ applies here. Anticipation, the ability to identify risks, may be considered a key resilience capability.

5 The role of responsible investments in addressing vulnerability

The idea of responsible finance as one of the possible policy and investments options to support vulnerable groups has gained much attention in recent years, resulting in the development of a wide range of responsible finance standards (e.g Principles of Responsible Agricultural Investments of the FAO, IFC Performance Standards, Universal Standards of Social Performance Management, Smartcampaign Client Protection Principles). These standards have in common that they try to incorporate environmental, social and governance (ESG) factors in investment decisions.

Within the domain of responsible finance, social protection and labor (SPL) interventions are often mentioned in relation to promoting resilience (Worldbank 2018). Social protection can be defined as all interventions from public, private, voluntary organisations and informal networks, to support communities, households and individuals, in their efforts to prevent, manage, and overcome a defined set of risks and vulnerabilities. Social protection mitigates vulnerabilities but also facilitates the capture of the opportunities (Barrientos, 2004).

SPL instruments generally fall within the following four categories (WorldBank 2018):

1. *Social safety net (SSN)/social assistance (SA) programs* are non-contributory interventions designed to help individuals and households cope with chronic poverty, destitution, and vulnerability. SSN/SA programs target the poor and vulnerable and aim to reduce vulnerability.
2. *Social insurance programs* are contributory interventions that are designed to help individuals manage sudden changes in income because of old age, sickness, disability, or natural disaster. Individuals pay insurance premiums to be eligible for coverage or contribute a percentage of their earnings to a mandatory insurance scheme. These programs anticipate on the risks of shocks and stresses.
3. *Social care services* are interventions for those facing social risks such as violence, abuse, exploitation, discrimination or social exclusion. Economically and socially vulnerable people have complex challenges. Social care services allow the range of needs of families to be understood and families connected to relevant services, including those such as violence prevention that may fall out of the social protection sphere.
4. *Labour market programs* can be contributory or non-contributory programs and are designed to help protect individuals against loss of income from unemployment or help individuals acquire skills and connect them to labour markets (active labour market policies).These programmes can be ‘passive’ or ‘active’.

Figure 10 shows a typology of social protection instruments per category (adapted from O’Brien et al., 2018).

A major shift in thinking within the social protection intervention area is away from fragmented social protection programmes towards comprehensive social protection systems. A social protection system can be considered at three levels: 1) the sector (mandates, policies, regulations etc.); 2) individual programmes; 3) delivery underpinning the programmes (databases, payment mechanisms, etc.). The idea of social protection systems corresponds with the idea of building resilience at multiple levels (Figure 11).

Next to social protection and labour interventions, risk financing as a concept is often mentioned as a way to manage the financial impacts of risks. Risk financing strategies are intended to ensure that individuals, businesses and governments have the resources necessary to manage the adverse financial and economic consequences of shocks (OECD 2015). It involves putting in place a strategy to mitigate risk ex-ante as well as a strategy to ensure the availability of funds for post-disaster relief and reconstruction, commensurate with the scale and frequency of anticipated risks (OECD 2014). Risk financing can be applied at macroeconomic level (e.g., as a public policy for disaster-preparedness). It is also relevant within companies, organisations, and at a household level to make them more resilient to shocks.

