Indicators for the Local Risk Index (Indonesia)

Indicators used for the Local Risk Index

This chapter deals with the description of the indicators which are used on the local scale (Table 1) to capture aspects of exposure, susceptibility, coping capacity and adaptive capacity as well as their aggregation to the Local Risk Index. . The description of the indicators and how they got measured and weighted within the index system is explained and outlined according to the four major components: a)exposure, b) susceptibility, c) coping capacity, d) adaptation capacity. In the local context, indicators vary only for the vulnerability index and were chosen according to the same concept as the World Risk Index, thus trying to fill the sub-categories that were defined on a generic level. This means, that each indicator represents a feature of one of the four main components as well as one of the five subcomponents of susceptibility, coping capacity and adaptive capacity as illustrated in table 1. One advantage of the local index is the inclusion of data that was not available at global scale, for example on social networks and housing conditions. On the downside, some data that was available on global level was not available in the needed quality and resolution for the local level assessment (i.e. in the subcategories nutrition, medical services and financing). All indicators are represented separately in indicator sheets, which explain the used indicators in detail.

Table 1: Structural Components and Indicators of the Local Risk Index (Indonesia)

1. Exposure

Exposed Population in Regard to

A) Earthquakes
B) Cyclones
C) Floods
D) Droughts
E) Sea level rise

2. Susceptibility

Public Infrastructure

A) Population without access to improved sanitation
B) Population without access to clean water

Housing Conditions

C) Construction materials

Nutrition

Poverty and Dependencies

D) Proportion of population below the local poverty line
E) Assistance for the poor
F) Dependency ratio (proportion of under 15 – and above 65-year-olds in relation to the working population)
G) Proportion female-headed households

Economic Capacity and Income

H) Gross regional product per capita
I) Income distribution (measured by the Poverty Severity Index)

3. Coping Capacity

Government and Authorities

A) Sustainable security (Proportion of villages with at least one riot)
B) Unemployment rate

Disaster Preparedness and Early Warning

Medical Services

Social Networks: Neighbor-hood, Family and Self-Help

C) Number of cooperatives and social organizations per 1,000 inhabitants
D) Presence of active NGOs per village

Economic Coverage

E) Diversification of household income
F) Landownership
G) Income per capita

4. Adaptive Capacity

Education and Research

A) Gross school enrolment
B) Education achievement

Gender Equity

C) Percentage of female mayors and village heads

Environmental Status / Ecosystem Protection

D) Ecological Footprint

Adaptation Strategies

E) Economic diversification (Diversification of the labor market at district level)

Investment

Calculation of Exposure

The calculation of the exposure to natural hazards at the local scale is based on the same hazard data as the global calculation. According to that, PREVIEW model data on the average annual exposure to the four selected hazards (earthquakes, tropical cyclones, floods and droughts) (http://preview.grid.unep.ch/) and a sea level rise scenario map from the University of Kansas Center for Remote Sensing of Ice Sheets (CReSIS) (https://www.cresis.ku.edu/data/sea-level-rise-maps) are used.

For the local case study, population data at district level (Kabupaten) was taken from official Indonesian statistics and linked to the administrative units.

Similar to the calculation of global exposure, the local population exposed was then calculated using a geographic information system (GIS):

1. The physical exposure, expressed as expected average annual population (based on data from 2007) that is exposed to one of the selected hazards was derived by calculating the zonal statistic (sum of each raster values within the bounds of each zonal polygon within each district. This was done for every district and each hazard – except sea level rise.
2. The population exposed by 1m sea level rise was calculated by extracting the exposed population information from the 1m inundation file and the population dataset (CReSIS).
3. Droughts and sea-level rise are weighted less (0.5) than the other three hazards, as drought is less accurate (cf. Peduzzi et al. 2009) and sea level rise lacks the probabilistic component.
4. The exposed population-per-hazard was summed up and divided by total population, in order to obtain one exposure index per district.

Exposure	
Indicator (*1A-D*) *Physical exposure to earthquakes, cyclones, floods and droughts*	
Measuring unit *Percentage of expected average annual population exposed to hazards per district*	**Spatial and temporal scale** *national scale, based on population grids for the year 2007, provided by LandScanTM Global Population Database (30 arc second) and for the district level population data from 2006*
Data sources Preview database of UNEP Global Risk Data Platform (GRID) (http://preview.grid.unep.ch/) Village Potenzial Statistics, *Potensi Desa Survei* (PODES)	
Relevancy of indicator The exposure – measured as the total number of people exposed to the selected hazards (earthquakes, floods, droughts, cyclones) or rather the share of people exposed to a set of different hazards - is an important aspect for disaster risk. If not exposed, the country or population is not at risk. The knowledge of the population exposed is fundamental for raising awareness and the development of protection measures (e.g. identification of suitable shelters) and evacuation strategies (e.g. development of evacuation routes). Additionally, the share of people exposed to a set of hazards on the total population also provides a first overview about one problem dimension, in terms of answering the question: how many people are exposed or might be at risk?	
Validity/limitations of indicator The indicator is based on the average estimated number of people exposed to hazards per year. It results from the combination of the (annual) frequency of hazards (ex-post focus) and the total population living in the spatial unit exposed for each event. It thus indicates how many people per year are at risk. The indicator is dependent on quality of population estimates and accuracy of frequency estimation of each hazardous event. (Peduzzi et al. 2009)	
Remarks:	

Exposure	
Indicator (*1E*) *Population exposed to sea level rise (possible from 1m to 6m)*	
Measuring unit *Percentage of population exposed to 1m sea level rise*	**Spatial and temporal scale** *District level population data from 2006*
Data sources Sea level rise from 1m to 6m: University of Kansas Center for Remote Sensing of Ice Sheets (CReSIS) https://www.cresis.ku.edu/data/sea-level-rise-maps Village Potenzial Statistics, *Potensi Desa Survei* (PODES)	
Relevancy of indicator Sea level rise is clearly a major hazard for the future, in terms of further increase in the global mean temperature and impacts of climate change. Compared to floods or earthquakes, sea level rise is a creeping process that also implies irreversible changes. A population affected by floods might be able to return to the flood-prone area, areas covered by sea water will hardly be usable anymore for housing or agriculture. Sea level rise is considered a new hazard that particularly puts coastal populations at risk.	
Validity/limitations of indicator Population exposed to sea level rise is an important indicator for estimation of the impact climate change might have in the future. This indicator gives a general overview of people living within the most exposed (low-laying) areas such as coastal zones. It is desirable, however, to use more recent population estimates in combination with differentiated projections of sea level rise, in order to evaluate the severity of exposure with more precision. Including the projected changes it will also be possible to evaluate the time horizon of the extending exposure. No probabilistic component (annual exposure) available.	
Remarks: The assessment of people exposed to sea level rise is possible using GIS analysis, but is rather time-intensive. Results are dependent on the available data, thus the problem of scale should always be kept in mind. The development of the exposure index encompasses the following process chain: For each hazard, except sea level rise, and for each country, the physical exposure - which is the expected average annual population (year of reference 2007) exposed - was derived by calculating the zonal statistic (sum of grid values within the bounds of each zonal polygon) within each national level. The population exposed by 1m sea level rise was calculated by extracting the exposed population information from the 1m inundation file and the population dataset.	

