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# Using Thresholds of Severity to Threats to and the Resilience of Human Systems in Measuring Human Security

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**Abstract** Ever since the contemporary view of the concept of human security has expanded from a state level to an individual level, it has been tied to a normative measurement of risk from perennial and pervasive threats that affect the vital core of human values. The vital core comprises an individual's set of functions for development relative to conditions such as safety, freedom, and wellbeing. Despite theoretical advances, a universal method for operationalizing the current human security concept has not yet been fully achieved. In this paper, we review different indicator-based frameworks in order to suggest a more feasible measurement of security at the individual level at different geographical scales. We see that a procedural evaluation at this level could be enhanced by using indicators based on (1) a severity threshold for risks that arise from threats that affect the vital core of an individual and (2) the overall capacity of an individual to respond to these threats. Suitability, accessibility, and reliability of data for evaluating the indicator variables of a particular security objective, however, could be a challenge when determining the variables on a local scale. Combining variables of varying quantitative and

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qualitative data types seems plausible only that there exists a grey area on which scale and dimension the approach can be more effectively applied.

**Keywords** Individual threshold · Risk · Resilience · Human values · Security

## 1 Introduction

In 1994, the United Nations Development Programme (UNDP) presented a major change in the interpretation of security when it reconceptualized the term “human security.” The reconceptualization essentially centered on individuals and their safety from chronic threats such as hunger, disease, and repression, and from sudden and damaging disruptions in the patterns of daily life (e.g., homes, jobs, and communities). Ul Haq (1999) considered this a paradigm shift where human security, which now looks at the protection of the vital core of human values in ways that ensure human freedom and fulfillment, became more concerned with human development (Commission on Human Security CHS 2003; Owen 2004).

A normative approach to operationalizing human security consisted of determining the threats to human values, including basic individual liberties, economic needs, or physical safety (e.g., Hampson et al. 2002), and managing the external factors that hamper an individual’s ability to make choices or inhibit the efficacy of freedom [Human Security Unit (HSU) 2009]. The state, as a principal actor, has to undertake domestic or foreign policies and conflict management systems to ensure a people—focused security outcome and guarantee the wellbeing and protection of individuals from risk (Hastings 2010; Tadjbakhsh and Chenoy 2012). This requires an action—oriented procedure that addresses a set of central questions regarding threats and which approach institutions should be used for a security evaluation (Rothschild 1995).

But what are threats? In the literature, threats are anything that could present a critical consequence to life and livelihood, whatever the source may be (Newman 2010). Some are caused by conditions such as a decrease in access to and the ability to afford energy (Bohi et al. 1996; Jansen 2009) or lack of access to and insufficiency of food (USDA 2006). They can be spatially characterized based on the area of affected systems (Alkire 2003), such as local, which affects small scale economies, or global, which rapidly spills beyond national frontiers and becomes transnational (UNDP 1994; Bajpai 2000). Although threats are more often location-specific (Jolly and Ray 2007), they can spread further across national borders and through their populations (MacLean 2006).

## 2 Analyzing Human Security Concepts

In practice, all potential threats that could harm an individual’s fundamental set of functions should be considered in analyzing security. Wolfers (1952), following the traditional conception, introduced a quantitative method by a straightforward analysis of threats to the state from risks to national territory. However, in the new conception, the HSU (2009) developed a hybrid approach that is people-centered, multi-sectoral, comprehensive, context-specific, and prevention-oriented. This approach modernized the security analysis

as it emphasized the complexities and consequences of threats based on individual nature and capacity.

Despite this development, there remains considerable discussion on how to achieve a universal method for operationalizing the concept (Tadjbakhsh 2005). One concern is that the concept, having been deliberated upon to various extents, has already been overloaded with definitions. Most of these, however, can be grouped respectively as broad or narrow conceptions and the majority utilizes both theoretical and practical applications (Owen 2004). The broad approach is the one that currently commands the most support and tackles a range of manifold challenges to economic, societal, and environmental systems encompassing both material and quantitative aspects and hitherto less-regarded issues affecting individuals (Tadjbakhsh and Chenoy 2012).

The most authoritative approach within the broad school conception is the one adopted by UNDP, where security was understood to comprise seven components, namely, economic, food, health, environmental, personal, community, and political (Table 1). This conception has reinforced narrow conceptions about protection from unstructured violence (MacLean 2002) such as environmental scarcity (Homer-Dixon 1999) or demographic pressure in accessing resources (Thakur 2004), and places less emphasis on material aspects in the analysis as people become more important than resources (e.g., Leaning and Arie 2000).

Two conditions were found crucial in undertaking the UNDP approach. First, since the focus is now on the individual, many multi-sectoral frameworks for analysis have emerged. This includes equitable access to services in a healthy environment (Lonergan et al. 2002), progress on human development (Ul Haq 1999), sustainable livelihoods (Scoones 1998), and wellbeing (Sen 1985). Second, potential risks have broadened to a variety of sources such as environmental degradation and inadequate access to resources (Lonergan et al. 2002; UNDP 1994). Some projects that attempted to connect this concern to the occurrence of large-scale social conflicts i.e., Toronto Project (Baechler 1998); Environment and Conflict Project ENCOP (Homer-Dixon 1999) were unsuccessful although they contributed by placing the issue on the human security agenda (Fraser et al. 2003).