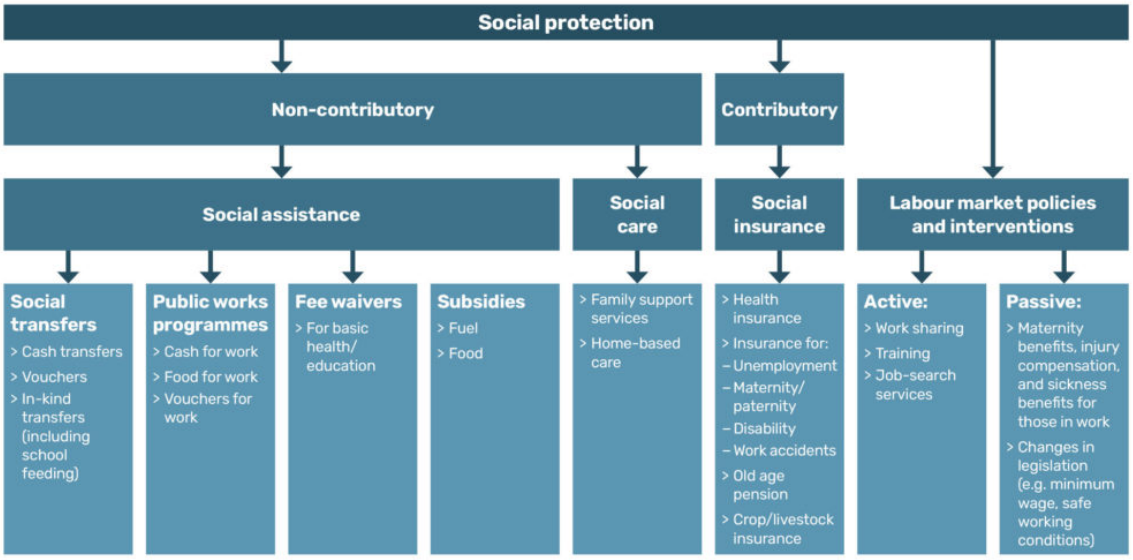

Figure 10 *A typology of social protection instruments per category*

Figure 11 provides an overview of risk financing instruments and arrangements available to cover (disaster) risks facing i) households, farms and small and medium sized enterprises (SMEs) operating at the micro scale, ii) financial-and donor-organisations operating at the intermediary scale, and iii) governments operating at the macro scale (Linnerooth-Bayer et al 2018).[3]

	Micro-scale Households/SMEs/Farms	Intermediary-scale Insurers/donor organisations/NGOs	Macro-scale Governments
Insurance instruments (standardly mutuality-based)	Indemnity –based property, crop & life insurance, index-based (parametric) property , livestock & crop insurance, weather hedges, national insurance programs	Indemnity and parametric insurance for NGOs, co-ops, re-insurance for direct insurance providers, catastrophe bonds, sidecars	Sovereign risk transfer (e.g., sovereign re-insurance, catastrophe bonds), contingent credit, regional catastrophe insurance pools
Loss financing instruments (often solidarity-based)	Government assistance, humanitarian aid	Government guarantees/bail outs	Bi-lateral and multi-lateral assistance, EU solidarity fund
Informal risk sharing	Kinship and other network-based arrangements, remittances	Emergency liquidity funds	Diversions from other budgeted programs
Savings and credit	Savings, micro-savings, micro-credit, fungible assets, food storage, money lenders	Emergency liquidity funds	Reserve funds, post-disaster credit

Figure 11 *Overview of risk financing instruments and arrangements*

Social protection and labor interventions and risk financing can complement each other as vulnerable groups are exposed to breakdowns in local social safety nets shocks like natural disasters (GFDRR & Worldbank 2014). Community-based risk sharing mechanisms are burgeoning in the developing world, with the poor increasingly able to participate in local groups that provide loans or grants to households that have been exposed to a shock. While these mechanisms perform well for idiosyncratic shocks (such as the death of a breadwinner), they often break down after a systemic shock from a natural disaster. Formal government-subsidized social safety nets may also struggle with increased demand during disasters if they lack the capacity to expand support.

[3] While there is a whole spectrum of mechanisms available these are the most common types of catastrophe insurance currently operating in developing countries

6 Getting to grips with challenges related to indicators and metrics

Vulnerability and resilience are concepts that relate to complex realities, which means assessment will need to connect to a variety of dimensions and dynamics, as illustrated in Figure 12 (Prosperi et al. 2016). Over the years, many indices and assessement frameworks have been developed for vulnerability and resilience (see Appendix 2 for an overview).

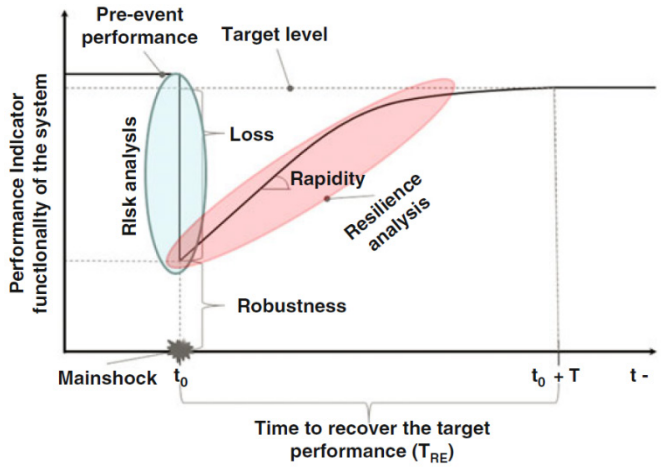

Figure 12 *Diverse dimensions involved in assessing vulnerability (risk) and resilience (source: Cimellaro, 2016)*

One of the main challenges in deciding on appropriate indicators and metrics for assessing vulnerability and resilience, is **making** those **specific enough**. Anything not doing well may be called an indicator of vulnerability, e.g. poverty or unemployment related indicators. In the same way, any capability or resource may be called an indicator of resilience. This a way of interpreting resilience in a very broad way where it becomes similar to such denotations as human flourishing, good governance, etc. Good societies are resilient societies. Or the other way around. And the logic in assessment then seems to become: the more good options, the more resilient.