Calculation of Susceptibility

Susceptibility is calculated in several steps. Figure 1 gives an overview of the different indicators within this factor and outlines the integration process of these indicators – including their weighting.

Susceptibility consists of nine indicators, namely A) Population with access to sanitation, B) population using an improved water source, C) construction materials, D) proportion of population below the local poverty line, E) Assistance for the poor (population receiving direct cash-transfer assistance), F) the total dependency ratio, G) proportion of female-headed households H) gross regional product per capita and I) income distribution.

In order that all variables are measuring "positive" characteristics of a community or society (e.g. access to water and sanitation), the values had to be subtracted by 1 to measure the part of the population not having access, i.e. capturing deficiencies that cause a population to be more susceptible to harm. Thereafter, each indicator was normalized and weighted equally, in order to aggregate the indicators.

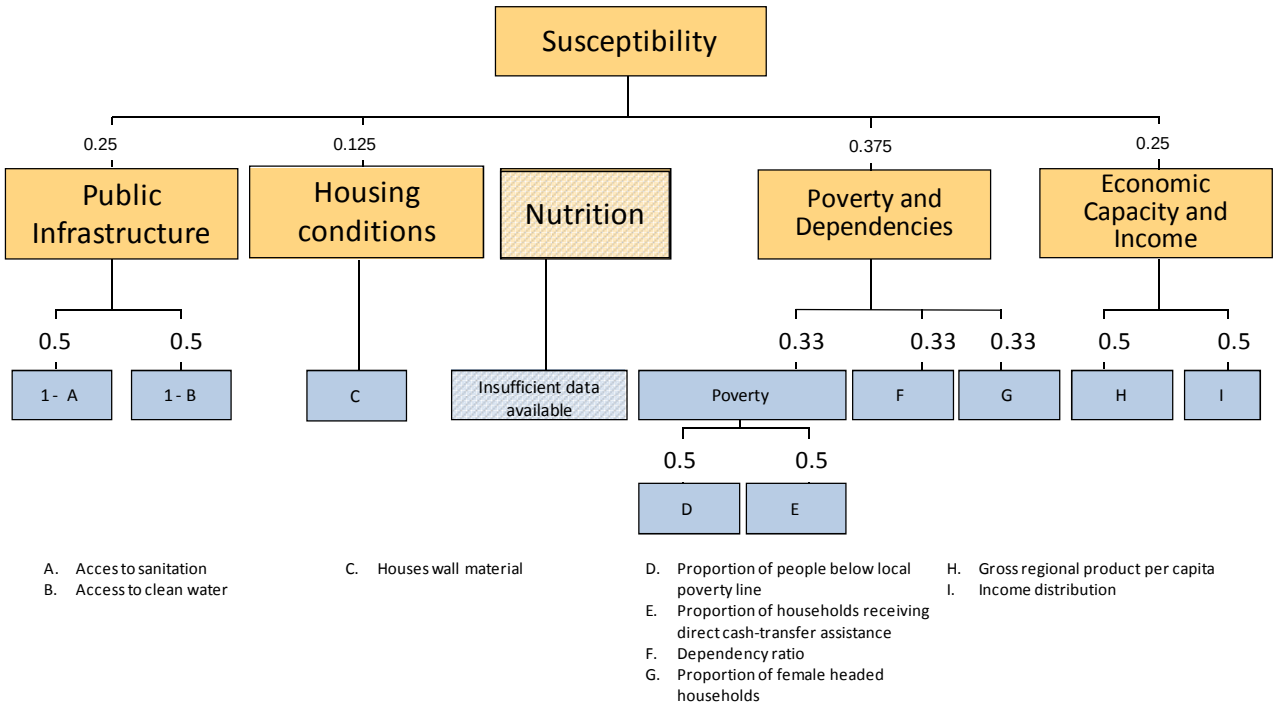

Figure 1: shows the various indicators and weights for the aggregated index of susceptibility

Susceptibility

Indicator: A

Population without access to improved sanitation facilities

Measuring unit	**Spatial and temporal scale**
Percentage of the population	*District*

Data sources

National Socioeconomic Survey (SUSENAS) 2006

Periodicity of data: annual

Relevancy of indicator

The population with access to improved sanitation facilities is an indicator of the quality of basic infrastructure, demonstrating quality-of-life and basic health condition of the population. Improved sanitation facilities (ranging from protected pit latrines to toilets with a sewerage connection) cannot only effectively prevent insect and animal contact, which are agents of diarrhoea, but also reduce other non-diarrhoea related health outcomes, such as scabies and helminthiasis (Esrey and Habicht 1986).

Improved sanitation should thus improve general living conditions and reduce child mortality rates. In this context, it can be concluded that people without improved sanitation are susceptible to diseases and can become more vulnerable following a hazard.

It has been identified as a key indicator of vulnerability at the national level by Brooks et al. 2005.

Validity/limitations of indicator

For Indonesia the criteria for improved sanitation, established by the Indonesian Central Bureau of Statistics are:

- Toilet facilities are alone or with: private sanitation (only used by the household), public sanitation (used by all households), shared sanitation (used by several households together)

- Toilet type is a swan neck (closet with U-shape –like swan neck- to keep the smell from the faeces)

- Fecal landfills is to use the tank / SPAL (disposal site in form of basin made of brick / stones / concrete with or without filtration site, as well as sewage system managed by the city government for the settlements)

These three criteria simultaneously applied define the condition of improved sanitation.