In this paper, we aim to contribute an approach for operationalizing the human security concept by looking at the vital core and with reference to UNDP's approach. First, we look at the risks from various threats that affect individual security levels. We consider risk to threats as a potential effect to an individual based on frequency and impact of various threats (exposure) and the individual's prevailing conditions (vulnerability) (e.g., Orenco and Fujii 2014). Then, we illustrate how the resilience of human systems has gained importance in ensuring security by highlighting some community-level developments in the Philippines, United States, and Japan. Finally, with reference to security frameworks that follow a component-based system (Nef 2006), we explore how an effective procedural evaluation of a particular human security construct would benefit from an approach to operationalization at the individual level by using indicators based on the level of an individual's severity threshold for risk and their capacity for resilience.

### 3 Resilience of Human Systems

The belief that threats cannot be prevented from occurring has underpinned the idea of resilience building in order to reduce the consequential impacts on people (Jimba et al. 2011). Described as the ability of a social system (e.g., individuals and communities) to

**Table 1** The human values of various human security components, their main threats as modified from UNDP (1994) and HSU (2009) and some sources of data for analyses

Components	Human values	Main threats	Some data sources for analysis		
			Global	National	Local
Economic security	Access to secured income/employment, fair pay and conditions for housing and other services	Persistent poverty, unemployment	WB data OECD statistics ADB reports MDG data UNDP reports	National statistics MDG data UNDP reports	National census data MDG data
Food security	Physical and economic access to food	Hunger, famine	FAO reports UNDP reports	FAO reports Agricultural statistics	
Health security	Access to preventative/curative medicines and services, nutrition, sanitation, clothing and clean water	Deadly infectious diseases, unsafe food, malnutrition, lack of access to basic health care	WHO reports ADB reports UNDP reports	Demographic and health surveys Health statistics ADB reports National agency reports	Demographic and health surveys MDG data
Environmental security	Policies and practice to ensure sustainability and protection of land, air and water environment and its resources	Environmental degradation, resource depletion, natural disaster, pollution, environmental change	IUCN red list Convention on biodiversity UNEP reports INGOs like WWF, Greenpeace	Environmental assessment reports Resource valuation studies National agency reports	Environmental surveys
Personal security	Safety against threats of violence, crime, war and abuse	Physical violence, crime, terrorism, domestic violence, child labor	CIA Factbook	National agency reports	
Community security	Protection of community groups including family and ethnic groups	Inter-ethnic, religious and other identity-based tensions	AHDS	Agency for indigenous communities	
Political security	Human rights, right to vote and express political views	Political repression, human rights abuses	CIA Factbook	National security agency reports	

ADB Asian Development bank, CIA Central Investigation Agency, FAO Food and Agriculture Organization, IUCN International Union for Conservation of Nature, MDG Millennium Development Goals, AHD Arts and Humanities Data Service, UNDP United Nation Development Programme, UNDP United Nation Environmental Programme, WB World Bank, WHO World Health Organization, WWF World Wildlife Fund

absorb, change, and persist (Klein et al. 2003), resilience enables the system to sustain less damage when exposed to threats. Moreover, the system tends to recover because of its inherent behavioral strategies (Buckle et al. 2000) and through the application of non-structural mechanisms including policy, awareness, knowledge, public commitment, information, and participation (Twigg 2007).

More often, the degree to which the social system has been capable of learning from past experiences has influenced putting the elements in place (Adger 2006). Observing from Japan's experience, community resilience begins to increase as networks of individuals transform and develop more cohesion (Childs 2008). In a different world setting, a culture of indigenous systems of response to a threat in the Philippines, which grew as a result of the absence of modern day mitigation measures, has become the prevailing strategy for adaptation (e.g., Orencio and Fujii 2013b).

On the other hand, there is also engineering resilience that emphasizes stability, nearing a steady state or achieving a relatively stable condition (Gunderson and Holling 2002). The United States, for example, has initiated a resilient critical infrastructures approach. In their recent National Infrastructure Protection Plan (NIPP), structural reformations were undertaken to ensure assets and networks are secured [US Department of Homeland Security (USDHS) 2013]. This program was practically influenced in part by the incident in Japan where an underestimation of the effects of large-scale hazards (e.g., tsunami) has provided evidence of systemic problems in security and management (Acton and Hibbs 2012).

As observed, despite the hard science that comes with preparedness, technical aspects cannot readily ensure a complete resistance when in harm's way. Hence, governments also have to consider human aspects. Local knowledge, for instance, has saved people from disasters. One example is during and after the March 11 tsunami in Japan, where many of the children survived because they faithfully followed the advice they learned in school—to evacuate to higher ground just after a tremor (Jimba et al. 2011). Another example is the community in the province of Camarines Sur, Philippines, which put up a flood-water monitoring system by working with residents from the community to watch for incidences of flooding during extreme rain on a rotational basis (e.g., Orencio and Fujii 2013b).

## 4 Managing Risk by Building Individual Resilience

The positive effects of having resilient communities prompted some institutions, including the US Federal Emergency Management Agency (FEMA), to initiate a whole-community approach for managing hazards and disasters (FEMA 2011). FEMA shifted from a process-oriented approach to a needs-based approach at the individual level. It created a whole new perspective, where the situation can be assessed in terms of how risk was managed, for example, understanding the effects of government actions on individuals in their process of recovery to a normal state. It also indicated how people can be assisted in their attempts to rebuild from a disastrous experience. In FEMA's recent NIPP (USDHS 2013), security and resilience were strengthened through risk management, whose strategy involves building a partnership of individuals and institutions.