Many existing assessment frameworks on vulnerability and resilience are therefore so broad and contain so many diverse indicators, that they basically only present characteristics of a particular situation, but the information this renders can easily become so overwhelming that it provides little opportunity for strategic decision-making in terms of what in particular makes for resilience. Also, it becomes difficult to see whether what is assessed is about vulnerability or about resilience (Cimellaro, 2016). They are not put in hierarchy in terms of e.g. causation regarding what is most important. To be able to know what would be responsible investment/intervention options that can really make a difference for a particular vulnerable group, a general understanding about their situation will not suffice. A more focused understanding is needed regarding what triggers and drives vulnerability and resilience most, what relates to root causes, and what to passing circumstances only.

On the other hand, some assessment approaches are oriented towards very specific conditions (shocks and/or stress), which does not provide a sufficiently **integral perspective** that can be applied for understanding vulnerability and shocks and stress that a particular vulnerable group is confronted with. For example, the focus of assessment may be on climate resilience. However, vulnerable groups are confronted with a range of shocks and stresses originating from far away and from nearby. That includes the impact of climate change, but there is more. The same applies to COVID-19. Yes, it caused all kinds of negative effects, but for some vulnerable groups it does not rank on top of shocks they are exposed to.

In the third place, especially in relation to the more focused approaches such as the ones on climate resilience, the assessment may tend to focus on conditions related to particular actors and pay less or no attention to **systemic conditions** which exacerbate vulnerability or undermines resilience to -in this example- climate change.

Finally, resilience is something that only fully shows when in action – it is an **emergent property** (van der Lee, forthcoming). A variety of indicators may give a fair indication of anticipated resilience, but since each shock has its own specific outworking, assumed resilience may not be as strong as it was anticipated. A good example of this is the situation of COVID-19. Many countries thought they were ready for handling a pandemic, but the specific nature and trajectory of processes following the outbreak of the virus, caught many countries by surprise.

Box 5. Types of indicators in terms of their focus and nature

- Indicators at what scale and focus:
  Country, community X, food system, etc.
- Indicators assessed through what method/process:
  e.g. participatory, based on statistics, etc.
- Indicators of what type of resilience:
  e.g. economic, social, etc.
- Indicators of what element of resilience:
  e.g. broad situation analysis, focus on assets, focus on attributes, etc.
- Indicators in relation to what stage:
  e.g. risk of impact (anticipatory), (speed of) recovery, etc.
- What type of indicators:
  e.g. quantitative, qualitative (such as vulnerability perceptions), proxy indicators, etc.
- Indicators applied through what type of approach:
  e.g. index, tool, score-card, etc.

Therefore, in the same way that Meuwissen et al. (2018) unpacked the question of resilience towards the dimensions regarding what is resilient, in relation to what is it resilient, etc., indicators need to be considered in terms of what they actually help assess. That requires getting relevant questions clear. However, most assessment approaches start with categories (e.g. social, economic) and then select related indicators *without clarifying the exact questions which need to be answered* (e.g. Beccari, 2016; Summers et al. 2017). We consider that approach to be a major reason for challenges related to identifying appropriate indicators and metrics for vulnerability and resilience.

To address the above described challenges related to indicators and metrics, we suggest doing two things. First, articulate relevant questions in our rapid appraisal approach to make sure that what we measure and assess does not provide generic information, but answers to concrete questions. Second, use proxy indicators which condense a bigger story and a variety of related indicators into summary characterisations. This is intended to help prevent creating overwhelmingly complex descriptions and rather create actionable insights that can guide strategic decision-making.

Following Arup International Development (2016), we also think it is useful to operationalise Max Neef's dimensions of human needs towards a perspective on vulnerability and resilience. He characterised human needs along the lines of four categories: being (qualities), having (assets), doing (practices and processes), and interacting (relationships) (Pagliacci and Russo, 2020). Both vulnerability and resilience may be assessed in relation to these four characteristics. This helps identify key aspects of the multifaceted nature of vulnerability and resilience.