Key Literature:

Brooks et al. (2005); Esrey & Habicht (1986); Central Bureau of Statistics (BPS)

Susceptibility

Indicator: B

Population with access to an improved water source

Measuring unit	**Spatial and temporal scale**
Percentage of the population	*District*

Data sources

National Socioeconomic Survey (SUSENAS) 2006

Periodicity of data: annual

Relevancy of indicator

The indicator defines the percentage of population with reasonable access (within one km) to an adequate amount of water (20 litres per person) through a household connection, public standpipe well or spring, or rain water system (ADB 2004).

Unsafe or unimproved water (sources include among others: vendors, tanker trucks and unprotected wells and springs) is one direct cause of many diseases. People without access to improved water sources are vulnerable to diseases caused by unclean water and could become more vulnerable in the aftermath of a hazard, due to their existing ailments. Also, hazards often cause the contamination of water bodies which increases the health risks for those who are using water of unprotected wells for domestic purposes (WHO 2006a).

Improved water sources (based on the assumption they are likely to provide safer water) can significantly lower the risk of water-borne diseases, which, in turn, has a positive impact on people's health status (Esrey and Habicht 1986).

Therefore, this variable is recognized as an important indicator for susceptibility to harm from natural hazards by different authors (e.g. Brooks et al. 2005; Bollin and Hidajat 2006).

Validity/limitations of indicator

The development of this indicator for the local level was made comparing improved water sources with the UN definition: "*Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collections. Unimproved water sources are unprotected wells, unprotected springs, vendor-provided water, bottled water (unless water for other uses is available from an improved source) and tanker truck-provided water"* (WHOSIS, 2007:1).

According to Indonesia's Central Bureau of Statistics, the improved water source can be: pipe retail payment - pipe water, rain water, and protected pump-well-spring with a distance to the septic tank higher than 10 m.

Key literature:

ADB (2004); Bollin & Hidajat, (2006); Brooks et al., (2005); Esrey & Habicht (1986); Central Bureau of Statistics (BPS); WHOSIS (2007); WHO (2006a)

Susceptibility

Indicator: C

(Durable) Houses wall material

Measuring unit	**Spatial and temporal scale**
Percentage of houses with walls made of cement and concrete materials	*District*

Data sources: National Socioeconomic Survey (SUSENAS) 2006

Periodicity of data: annual

Relevancy of indicator

"Durable structures" are considered as part of the Habitat Agenda Goal, as an index related to "*Providing security of tenure*". People who live in slums usually occupy non durable dwelling units that expose them to high morbidity and mortality risks. Durable structures are identified as criteria for the definition of slum housing. Generally, a housing structure is considered durable when certain strong building materials are used for roof, walls and floor.

Among characteristics to define the durability of houses there are exposure conditions to natural and technological hazards, and particularly some factors regarding the construction itself:
Quality of construction (e.g. materials used for wall, floor and roof); and
Compliance with local building codes, standards and bye-laws.

The importance of durability in housing construction regarding disaster risk and susceptibility has been taken into account for Indonesia by including an indicator based on the information related to the type of wall material used identified in houses.

Validity/limitations of indicator

According to the Indonesian Central Bureau of Statistics wall materials information into the survey includes: cement-concrete, wood, bamboo and unknown materials.

The development of the indicator considered cement-concrete wall materials as the standard that protects better people when facing different types of hazards.

Remarks:
It is important to consider that there are particular cases where traditional constructions made of bamboo and wood, have a particular structural and non-structural design which have a high resistance, for example to earthquakes. In these cases it is required a further analysis to establish the presence of seismic-cultures, or other risk-culture-type, to have a better assessment of this indicator. This could be the case in Indonesia, especially outside Java island where there are some areas with traditional buildings in these materials.

Key Literature:

Central Bureau of Statistics (BPS); UN Habitat (2009).

Susceptibility

Indicator: D

Extreme Poverty: Local Poverty line - Poverty

Measuring unit	**Spatial and temporal scale**
Percentage of people living below the poverty line	*District*

Data sources

Calculated data from BPS based on data from National Socioeconomic Survey (SUSENAS) 2004

Periodicity of data: annual

Relevance of indicator

Poverty is the deprivation of essential goods, services and opportunities (ADB 2004). Poor people are more susceptible to suffer from the impact of natural hazards, as they tend to live in hazard-prone areas (e.g. in unsafe buildings, on floodplains, etc.) and continuously have to cope with various shocks related to hazards, in dire conditions with limited assets (UNDP 2007). Extreme poverty thus increases the susceptibility to harm. Therefore, it is important to use this indicator to identify those people unable to meet their minimal requirements for survival.

Validity/limitations of indicator

To estimate poverty, BPS uses the basic needs approach, which defines poverty as economic incapability to meet food and non-food basic needs measured from the expenditures. This approach enables calculation of Head Count Index or proportion of population living under poverty line.

Poverty line is composed of two components: Food and Non-Food poverty lines. The calculation was done separately for rural and urban areas. Poor population are the people with average per capita income lower than the poverty line. Main data source for poverty estimation is SUSENAS and additionally, information about expenses on various non-food commodities from the Basic Commodity Basket Survey (SPKKD) (MAKSUM 2004).

Calculated data was available for 2004 only. Data for 2006 could not be calculated since the additional information needed to calculate the poverty line was not available. This difference might be caused by 1) change in administrative boundaries from 2004 to 2006 and 2) change in economics in that period (further information on this matter needed from statistical office was not yet available at the moment).

Remarks:

In 1998, the Central Bureau of Statistics (BPS) revised the poverty measurement methodology to reflect a shift in the consumption pattern, and to broaden the definition of minimum basic requirements and commodities, leading to an increase in the population below the poverty line from 11.3% to 17.6%. Both sets of data are given for 1996. In theory, post-1996 headcounts cannot be compared with pre-1996 data.

Key Literature:

ADB (2004); UNISDR (2009); World Bank (2008); UNDP (2007); ADB (2006a,b); Maksum (2004)

Susceptibility

Indicator: E

Assistance *for the poor*

Measuring unit	**Spatial and temporal scale**
Percentage of households, which are receiver of direct-cash-transfers program	*District*

Data sources

National Socioeconomic Survey (SUSENAS) 2006

Periodicity of data: annual

Relevancy of indicator

Poverty is the deprivation of essential goods, services and opportunities (ADB 2004). Poor people are more susceptible to suffer from the impact of natural hazards, as they tend to live in hazard-prone areas (e.g. in unsafe buildings, on floodplains, etc.) and continuously have to cope with various shocks related to hazards, in dire conditions with limited assets (UNDP 2007).