Flynn (2007) believed that it is mostly confidence and optimism that has driven the individual capacity to participate in resilience building. When coupled with further promotion and empowerment, however, more individuals could assume the role of local leaders that would be responsible for future development (Bankoff 2007). For example, in



the Philippines, disaster survivors were made vital participants in planning for a disaster situation because their experiences could contribute to a more effective system for disaster risk-reduction and management. In Japan, an increase in citizen involvement could be expected if government action would capitalize on individuals who were critically important in undertaking preemptive actions (Jimba et al. 2011).

These examples of measures undertaken by countries of different economic levels illustrate the necessity of having resilient communities that can counter the negative effects of threats and achieve human security. Although mostly undertaken at the community level, resilience was observed to be built upon individual capacity. One of the key factors for resilience is the perception of safety, especially for individuals who were most affected during occurrences of disasters. Experience has taught people to become more connected with security schemes that target the most at-risk individuals, including the poor, uninformed, under-networked, and disengaged individuals of the community. Orencio and Fujii (2014) wrote also that prevention is the one of the best approaches and this may include activities that enhance public awareness of potential natural hazards and establishment of an emergency warning system. Hence, involving them in developing the mechanisms for managing the emerging risks could further improve the risk management process.

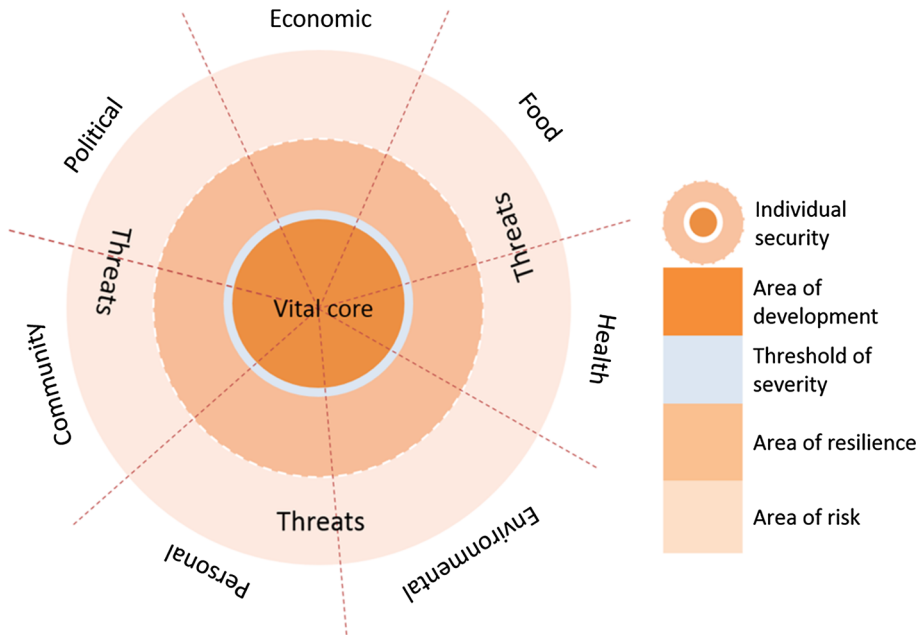
## 5 A Conceptual Model for Measuring Security at the Individual Level

The importance of resilience in human systems suggests that a solitary focus on vulnerability to risk in conducting robust security evaluation and management may not be sufficient (Webb and Wills-Herrera 2012). Not only does this overlook related opportunities for increasing human capabilities (Khagram et al. 2003) and chances to deal with change (UNEP 2002), it also fails to take people's abilities into account. Individuals have an inherent and unique capacity to counter any threat, which has permitted them to cope with or at least moderate any threats (Orencio and Fujii 2013a). Hence, resilience elements were understood to make up the essentials of individual security given its connection with human capability to pursue quality life (Nussbaum and Sen 1993) within circumstances favorable for development (Margarit 2009).

Against this backdrop, we propose a conceptual model that looks at both risk and resilience for undertaking human security measurements at the individual level (Fig. 1). This model suggests considering individuals as referent objects in an attempt to assess a certain security objective by looking at which point or level the vital core may be threatened or exposed in situations of critical danger (Amouyel 2006). The individuals' vital core has something to do with various aspects of capabilities and freedom that could enable activities and conditions that they have to do and to be in, respectively (Alkire 2003). It comprises of elements of individual human rights that pertains to values such as survival, livelihood and basic dignity.