7 Conclusion

Vulnerability and resilience are complex concepts and involve complex dynamics and non-linear processes. Apart from its inherent multifaceted nature, the concept of resilience is also interpreted in quite different ways by different researchers, politicians, and practitioners. Whole books and many reports and articles have been written on the topic, so we have focused on selecting elements that can be informative in the development of an assessment methodology. It illustrates how the concepts of vulnerability and resilience cannot be treated in isolation. They need to be understood in an interconnected and dynamic reality of actors and factors and connected to related dimensions and dynamics. Behind each of the concepts, there is a variety of potential manifestations. Vulnerable groups are vulnerable in a particular context, and are vulnerable for particular shocks, are vulnerable in specific ways and their resilience (capacity) is based on a range of different internal and external factors. The report: "Enhancing the resilience of those most vulnerable to (food) system shocks – Towards a sense-making framework and assessment methodology" will translate the exploration of key concepts into a sense-making framework to guide the development of a methodology to assess what causes particular groups of people to be most vulnerable, and to identify options for reducing vulnerability and enhancing resilience.

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Appendix 1 A systemic perspective on shocks, vulnerability and resilience

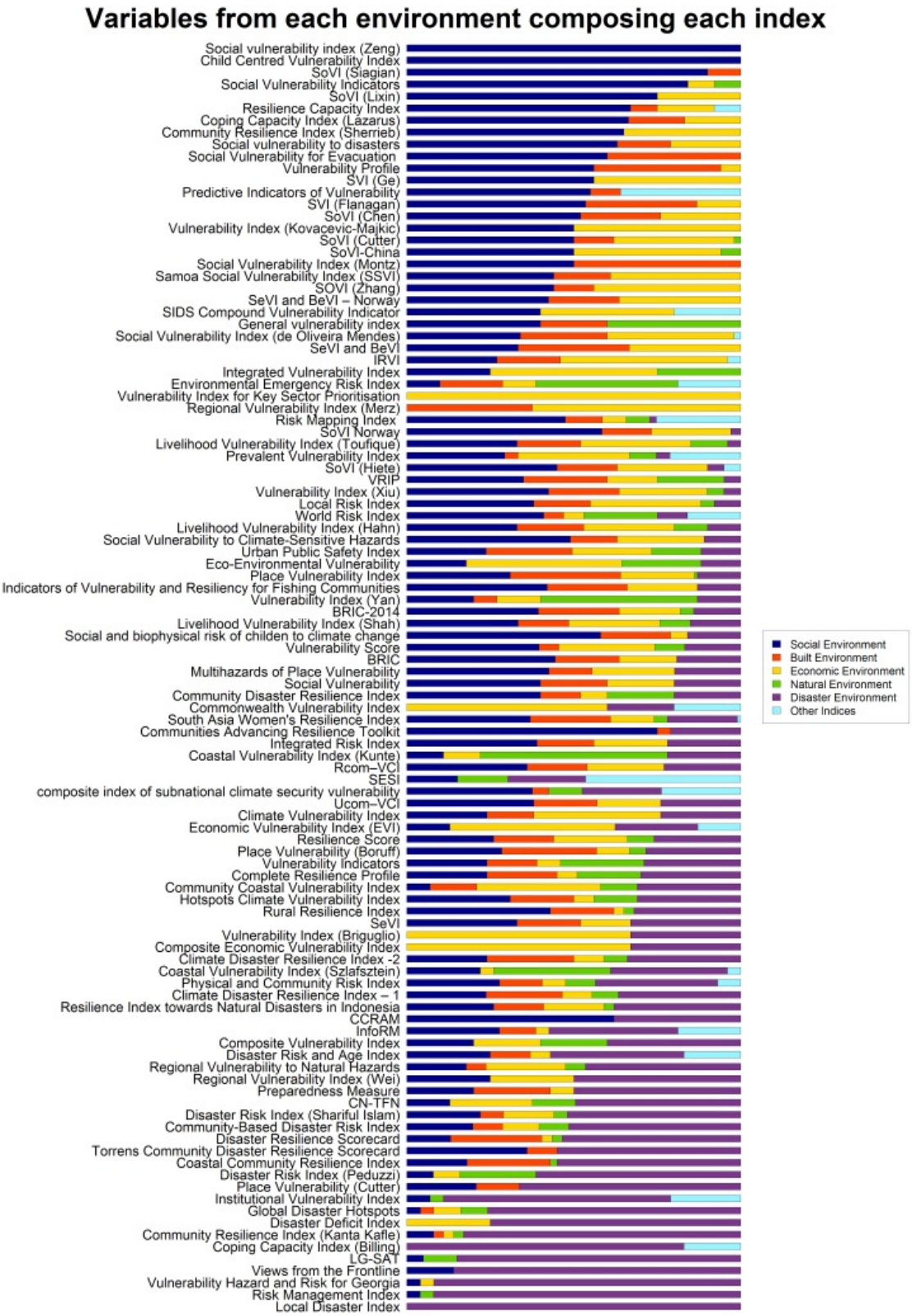
Table 1 *An integral/coherent reference framework for exploring the possible nature and aspects of shocks/stress, aspired functions/outcomes, vulnerability, and resilience (authors' application of the theory of modal aspects (Basden, 2011)*