Validity/limitations of indicator

Direct-Cash-Grant is an Indonesian government´s program for the poor based on President Instruction No. 12/2005. The economic purpose of this government´s welfare program is to dampen the increasing rate of poverty incidence in Indonesia due to increase of gas prices. BPS had the duty to collect data to determine the poor households through a special micro socio-economic survey in 2005 (called PSE 2005).

There are 14 indicators used to determine poverty status of the households with regard to housing area, materials, sanitation, drinking water, energy use, food, cloth, access to medical services, main livelihood sector, education attainment and household assets. With regard to the controversies on the implementation of the program and difficulties in distributing the assistance to the households (See e.g. Hastuti et al. 2006, Royat 2009), the variable in SUSENAS whether a household is a receiver of direct-cash-transfer may not indicate poverty level precisely but could serve as a complementary proxy for extreme poverty, malnutrition and associated health problems.

In contrast to the poverty line this indicator is based on expenditures data and at the local level is more detailed information. From the statistical point of view there is not a correlation between these two indicators and this variable is better distributed than the poverty line.

Key Literature:

UNDP (2007); Central Bureau of Statistics (BPS); Royat (2009);Hastuti et al. (2006)

Susceptibility

Indicator: **F**

Dependency Ratio by sub-district

Measuring unit	**Spatial and temporal scale**
Number of dependents (younger than 15 and older than 65) compared to the population in working age (15-64)	*District*

Data sources

Calculated data from BPS based on data from National Socioeconomic Survey (SUSENAS) 2006

Periodicity of data: annual

Relevance of indicator

A high dependency ratio can indicate, in different ways, a population's susceptibility to harm: As the ratio of the economically dependent population to the income generating population, a high value increases the susceptibility to harm as more people are affected if a working person experiences harm (see Schneiderbauer 2007).

As proportion of children and elderly to working age population, it can also give a more direct measure of susceptible population as children and elderly are often limited in mobility and thus lack the capacity to individually "move out of harm's way" in case of a hazard (Cutter et al. 2003). The dependency ratio of a given population can thus indicate societal vulnerability, as dependents are more susceptible to harm from disasters. The total dependency ratio for each country will be calculated:

(Total) Dependency ratio = $\frac{0-14+65\ \&\ over}{15-64}\times 100$

Validity/limitations of indicator

The indicator gives an insight into the amount of people of non-working age, compared to the number of those of working age. A high rate of dependent population means, that those segments of the population in working age, and the overall economy, face a greater burden in supporting both groups, namely children (under the age of 15) and senior citizens (age 65 and older), economically and socially in stress situations and when direct and indirect losses due to hazards of natural origin occur.

For Indonesia the working age is 15-64 years (Central Bureau of Statistics, BPS).

Key literature:

Cutter et al. (2003); Schneiderbauer (2007); Central Bureau of Statistics (BPS)

Susceptibility

Indicator: G

Proportion of female headed households

Measuring unit	**Spatial and temporal scale**
Percentage of the households	*District*

Data sources: National Socioeconomic Survey (SUSENAS) 2006

Periodicity of data: annual

Relevancy of indicator

The proportion of female-headed households represents a vulnerable group among the population. Studies and data have demonstrated that female-headed families account for large and growing proportion of the poverty population (cf. Snyder et al. 2006; for earlier work Danziger & Plotnick 1981). Similarly, health surveys indicate that single mothers and their children experience higher levels of psychological distress (Guttentag et al. 1980 in McLanahan 1983).

The UN HABITAT Slums of the World: The face of urban poverty in the new millennium? Document (2003) has identified women, children, widows, and female-headed households as the most vulnerable groups among the poor. Statistics for this report found that there are a large number of women-headed households in urban areas; mainly in slums (e.g. urban African slums have a 30% or more of women-headed households). Limitations for these women are the general mobility out the house, access to education, and, as a result, reduced income-earning opportunities. These conditions make households prone to poverty, malnutrition and diseases. Additionally, the possibility for these women to hold a title to land, either through legal means or cultural traditions in clearly impossible (UN-HABITAT, 2003).

Validity/limitations of indicator

This indicator is calculated by processing individual survey data from SUSENAS 2006, related to: "*relationship with the head of the head of the household*" (1: head, 2: spouse, 3: child, 4: son/daughter in law, 5: grandchild, 6: parents, 7: other relative, 8: housemaid, 9: other); and "*gender*" of the person answering the survey.

Afterwards, the proportion of female head households is obtained for the district.

Key Literature:

Central Bureau of Statistics (BPS); McLanahan (1983); Snyder et al. (2006); UN-HABITAT (2003)

Susceptibility

Indicator: H

Gross Regional Domestic Product at Current Market Prices per capita (Million Rupiahs)

Measuring unit	**Spatial and temporal scale**
Million Rupiahs per person	*Province*

Data sources

Central Bureau of Statistics (Badan Pusat Statistik Republik Indonesia, BPS)

Periodicity of data: annual

Relevancy of indicator

GDP purchaser's prices (local currency at local prices) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current local currency (World Bank).

GDP has been identified as an important determinant of susceptibility and vulnerability by different authors and used in the Disaster Risk Index 2004 (Peduzzi et al. 2009, Schneiderbauer 2007, UNDP 2004) and is commonly used as an indicator for a country's economic development (e.g. Human Development Index (HDI)).

The emphasis of this indicator is the production and work generated by the economical activities.

Validity/limitations of indicator

The production approach used in Indonesia defines GDP as the total value added of all production units in a certain country for a certain period (usually one year). The production units in this publication are grouped into 9 sectors of industrial origin, namely:

- Agriculture, Livestock, Forestry and Fishery
- Mining and Quarrying
- Manufacturing
- Electricity, Gas and Water Supply
- Construction
- Trade, Hotel and Restaurant
- Transport and Communication
- Finance, Real Estate and Business Services
- Services including services provided by government. Each sector is further divided into sub-sectors.

The gross domestic product is available at province level only; the indicator thus has a lower resolution than the final index, which means that the same values apply to several districts.

Key Literature:

Peduzzi et al. (2009); Schneiderbauer (2007); UNDP (2004);World Bank ;Central Bureau of Statistics (BPS)

Susceptibility

Indicator: I
Income distribution (measured via the Poverty Severity Index)

Measuring unit	**Spatial and temporal scale**
Distribution of income (or expenditure)	*District*

Data sources
Calculated data from BPS based on data from National Socioeconomic Survey (SUSENAS) 2004

Periodicity of data: annual

Relevancy of indicator

The poverty severity index (P_2) was selected as a measure for inequity keeping the correspondence to the GINI index of the global level model. This index gives an idea of the distribution of income among the poor, giving a more sensitive poverty index. The development of the index was proposed by Forster, Greer and Thorbecke (1984), considering poverty as dependent on the poverty gap ratio. The index is presented in the next equation (Maksum 2004, p:5):

$$P_{\propto} = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - y_i}{z}\right]^{\propto}$$

Where:

y_i represent the averaged consumption value per capita for the i-th person's household

z is the poverty line q is the total population

$(z\text{-}y_i)/z$ is the poverty gap ratio.