In Fig. 1, we show that threats to the elements could come from various causes and the risks they pose to individuals can vary based on their prevailing human circumstances. Nonetheless, we argue that the resulting conditions generally depend on the inherent capability of individuals and support systems to counter the negative effects of risk. For instance, risk to flooding events could affect the distribution and access of food by the individuals while it could also bring water-borne diseases such as schistosomiasis and leptospirosis. The changes caused by the events in the two sectors may affect the individuals in varying degrees depending on their threshold levels for food and health,



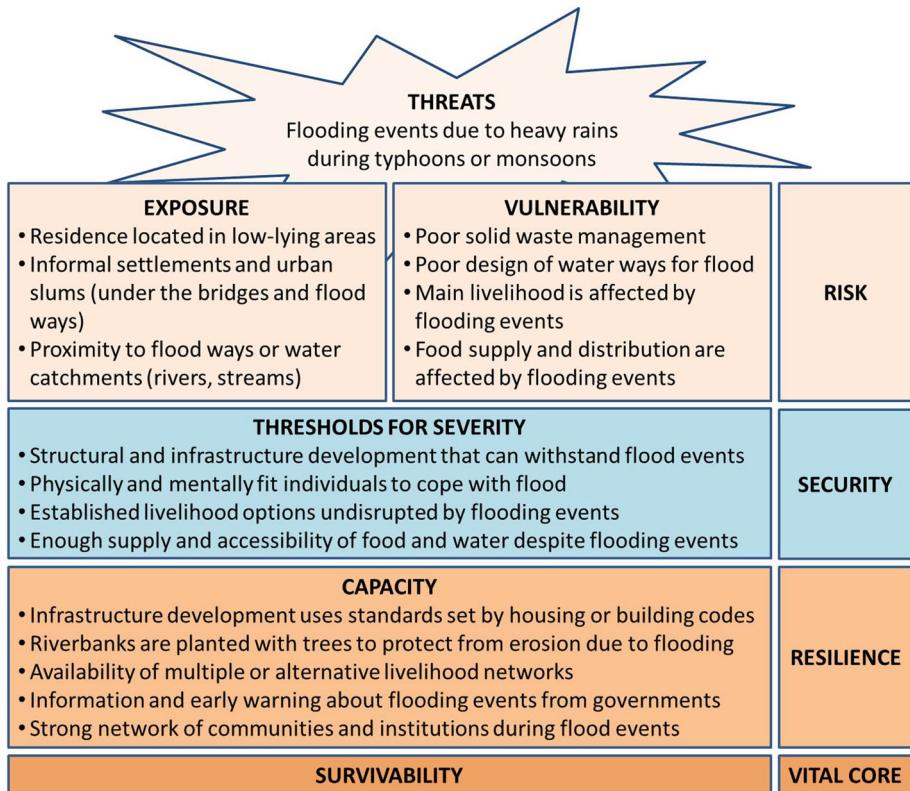


**Fig. 1** A conceptual illustration of individual security achieved from the absence, or presence of threat, and not exceeding a threshold of severity of the vital core

respectively. Some of these could even be referred to as analytical values, like protection and empowerment, that could be used for understanding people's ability to cope with on-going threats (e.g., Ogata and Sen 2003).

In this conceptual model, we first suggest an assessment of simultaneous threats that affect the individual based on certain thresholds for severity of threats to the vital core of human values (e.g., King and Murray 2001; Owen 2004). Threats can become simultaneous when they affect the different dimensions of human security at the same time though in varying levels. With or without a threat, these thresholds are considered to represent the minimum conditions or standards needed by an individual to achieve human security. They include the core elements of development, such as human rights, to which an individual is directly entitled (Caney 2010), and were classified according to UNDP components in order to identify directly the causal threats or related issues affecting the vital core. These issues comprising the downside risks (Fukuda-Parr and Messineo 2012), external factors produced by different goals for enhancing security (Tadjbakhsh and Chenoy 2012) or non-armed conflicts that compromise livelihoods (Barnett and Adger 2007) should be analyzed to provide an appropriate context-specific system for security management.

In order to illustrate how an assessment of human security could benefit from the use of the model, we discuss the occurrence of severe flooding in urban Metropolitan Manila in the Philippines, as an example (Fig. 2). In this area, about 20 % of the population is considered to be at risk from flooding. Most flood incidences are caused by typhoons and seasonal monsoon rains, to which in the last 5 years have resulted in mass displacements and loss of livelihood and properties. Among the many people that are continuously exposed to this risk are the communities and individuals that are living in urban slums and informal settlements that are usually located in unsafe areas (e.g., near the river systems,



**Fig. 2** A graphical illustration of how to assess individual security during flooding events in Metro Manila when viewed at the vital core, survivability

under the bridges and on the dumpsites). This is further exacerbated by the lack of appropriate infrastructural development and the people's poor regard to proper waste disposal system. The people tend to clog the metro's waterways with their solid wastes thus, contributing to faster rate of inundation on a relatively longer water residence time.

Although vulnerability or exposure could worsen the resulting risk and compromise individual safety and survivability, an increase in individual capability or having the enabling mechanisms in-place could mitigate negative effects. For instance, subjecting individuals to the same intensity of rain may not bear the same risk to floods because the physical and locational conditions and the way individuals try to prepare themselves from the potential threats vary per person. Anecdotal evidences have also shown that the long and recurring exposure to floods has allowed some people to establish a certain kind of adaptation that enable them to cope with the negative effects. Their experiences, perceptions and constant practices prior, during and after any flood events have been the subjects of many studies because of the recognition that it has something to do with capability (e.g., Orencio and Fujii 2014). This capability also includes external activities not limited to having a stronger network of community rescuers, early warning systems or response and recovery mechanisms.