Aspects of entities	What system (resilience) functions (outcomes) can be about (examples)	Different natures and aspects of shocks and stress	Different natures and aspects of vulnerability	Different natures and aspects of resilience
	To be protected through resilience	*Distinguishing shock event and shock impact*	*Always in relation to 1) (potential) shocks and stress and 2) desired continuation of key functions/outcomes*	
Quantitative (discrete amount)	Sufficiency	*Quantitative shock event:* e.g. price hike, stocks market collapse*; Quantitative shock impact.* e.g. numbers of people affected	Fragile basis for sustaining sufficiency in terms of e.g. financial assets	Ability to maintain/restore needed amounts (e.g. quantitative buffers)
Spatial (continuous extension)	Proportionality; place-based qualities; spatial/land security; scalability	*Spatial shock event:* e.g. a land grabbing incident*; Spatial shock impact:* e.g. drastically reduced area of land to cultivate	Fragile basis for sustaining needed space, volume, land	Ability to maintain/restore needed space
Kinetic (movement)	Mobility, flexibility, circularity, continuity	*Kinetic shock event*: e.g. earthquake, massive migration; *Kinetic shock impact*: e.g. drastic reduction of mobility	Fragile basis for sustaining movements and mobility	Ability to maintain/restore needed movement, mobility
Physical (energy, material)	Utility, availability, accessibility	*Physical shock event:* e.g. electric storm, volcano eruption, climate events, incl. storms*; Physical shock impact:* e.g. loss of energy supply, drought, floods, landslides, loss of soil fertility	Fragile/sensitive structures, materials, and sources of energy	Ability to maintain/restore needed energy, materials and structures
Biotic (life, organism)	Biodiversity, health (security), ecosystem services	*Biotic shock event:* e.g. pandemic: *Biotic shock impact*: e.g. death, health failure	Fragile basis for sustaining life (functions), ecosystems, health	Ability to maintain/restore needed life functions, ecosystem functions/ services
Sensitive (perception, emotion)	Security, sensibility	*Psychological shock event:* outbreak of panic; *Psychological shock impact:* e.g. depression, apathy	Fragile/sensitive basis for sustaining e.g. mental health	Ability to maintain/restore needed sound perceptions, emotions, and attitudes
Analytical (distinction)	Validity, factuality, evidence-basedness	*Cognitive shock event:* e.g. massive misinformation, fake news*; Cognitive shock impact*: e.g. confusion	Fragile basis for sustaining knowledge, sense-making and understanding (e.g. through lack of education)	Ability to maintain/restore needed clarity of understanding
Formative (power, give function)	Functionality, productivity, accessibility	*Creative shock event*: stopped delivery of inputs; *Creative shock impact*: disrupted production	Fragile/fractured basis for sustaining production processes	Ability to maintain/restore needed production/ construction supporting factors