α is a parameter for the "power" of the poverty gap ratio

According to Maksum, $\alpha = 2$ defines the poverty severity, measure that satisfies the axiom called "*monotonicity axiom*", which means that "*given other things, a drop in the income of a poor household must increase the poverty measure"* (Maksum, 2004:5).

Validity/limitations of indicator

The income data for Indonesian can be biased and underestimate the real income values e.g. it might relate to taxes etc[1]. As more reliable proxy for income, BPS uses data on expenditures. Per capita income is estimated by means of household expenditures divided by number of household members.

Data collection on expenditures is normally much easier. Some difficulties may be caused especially for elderly respondents who could not recall precisely their expenditures. Nevertheless, it is still the BPS best approach at the moment.

Remarks:
Other suggested alternative indicators are the poverty gap index and distributional sensitive index already calculated for year 2004.

Key Literature:
Gini (1921); Foster et al. (1984); Maksum (2004);

[1] Source: Tidora Siagian, BPS contact (communication March 17th 2011)

Calculation of Coping Capacity

The calculation of coping capacity is based on several indicators that determine the capacity of a given population to immediately react to, or manage the impact of a hazard event.

The indicators that were used for the local scale assessment are: A) Proportion of villages with at least one riot, B) unemployment rate, C) number of cooperatives and social organizations per 1,000 inhabitants, D) presence of active NGOs per village, E) diversification of household income (E1 job sectors per household, E2 number of jobs per household), F) landownership and G) household income per capita.

Indicators C and D are combined with different weights into one social network indicator because the dichotomous variable (D) has less explanatory power than (C). Secondly, the diversification of income (E) incorporates two variables, one accounts for the number of different sectors in which household members work (E1) the second one for the number of jobs per household (E2).

The remaining six indicators are then weighted equally as shown in **Figure** 2.

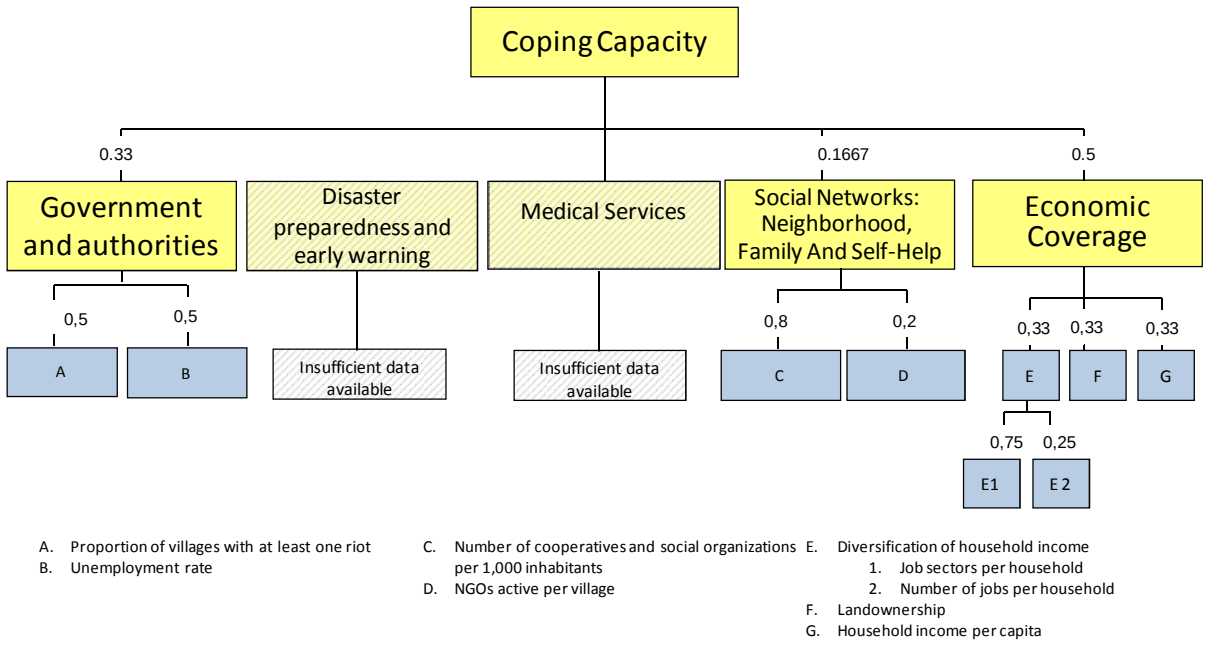

Figure 2: Aggregation of Coping Capacity Components, source: own figure

Coping Capacity

Indicator: **A**

Riots and Conflicts

Measuring unit:	**Spatial and temporal scale**
Fraction of villages with at least one riot	*Districts*

Periodicity of Data: annual

Every year the main topic differs from the last year:Agriculture, Economy and Population

Data sources The Village Potential Statistics (PODES) 2006

Relevance of indicator

According to the Fund for Peace sustainable security is a concept that "*refers to the capacity of a society to solve its own problems peacefully without an external administrative or military presence. The concept is to be distinguished from democracy, the best political system to settle differences non-violently"* (Baker 2006:13).

In this sense, and regarding the data for Indonesia, it was possible to use the fraction of villages with at least one riot as one of the indicators that reflects political/military conflicts as the criminalization and/or delegitimization of the State. In fact, the Conflict Assessment System Tool (CAST) methodology for State Collapse And Internal Conflict (The Fund for Peace), includes indicators for widespread loss of popular confidence in state institutions and processes the following: *widely boycotted or contested elections, mass public demonstrations, sustained civil disobedience, inability of the state to collect taxes, resistance to military conscription, rise of armed insurgencies*; among others (Baker, 2006:19).

According to Birkmann (2008), conditions of violent conflicts before a natural disaster could in some cases be reproduced in the aftermath of a disaster, thereby increasing the insecurity conditions and holding back the recovery process of communities.