From what we have observed in Fig. 2, individual risk varies across individuals and communities as this increases or decreases depending on how exposed, vulnerable or capable the people is. For example, the inability to swim or a chance to live in a one-story house in a frequently inundated area could increase or lessen the vulnerability of an individual to a flood event, respectively. Residency in high location and/or near a good and functional drainage, despite exposure to floods, could result to minimal effects. This scenario has also been also influenced by personal capability and the external support that enable individuals to cope and make adjustments when flooding comes.

From this example, we could observe how these mechanisms interact to bring about a level of risk that affects the vital core (e.g., survivability) of individuals. We see that a minimum level of required capacity, as well as the acceptable level of vulnerability and exposure, are needed for understanding the degree to which an individual is considered at—risk to flooding events. The minimum levels for this reference are thresholds, which in all cases, may include the individual's physical and psychological imperatives to sustain the effects of any hazard as well as economic, social and governance imperatives for communities and institutions to ensure sustainable development.

## 6 Individual Level Thresholds

In general terms, a threshold is defined as a magnitude or intensity of stimulus that must be exceeded for a certain reaction, result, or condition to be manifested. From perspectives of human geography and psychology, the term connotes a positive effect that measures an area of economic feasibility, or the start of a neural impulse, respectively. Hypothetically, once the thresholds are exceeded by threats, these become risks that may affect the individual. The effect, however, which includes a range of maldevelopment that contributes to individual insecurity, may depend on the capacity of the individual to make the necessary adaptation. This capacity is broad, consisting of physical infrastructures and social behavior that moderates the direct effects of risk.

Lonergan et al. (2000) was the first to apply the term “degree of severity” to threats and assessed this degree of severity based on certain thresholds. King and Murray (2001) operationalized security by referring to the domains of wellbeing to determine a state of generalized poverty, using threshold values for income, health, education, political freedom, and democracy. Rummel (2001), on the other hand, looked at the economic development of people, levels of wealth and prosperity, and threats to lives from political turmoil and equated the analysis with freedom. He aggregated the values of these thresholds based on their accuracy and relevance that result from a statistical inference.

Likewise, a human security audit was constructed by Bajpai (2000) by using quantitative sets of reference values for evaluating threats to safety and freedom and the capability of individuals to meet them in various development scenarios. Meanwhile, in order to measure psychosocial security, Leaning and Arie (2000) indicated values for a sustainable sense of home, constructive social and family networks, and acceptance of the past and a positive grasp of the future. The values were determined from inverse measurement of conditions of social dislocation, dynamic inequality, and discount rates, respectively. A summary of indicators based on thresholds as reference values for measuring a particular security framework are presented in Table 2.

The review of indicator-based frameworks showed that assessing human security based on certain threshold values can be conducted. It has suggested three important

**Table 2** A summary of selected security frameworks and their indicators for measurements

No.	Index name	Framework for discourse	Security definition	Components	Indicators	Methodology	Authors
1	General poverty index	Economic wellbeing	A state of generalized poverty, which exists when a human being ranks below a predetermined threshold in any of a number of domains of wellbeing	Income Health Education Political freedom Democracy	GNP per capita converted to purchasing power parity Quality of health scale Literacy rate or average years of schooling Freedom House measure of societal freedom Fraction of adults able to participate in elections	Measuring the Years of Individual Human Security (YIHS), which indicates the number of years that an individual spends in a state of generalized poverty using a scale of 0–1 Measuring Individual Human Security (IHS), representing the proportion of an individual's lifespan that s/he could expect to spend outside of a state of generalized poverty Aggregating the YIHS for a particular population to yield the Population Years of Human Security (PYHS)	King and Murray (2001)
2	Human security audit	Societal safety and freedom	Relates to the protection of the individual's personal safety and freedom from direct and indirect threats of violence	Direct and indirect threats	Violent crime, abuse of women/children Terrorism, genocide, government repression Societal violence, international war, banditry, ethnic violence Interstate wars, weapons of mass destruction, landmines Lack of basic needs, disease, employment levels, population growth or decline, natural disasters Population movement, environmental degradation, unequal consumption	Measuring the potential threat to the individual Measuring the capacity of the individual to cope with potential threats (capacities of government and individual)	Bajpai (2000)

**Table 2** continued

No.	Index name	Framework for discourse	Security definition	Components	Indicators	Methodology	Authors
3	Index of Human Insecurity (IHI)	Socio-ecological adaptation	A cumulative causal relationship between environment and personal safety that is achieved when individuals have the physical and political option to adapt to threats	Social Environment Economic Institutional	Urban population growth Young male population Maternal mortality ratio Life expectancy Net energy imports Soil degradation Safe water Arable land Real GDP per capita GNP per capita growth Adult literacy rate Value of imports and exports of goods and services Public expenditures on defense versus education Gross domestic fixed investment Degree of democratization Human Freedom Index	Time-series and national-level data of all indicators are collected Standardization of data into a common scale, which is crucial to the validity of the final measurement Compilation through cluster analysis, assigning a degree of severity (insecurity) between 1 to 10 per indicator	Loneragan et al. (2000)
4	Human Security using Threat Analysis	Psychosocial wellbeing	A psychosocial condition for sustainable human development that in times of acute crisis or chronic deprivation protects the survival of individuals to attain minimally adequate standards of living, and promote constructive group attachment and continuity through time	Conditions resulting from a sustainable sense of home, constructive social and family networks, and acceptance of the past and a positive grasp of the future	Inverse conditions related to social dislocation, dynamic horizontal inequality, and discount rates	Qualitative and quantitative metrics using negative indicators Score cards that contain measures of access to basic material resources	Learning and Arie (2000)