Aspects of entities	What system (resilience) functions (outcomes) can be about (examples)	Different natures and aspects of shocks and stress	Different natures and aspects of vulnerability	Different natures and aspects of resilience
Lingual (signification, symbolising)	Intelligibility, evidentiality	*Communication shock event*: like Babel event; *Communication shock impact*: figuratively or literally not speaking the same language	Fragile basis for sustaining communication and clear symbolising	Ability to maintain/restore needed communication quality and channels
Social (company, community)	Inclusiveness, equity, participatory	*Social* shock event: e.g. outbreak of war, conflict; S*ocial shock impact*: e.g. social distancing, loss of relationships	Fragile/sensitive basis for sustaining social interaction/ relationships	Ability to maintain/restore needed social interactions
Economic (provision)	Affordability, prudence, efficiency	*Economic shock event*: e.g. loss of employment, of cash flow; *Economic shock impact:* e.g. no supplies available, management collapse (e.g. tragedy of the commons)	Fragile/sensitive basis for sustaining prudent provisioning	Ability to maintain/restore needed provisioning
Aesthetic (delight, enjoyment)	Beauty, appeal, recreation	*Aesthetic shock event: e.g. pollution; Aesthetic shock impact: e.g.* loss of beauty, enjoyment	Fragile/sensitive basis for sustaining beauty and enjoyment	Ability to maintain/restore needed beauty, enjoyment, recreation
Jural (legality)	Legality, legitimacy, lawfulness	*Jural shock event*: e.g. policy change, change of law, loss of rights; *Jural shock impact*: breakdown of law and order	Fragile basis for sustaining law and order and/or regulatory frameworks	Ability to maintain/restore needed law and order
Ethical (loving, morality)	Accountability, responsibility, love, integrity (norms)	*Ethical shock event*: widespread failure of acting out justice, solidarity, loss of moral compass; *Ethical shock impact:* lovelessness, no solidarity, no caring and sharing	Fragile basis for sustaining norms, accountability, love and solidarity	Ability to maintain/restore needed love, solidarity, accountability
Fiduciary (belief, faith, commitment)	Trust, hope, reliability, commitment to values	*Fiduciary shock event*: e.g. paradigm shift, shift of allegiance; *Fiduciary shock impact*: e.g. despair, loss of commitment (to values), loss of (mutual) trust	Fragile basis for sustaining trust, hope, and commitment to values	Ability to maintain/restore needed fundamental trust and hope

Adapted from: Wigboldus, S., Jochsemsen, H., 2020. Informing the governance of STE resilience by integrated and normative perspectives. https://research.wur.nl/en/publications/informing-the-governance-of-ste-resilience-by-integrated-and-norm (accessed 24 February 2021).

Appendix 2 Illustrating the wide variety of resilience and vulnerability indices



Source: Beccari B., 2016. A Comparative Analysis of Disaster Risk, Vulnerability and Resilience Composite Indicators. PLOS Currents Disasters. 2016 Mar 14. Edition 1.

Name of framework
Rockefeller Foundation's Asian Cities Climate Change Resilience (ACCCRN)
Assessments of Impacts and Adaptations of Climate Change (AIACC) Sustainable livelihood approach
Action Research for Community Based Adaptation (ARCAB)
ARUP's City Resilience Framework (ARUP)
UK Department for International Development Building Resilience and Adaptation to Climate Extremes and Disasters framework (BRACED)
UNDP Community-Based Resilience Analysis (CoBRA) Framework
Constas and Barrett's Principles of Resilience Measurement for Food Insecurity (Constas and Barrett)
Mayunga's Capital-Based Approach to Community Disaster Resilience (Mayunga)
Feinstein International Center's Livelihood and Resilience Framework (Feinstein)
International Institute for Sustainable Development's Climate Resilience and Food Security (IISD)
UN Food and Agriculture Organisation's (FAO) Self-evaluation and Holistic Assessment of Climate Resilience of farmers and pastoralists framework (SHARP)
International Institute for Environment and Development's Tracking Adaptation and Monitoring Development (TAMD)
Technical Assistance to NGO's (TANGO) Livelihood Framework
Characteristics of a Disaster Resilient Community (Twigg, 2009) (Twigg)
UN/ISDR Disaster Resilience Scorecard for Cities (UN/ISDR)
USAID Measurement for Community Resilience (USAID 2013)
USAID Coastal Resilience (Indian Ocean Tsunami Warning System Program) (USAID 2007)

Source: Schippers and Langston, 2015.

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Report WCDI-21-141

Wageningen Centre for Development Innovation supports value creation by strengthening capacities for sustainable development. As the international expertise and capacity building institute of Wageningen University & Research we bring knowledge into action, with the aim to explore the potential of nature to improve the quality of life. With approximately 30 locations, 6,500 members (5,500 fte) of staff and 12,500 students, Wageningen University & Research is a world leader in its domain. An integral way of working, and cooperation between the exact sciences and the technological and social disciplines are key to its approach.

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