Validity/limitations of indicator

Types of riots considered in Indonesia:

1. Among villagers
2. Between community and government staffs
3. Students
4. Between ethnic groups
5. Others

The types of riots described can be seen as a limitation because there are cases of arguments that may not necessarily mean weak governance. Also, student activities will be more likely to happen in urban areas, e.g. in Padang such political activism is more frequent therefore the government component "riots" is higher, although in general (qualitatively) the people of Padang seem to be happy with their current (2006) local government. One suggestion might be to consider the type of conflicts, number of victims due to the conflicts, and whether the conflicts were solved in peace, to minimize the possibility of bias in future assessments.

Literature:

The Central Bureau of Statistics (BPS); Baker (2006); Birkmann (2008)

Coping Capacity

Indicator: **B**

Unemployment rate

Measuring unit	**Spatial and temporal scale**
Number of population in working age (15 years and above) who are looking for job	*District*

Periodicity of data: annual

Data source: National Socioeconomic Survey (SUSENAS) 2006

Relevance of indicator

According to the evaluation of the Prevalent Vulnerability Index developed by Cardona et al (IDEA 2005), the relevance of the unemployment rate refers to an additional economical disadvantage which reduces the capacity to gain access to resources and means of protection (IDEA 2005). In this sense, this indicator was used into the local risk model as part of materially coverage.

The unemployment rate is calculated considering: labour force as the economically active proportion of the population (people aged 15 years and older), and the unemployed as people no working, available for work and those who are seeking or have sought for a job recently (UN Statistics Division).

Unemployment can be defined differently at each country in comparison with the international standard definition (e.g. age limits, reference periods, criteria for seeking work, treatment of persons temporarily laid off and of persons seeking work for the first time) (UN Statistics Division).

Validity/limitations of indicator

Indonesia national statistics consider the economically active age as 15 years and above. The labour force is people in economically active age, who are either working (employed) or looking for job (unemployed), it is not included here people who are still going to school, doing household work or other in other conditions (e.g. elderly, handicapped, etc.).
People employed are the people who are:
1) currently working or 2) who have a job but temporarily not working/absent
People unemployed are the people who are:
1) looking for a job 2) preparing a business 3) not looking for a job because they feel cannot get a job 4) have a job but haven't started yet
The calculation of open unemployment rate is:

$$unemploment\ rate = \frac{people\ unemployed}{labour\ force} \times 100\%$$

The official unemployment rate in Indonesia is normally derived from SAKERNAS (special survey for employment), however it can only estimates up to provincial level. Therefore, the same variables are collected through SUSENAS for estimation at the district level. However, the value from SUSENAS is normally a little bit higher than SAKERNAS (about 1-2% at national level)[2].

Key literature:
IDEA (2005); Central Bureau of Statistics (BPS); United Nations Statistics Division (2011)

[2] (Personal communication with Hamonangan Ritonga from BPS, 13.07.2007)

Coping Capacity

Indicator: C

Cooperatives - Social organizations

Measuring unit	**Spatial and temporal scale**
Number of cooperatives by 1000 inhabitants	*District*

Periodicity of data: annual

(Every year the main topic differs from the last year:Agriculture, Economy and Population)

Data source:

The Village Potential Statistics (PODES) 2006

Relevance of indicator

In addition to or even as a substitute of insurances, savings, or a secure livelihood that will continue without significant disruption in an emergency, an individual or household has a social network (extended family or other) that is capable of providing material or non-material assistance in recovery (Wisner 2003).

"Success in re-establishing livelihoods and in gaining voice with government so that problems with infrastructure and social services are addressed in a timely way are both very much facilitated by a high level of local social organization. This can be measured by the number of citizen groups and other interest groups (among small business owners, fishermen, women, etc.)" (Wisner 2006:3).

For Indonesia an indicator related with this kind of social organization is the presence of cooperatives.

Validity/limitations of indicator

In Indonesia, cooperative organizations are enterprise units, where members are people or legal units with similar interests, using an economy democracy. The cooperative is voluntary based and in some cases aims to support the members with their financial needs.

Types of cooperatives in Indonesia, according to PODES data source are: village cooperative units, small enterprises and crafts cooperative units, save and lend cooperatives, other non-village cooperative units

Key literature:

The Central Bureau of Statistics (BPS); Wisner (2003); Wisner (2006)

Coping Capacity

Indicator: D

NGO active - Social organizations

Measuring unit	**Spatial and temporal scale**
Fraction of villages with NGO activities	*District*

Periodicity of data: annual

(Every year the main topic differs from the last year:Agriculture, Economy and Population)

Data source: The Village Potential Statistics (PODES) 2006

Relevance of indicator

NGOs are also considered part of civil society organizations. According to Cannon (2003), *"civil societies, participatory environment and institutions…involve the degree that different groups of people are able to affect the priorities of government, to engage in self-organised activities, to have freedom of association… It also includes the right of non-government organisations to operate in co-operation with the people to reduce disaster risk"* (ibid:7).

The emergence of NGOs in Indonesia, as well as in the rest of the world, was slow. Some of the earliest were: *Persatuan Keluarga Berencana Indonesia* (Indonesian Familiy Planning Association), *Yayasan Indonesian Sejahtera* (YIS), *Dian Desa*, *Bina Desa*, *Lembaga Studi Pembangunan*. Now, there are about 8,000 NGOs working across all provinces of Indonesia, in activities that vary from family planning to community development (ADB 1999).

Validity/limitations of indicator

NGOs are part of the group of institutions for the community considered in the Indonesian Surveys. Particularly, the Village Potential Statistics (PODES) 2006 includes variables related to NGO availability and NGO activities (as there is or there is not) at this level. Unfortunately there is no additional data related to the NGOs.

Remarks:

For further evaluations it is important to consider the number of NGOs that are currently working on disaster preparedness with the community.

Moreover, for Indonesia the more recent PODES assessments (2008) started to include more variables related to disasters and help received to overcome these disasters, where NGOs are mentioned. This information could be very useful to build a new indicator in the future.

Key literature:

The Central Bureau of Statistics (BPS); Cannon (2003); ADB (1999)

Coping Capacity

Indicator: **E1**

Job-sectors per household – Job security

Measuring unit	**Spatial and temporal scale**
Relative number of different job-sector within one family	*District*

Periodicity of data: annual

Data source: National Socioeconomic Survey (SUSENAS) 2006

Relevance of indicator

The composition of employment by economic sector is considered an indicator for the economic and social context of decent work, for the new employment indicators at the Millennium Development Goals. "*Certain industries are, by nature, safer, more likely to be unionised and provide higher than average compensation. The indicators selected to represent the broad outlines of a country's economic structure are the shares of employment in agriculture, industry, and services. For example: (1) workers in agriculture tend to work on family owned farms and have relatively low incomes; (2) industrial workers are often paid relatively well and are more likely to be union members; (3) labour statistics are likely to be most complete for the industrial sector*" (Anker et al. 2002:62).