**Table 2** continued

No.	Index name	Framework for discourse	Security definition	Components	Indicators	Methodology	Authors
5	Measures of Human Security	Human freedom	People's freedom is closely intertwined with human security such that the more rights a people have, the greater is their human security	16 Political variables whose data were gathered from 190 nations	Civil liberties Increase and decrease of civil liberties Political rights Increase and decrease of political rights Freedom Increase and decrease of freedom Economic freedom Increase and decrease of economic freedom Socialist past or present British legal origin French legal origin Government accountability Government effectiveness Government regulations Rule of law Government honesty	Determine the indicators for freedom using component factor analysis Order the loadings and omit loadings below .40 or variables with less than 16 % of the variance in common with the dimension Using the two largest dimensions determine the component scores which were used in an analysis of human security	Rummel (2001)
6	Threshold of Severity	Human development	The protection of the vital core of all human lives from critical and pervasive threats emanating from environmental, economic, food, health, personal, and political factors	Economic Environmental Food Health Personal Political	Use of mortality rates from diseases, disasters and armed conflicts	Identify threats based on threshold of severity Collect data at local level using qualitative approach Spatial analysis and developing models to enable correlation	Owen (2003)

**Table 2** continued

No.	Index name	Framework for discourse	Security definition	Components	Indicators	Methodology	Authors
7	Human Security Index	Human development	The attainment of physical, mental, and spiritual peace or security of individuals and communities at home and in the world—in balanced local/global context	Economic Environmental Social (Education, Empowerment, Diversity, Peacefulness, Food security, Health, Governance)	Income resources from pocket of typical people [GDP per capita, Income inequality (GINI Coefficient)] Environmental vulnerability index, Environmental performance index, GHG emission per capita, Population growth rate Literacy rate, Press freedom index Gender gap index, Global peace index, World prison population list, Political terror scale Undernourished people, People below local poverty index, Food imports in comparison to exports, Food insecurity, Land production change Life expectancy at birth, Population using improved water resources, Health outcome equality Political stability, No violence, Illegal corruption, Legal Corruption	Mapping each component index fabric using the collected information from institutions and agencies Combining the indices to map the human security fabric	Hastings (2010)



considerations in constructing the indicators and composites when approaching a human security measurement at the individual level. First, a particular objective should be defined based on a specific security issue because this will determine which set of components and their interrelationships could be used for a conceptual model (e.g., Fig. 1). Second, the spatial scale should be set because this would drive which variables were currently available in real data format. It is important to know the information that relate to various domains such as social, economic, governance and environmental.

Third, selecting the dimension for measurements should be based on the available information. Data types vary according to scale and this can be gathered from various sources (shown in part in Table 1). Otherwise, in the absence of real data, some qualitative approaches may be explored for valuing the indicators. Data generated from qualitative and quantitative approaches, however, differ in terms of quality and relevance based on the objective of the assessment, and depending on the geographical scales. Hence, we suggest a systematic determination of the threshold values prior to the conduct of the assessment. In the following sections, these were considered in devising a measurement of human security at the individual level.

## 7 Security Indicators and Their Composites

To express a framework abstractly and define a particular human security objective, all components and their interrelationships are presented in a conceptual model. Using indicators to describe system components is a method that has gradually gained ground because of their ability to represent and describe the complexity of a system in a quantitative and transparent way (Gallopín 1997). The compositions, however, vary enormously depending on how a particular conceptual model has been constructed, usually based on an empirical significance to a certain objective (Booyesen 2002). However, when valued and grouped together, these different representations can be used to characterize the real world based on the theoretical concepts used (Hiete and Merz 2009).

The Organization of Economic Cooperation and Development (OECD), the organization that created indicators for human wellbeing, discussed how indicators could be combined to form a composite or index. The most popular among the indices developed is the Human Development Index (HDI), which is concerned with realizing people's wellbeing by achieving the basic human capabilities [Human Development Report, HDR (UNDP 1990)]. The current indicators for HDI have become extensive because of the realization that not all development outcomes were economic. On a related note, a Sustainable Development Index (SDI), based on the Roots Index developed by Hoffman (2000), can be used to measure local development using seven categories, namely, education, health, environment, housing, infrastructure, legal economy, and equal opportunity.