For the local level, in this case for Indonesia, this indicator was defined for the household level (family group), as part of the coping capacity indicators, to represent the ability to financial recover and/or handle economical consequences due to natural disasters, by counting on different economical activities. In many cases natural disasters affect particularly an economical sector, e.g. the agricultural sector, situation that leads to a slow and difficult recovery when there is a high dependency to it.

In this sense this indicator is related somehow to certain flexibility level of the family and it can be considered as part of job security, into the financial support and materially coverage category.

Validity/limitations of indicator

For Indonesia the economical sectors assessed according to the production approach for the GDP are 9 sectors of industrial origin, namely :
-Agriculture, Livestock, Forestry and Fishery
-Mining and Quarrying
-Manufacturing
-Electricity, Gas and Water Supply
-Construction
-Trade, Hotel and Restaurant
-Transport and Communication
-Finance, Real Estate and Business Services
-Services including services provided by government.
-Others
Each sector is further divided into sub-sectors.

Key literature:
The Central Bureau of Statistics (BPS); Anker et al. (2002)

Coping Capacity

Indicator: **E2**

Number of jobs per household – Job security

Measuring unit	**Spatial and temporal scale**
Relative number of jobs within one family	*District*

Periodicity of data: annual

Data source:

National Socioeconomic Survey (SUSENAS) 2006

Relevance of indicator

Employment is the main source of household income. More than one job per family can allow the family group to count on other economical activities, giving them some flexibility and the possibility to have savings, which are important resources when coping to crisis times.

According to the research on Measuring Vulnerability at the Local Level, by Birkmann et al. 2006, for the case of Sri Lanka, it is possible to analyse the relationship between income and employment per household with the coping capacity from the personal/familial point of view. Results demonstrate that households with higher level incomes generally have more than one income (either in government or the private sector) and where less affected in terms of income decline. In a similar way, small scale businessmen, fishermen and self-employed people, which earn a medium level income faced income decline but still they were in a better position than the low income category (Birkmann 2006).

In this sense this indicator can be considered as part of the job security indicator, and of the financial support and materially coverage category into coping capacity.

Validity/limitations of indicator

The number of jobs per household was calculated by obtaining the average of the relative number of jobs within one family, for the district level. Measuring the capacity of self aid based on an average family could be limited if it is neglected the variance of this value.

Indonesia national statistics consider the economically active age as 15 years and above.

Key literature:

The Central Bureau of Statistics (BPS); Birkmann et al. (2006), Birkmann & Fernando (2008)

Coping Capacity

Indicator: F
Landownership

Measuring unit	**Spatial and temporal scale**
Proportion of households with landownership	*District*

Periodicity of data: annual

Data source: National Socioeconomic Survey (SUSENAS) 2006

Relevance of indicator

Landownership indicator has been used as descriptor of socio-economic susceptibility by Birkmann et al. (2006) for vulnerability measurement in Sri Lanka. This indicator was analyzed also as a potential indicator in terms of recovery due to the possibility to sell it in times of crisis in order to overcome the difficulties. In Sri Lanka "*the lack of landownership and the low standard of squatter-occupied housing units are root causes as to why nearly half of the squatter still live either in relief camps or temporary shelters provided by the government and NGOs. When people in the buffer zone are resettled, those who had legal title can continue to claim their property and use it for purposes other than construction, while illegal settlers and squatters do not have this opportunity"* (Birkmann et al. 2006:348).

On the other hand, in many countries the way own a property is by having a loan from financial entities, which most of the times require insurances policies to protect the mortgage (Lea 2000), e.g. in case of loss the property due to natural disaster. In this sense the landownership indicator could be also a proxy to probable population covered by insurances.

Validity/limitations of indicator

For Indonesia the variable "house ownership" can be used as a proxy for landownership, since it is very rare case that a household owns a house without owning the land[3]. The status of dwelling considered for this variable are:
Own property, if such residence at the time of enumeration actually already owned the head of the household or one of a household member. The house purchased in installments through bank loans or homes with rental status regarded as self owned.
Lease, if the residence was leased by the head of the household / member of household in a certain period under a contract agreement between owners and users.
Rent, if the residence was rented by the head of the household or one of household member with payment of the rent regularly and continuously.
Free-rent property of others, if the residence was obtained from another party (not family / parents), and occupied by the household without a payment
Property owned by a parent / relative / brother, if the residence does not belong to itself but belongs to the parents / relatives / brother and did not issue any payment to inhabit a place to stay them.
Official house, if the residence was obtained from another party (not family / parents), and occupied / occupied by the household without spending a payment of any kind.
Others.

To develop the indicator it was considered only the "own property" answer of the survey.

Key literature:

The Central Bureau of Statistics (BPS); Birkmann (2006); Lea (2000).

[3] Source: Tidora Siagian, BPS contact (communication March 17th 2011)

Coping Capacity

Indicator: **5**

Income per capita

Measuring unit	**Spatial and temporal scale**
Total expenditure in a month by household members	*District*

Periodicity of data: annual

Data source: National Socioeconomic Survey (SUSENAS) 2006

Relevance of indicator

The income at the individual level has been related to a self-protection capacity by Cannon (2003), among other four components of vulnerability. According to this framework, "*being able to acquire adequate self-protection from a hazard depends on people's capability (and willingness) to build a home that is safe from the prevalent hazards, and the ability to site the house somewhere out of harm's way, e.g., from floods or landslides. Whether or not someone is able to build a house that is wind or earthquake resistant is largely determined by their income. Of course they must also want to build safely, and have the knowledge and skills available to achieve proper construction when they do have adequate resources"* (Cannon 2008:6).

Additionally a higher income will allow people to cover satisfactory personal needs and have any savings for the future. This condition will be desirable in case of crises such a natural disasters.

In some way we could say that when having a higher income per capita higher individual capacity to cope. In conclusion, this indicator can be considered as a proxy for financial support and materially coverage.

Validity/limitations of indicator

According to the Central Bureau of Statistics (BPS) (contact: Tiodora Siagian, personal communication, March 17), the income data for Indonesia can be biased underestimating the real income values e.g. it might be related to taxes, etc. For this reason a more reliable proxy for income is the data on expenditures. The income per capita is estimated by means of household expenditures divided by number of household members.