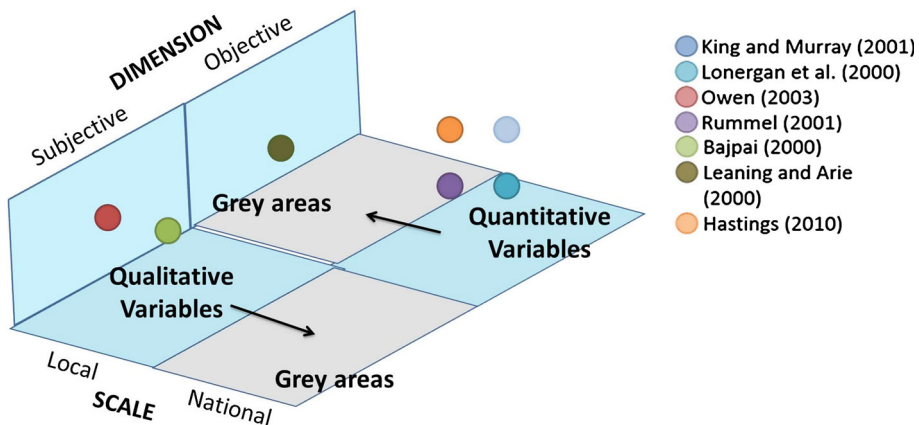
A pioneering work on developing a security index was initiated by the Global Environmental Change and Human Security (GECHS) project. Sixteen indicators were grouped into six major categories for an Index for Human Insecurity (IHI) to distinguish countries based on their level of insecurity and the extent to which this level is linked to global environmental change (Loneragan et al. 2000). IHI assessed the vulnerability of societies to insecurities and to changes using functional and structural specific indicators. A more integrative and global approach to measure human security was encapsulated in a Human Security Index (HSI). HSI incorporates over 150 input datasets overall when one counts the source data used in the index (Hastings 2010).

Some security-related indices were also constructed on a sectoral level like the System Average Interruption Duration Index (SAIDI). This reliability index is developed for electric power utilities and computes energy security based on the average outage for each served customer. A Food and Human Security Index (FHSI), which outlines the food security embodied by conventional agricultural food policies and practices developed by Carolan (2012), takes into consideration macro level indicators that look at individual and societal wellbeing, ecological sustainability, food dependency, nutritional wellbeing, and food system market concentrations. Sullivan et al. (2010) developed a water index, the Rural Water Livelihoods Index, to understand water-related components that influence rural livelihoods and suggest how to support poverty alleviation.

## 8 Determining Individual-Level Indicators

We observe that the indicator-based frameworks in Table 2 are basically context-driven and they follow specific objectives for measuring human security. Most measurements were carried out pragmatically based on the availability and treatment of scale and data. The approach to measurement can always be challenging especially when moving towards utility. We see that a larger scale (e.g., national level), which involves quantitative values, enables an objective approach but a more subjective method can be more appropriate when the scale of assessment becomes smaller (Fig. 3). Depending on the approach, it is however important to know the extent qualitative or quantitative variables can be used to conduct an analysis in transboundary systems or areas that go beyond the local scale but lesser than the national scale.

On the other hand, we also see the opportunity of mixing the two variable types in conducting subjective or objective approaches depending on scale. For instance, the use of a combination of qualitative and quantitative variables in a subjective approach for measuring human security at the individual level in a local scale can be observed (e.g., Leaning and Arie 2000). Because of the potential applicability, we believe that subjective methods for a concept-driven approach can actually extend and cover a larger scale. This



**Fig. 3** Illustration of how variables are available and used by prevailing approaches in operationalizing security across various scales

assumption is due to the fact that qualitative methods such as internet surveys or real time Delphi methods can now provide quality data beyond the local scale. When combined with hard data, this can supplement the values needed for an analysis especially, when hard data is lacking. The extent of how to do such an approach in a dimension that combines the two variable types in a common scale also has created a grey area in this discourse.

While it may be promising that human security objectives and the individual should complement, to distinguish the components (e.g., risks and resilience) at this level has posed some analytic and policy difficulties (Heinbecker 1999). This difficulty stems from understanding the nature of issues and determining the systems and scales for an assessment. For instance, a risk could be characterized based on the scale of a threat and its effects on people's lives and property. When referring to the degree of severity of threats to the vital core to analyze the effects on security, it could be assumed that assigning a low or zero score that constitutes a low risk would mean a high security evaluation.

Assessing resilience at the individual level could likewise be difficult because of the shared conditions characterized by the communities to which they belong. Margarit (2009) argued, for instance, that an individual's sense of security is directly connected to the circumstances of his/her group. In contrast, a single individual's insecurity condition, associated with the incapacity to manage threats because of low perception of its effects on their person, could compromise the overall security of a community. The extent of effects in this situation may also be significant in larger-scale situations when influenced further by person-to-person interactions.

Meanwhile, some interactions can result from externalities, which, like threats are transborder. They can emanate from a particular geographical area and have a global effect (Lake et al. 1997). Externalities usually take the form of a benefit or cost that spill over from conditions that cause them (Fusfield 1987). One example is the emergence of globalization, which, despite contributing to an economy, can also be damaging to a system because of the competing trends of regionalization. To an affected individual, the effects and costs of externalities could vary depending on the extent to which the development change was beneficial or not. As such, the response and recovery could likewise vary as access to and the quality and quantity of resources used in the process may be dependent on the interests of other contending individuals (Kahl 2006).

## 9 Valuing the Individual-Level Indicators

In reality, and as observed from the illustration in Fig. 3, it is not easy to comprehend fully all the components of a particular objective because of the underlying complexities. One issue is that real data at household level, which are the most sought after to quantify indicator variables, are usually missing in the current approaches (Dercon 2001). Not only does this limit the spatial application of an indicator-based approach, but it also lessens the effectiveness of selected variables in giving a picture of the real situation. The prevailing tendency is to select variables that limit rather than expand a definition (e.g., Collier and Hoeffler 2001). As demonstrated in some studies that assessed vulnerability to risk, a lack of real data about stressors in an appropriate scale tends to result in a biased evaluation (O'Brien et al. 2004; Brooks et al. 2005). The lack of data sources has been the primary cause of unrelated and inconsistent variables during the conceptualization stage (Fekete et al. 2010).

There are areas that are seriously threatened where real data are usually available (Owen 2003). Orencio and Fujii (2014) also noted the increase in information systems immensely

in the last three decades and provide statistical data on people and places at risks. This is due to the fact that donors and development agencies are paying increase attention to data collection methods to analyze risks to various threats. However, in the absence of real data, a grounded empirical qualitative approach that utilizes personal experiences and perceptions in an assessment should be explored (e.g., Cummins et al. 2003; Wills 2009). When determining the components of human security, Hastings (2010) has suggested selecting variables that can be observed to better comprehend the objective. Owen (2008) has suggested referring to relevant threats within a specific scale and accepting an element of subjectivity by measuring local knowledge. When these individual characteristics are aggregated, they can be like mutual conditions (Nef 1999) that provide an overall description of a community (United Nations Environmental Programme UNEP 2002).

The use of indicators derived and valued from a qualitative approach is, relatively speaking, not a new method. It has even been popularized by the OECD. In particular, the OECD came up with three categories for framing indicators for a Framework for Action on Energy Security in the Pacific (FAESP). This shows how qualitative indicator values can be aggregated, labeled, and scored (Vivoda 2010). The use of participatory approaches by post-coding the responses in patterns is common (Moser 2003). Orenco and Fujii (2013a), for example, have demonstrated a vulnerability assessment by using values assigned for attitudinal statements that are oriented in an evaluative continuum like Likert (1932) scales, and collecting them through social surveys.

Corollary, we look at two methods for developing the threshold values. First method is to use mean and standard deviation from the collected data. Although this can be useful in both qualitative and quantitative data, applying this would also entail looking at how normally distributed the data are in order to be justified for its use. For instance, areas with large variations in socio-economic status welcome the problem of biased measurements. A second approach, which is based on expert opinion, could ride on an objective assessment of baseline data but only when it satisfies a normal and acceptable state or condition. For instance, if the percentage of household level dependency on fish for food is 40 % in the last year, having lesser fish supply to support the 40 % in this year would mean families have become less food secure. In most cases, this value can be validated or assessed by conducting a household survey.

In a case of a spatial approach to measuring security, using an issue-based method for identifying the variables could be more relevant. This includes narrowing down the focus questions for an assessment of human security and determining how quantitative or qualitative information can be made available at different scales (e.g., city or national levels). To set the dimensions for measurement, a boundary that takes into account the characteristics of the individuals in the target communities and their respective human values, and the hazards that threaten the values, and the means for mitigating their negative effects in this case would be of value to the assessment. Hence, operationalizing a human security measurement can be best observed pragmatically by recognizing first the issue and then checking the availability of data for an analysis.

From the results of the analysis of various indicator-based approaches, we can surmise that determining the thresholds for severity at the vital core could be complicated considering that no standard approach has yet been developed. This difficulty could be attributed to the grey areas surrounding two issues, namely, figuring out how to develop the objectives for measuring human security, and at which geographical scales subjective or quantitative methods can be used. Such a concern is noteworthy because this could influence the kind of approach for operationalizing a chosen human security objective at the individual level across a range of scales. Sen (1999) discussed alternative practical approaches that can be

likewise applied to the purpose and context for operationalizing human security. These include strategies such as direct, supplementary and indirect, which can be used in a variety of ways following no specific empirical formulations that are set in stone.

## 10 Conclusion

It has become apparent that understanding the term human security only in terms of national security is inadequate. Hence, shifting the referent object to people seems a necessity if policies and analysis are applied to this concept. Given that there is still no agreed definition of security, this is a convincing reason to discuss this issue in relation to individuals and their situation. By looking at the issues of vulnerability, the risk of threats, and the capability to manage threats, a measurement of human security at the individual level using a severity threshold for risk to the vital core would be the most likely approach. As an individual capacity, resilience is a necessary element in measuring the concept of security as it tends to absorb the negative effects of risk.

One aspect that it is important to specify in establishing threshold values is to identify the human security of a certain location using a measure of severity at the individual level, which could potentially range from a zero to a negative effect. There are two potential approaches for constructing the threshold values—one by establishing the mean and another by obtrusive observation and agreement by experts. In terms of security conceptions, it becomes more complicated and less feasible to evaluate an objective that utilizes a broader conception because of the tendency to lack data to support an evaluation. It is further observed that issues of data availability, integrity, and aggregation become increasingly problematic as the spatial scale of analysis decreases. To reinforce the lack of quantitative data for an analysis, qualitative approaches for establishing the variables at the local scales could be useful.

While it is conceivable that index systems can be used to operationalize human security, at the individual level, these systems may have to work within certain limitations, for instance, depending on circumstances such as the availability of data to quantify the extent of threats, and the current capacity, vulnerability and exposure of individuals in a chosen scale of study in order to assign appropriate threshold variables. It must be understood likewise that the index may either enhance or diminish the validity of the concept and the scope of definitions. Hence, instead of a multi-sectoral approach in framing security objectives, a more issue-based approach within a specific boundary would ease the process entailed for identifying the necessary components for a human security measurement. In the end, it could help decision-makers identify the opportunities for managing prevailing threats to individual security.

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