Data collection on expenditures is normally much easier. Some difficulties may be caused especially for elderly respondents who could not recall precisely their expenditures. Nevertheless, it is still the BPS best approach at the moment. According to this the indicator was calculated using the total expenditure by month by household and then it was obtained the expenditure per person.

Remarks:

Adjustment with the minimum wage per district is not needed, since this value was derived from the standard needs of the previous year and may cause significant difference with the current prices.

Key literature:

The Central Bureau of Statistics (BPS); Cannon (2003); Cannon (2008)

Calculation of Adaptive Capacity

Indicators for the adaptive capacity of a district need to portray the long-term response capacities to natural hazards and/or environmental change. They should grasp the ability of a society or community to transform or adjust, in order to alter (reduce) the vulnerability to natural hazards and climate change.

Indicators used to measure adaptive capacity at the district level in Indonesia are A) gross school enrolment, B) educational achievement, C) percentage of female mayors and village-heads, D) ecological footprint and E) economic diversification.

The variables are currently combined using equal weights (see **Figure** 3).

The consideration of gender in the disaster risk context is important because it is a indicator of equity in a society, and also takes the womens role in familial and local culture development into account. Therefore it can be concluded that districts with high levels of women participation in the fields of education, politics and economic show their empowerment in the active actual life, which can be regarded as a strength to overcome future crisis. In the Indonesian context, the number of women in political positions is still quite low and does not vary a lot among the districts that were chosen. Thus, the indicator currently has only limited explanatory power.

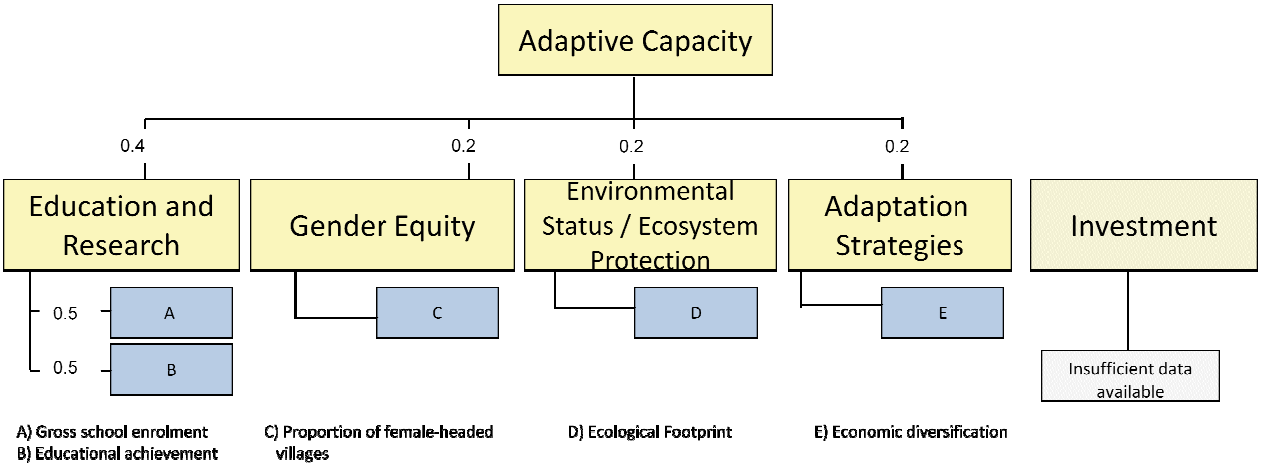

Figure 3: Aggregation of Adaptive Capacity Components, source: own figure

Adaptive Capacity

Indicator: A

Gross School enrolment

Measuring unit	**Spatial and temporal scale**
Proportion of pupils enroled	*District*

Data sources

National Socioeconomic Survey (SUSENAS) 2006

Periodicity of Data: annual

Relevancy of indicator

A good level of educational attainment is important not only to find a secure job, or climb up the ladder of social mobility to achieve higher socio-economic status, but also to recover sooner from shocks related to natural hazards. A good level of education also improves the capacity of a society and different groups to potentially change from one economic activity (e.g. farming) to another (e.g. small-scale business). In this context, school enrolment is a vital indicator that captures adaptive capacity, as it measures education access and coverage. It shows the general level of participation in a given level of education and further indicates the capacity of the education system to enrol students of a particular age group (UNESCO glossary). It also provides some indication of internal efficiency of the educational system.

It defines total enrolment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school year (UNESCO glossary).

Gross enrolment ratio per country can be presented by gender and level of education (primary and secondary).

Validity/limitations of indicator

A high school enrolment generally indicates a high degree of participation, whether the pupils belong to the official age group or not. An indicator value approaching or exceeding 100% points out that a country is, in principle, able to accommodate all of its school-age population, but it does not indicate the proportion already enrolled (UNESCO glossary).

The school enrolment can exceed 100%, due to the inclusion of over-aged and under-aged pupils/students because of early or late entrants, and grade repetition (UNESCO glossary).

In Indonesia, normally BPS calculates the enrollment by age group of each educational level, which is:

7-12 (primary), 13-15 (junior high), 16-18 (senior high), 19-24 (higher education) –

School is mandatory until junior-high school.

Key Literature:

UNESCO Institute for Statistics (2008) ; The Central Bureau of Statistics (BPS)

Adaptive Capacity

Indicator: B

Educational achievement (Primary and secondary education attainment index)

Measuring unit	**Spatial and temporal scale**
Proportion of the population	*District*

Data sources

National Socioeconomic Survey (SUSENAS) 2006

Periodicity of Data: annual

Relevancy of indicator

The primary and secondary education attainment index can be understood as it is the Adult Secondary (Tertiary) Schooling Attainment Level, from the United Nations Commission on Sustainable Development (CSD). *"This indicator provides measures of the quality of the human capital stock within the adult population of approximately working age. For instance, those who have completed upper secondary education can be expected either to have an adequate set of skills relevant to the labour market or to have demonstrated the ability to acquire such skills"* (UNCSD, 2007:56).

According to UNESCO indicators the education attainment is closely related to the skills and competencies of a country's population, which is an important issue within adaptive capacities. Particularly, the achievement of certain level of education improves capacities for understanding public information, participation in collective activities and searching for individual or community solutions when facing crises (UNESCO Institute for Statistics).

Validity/limitations of indicator

The primary and secondary education attainment index proposed uses the variables: rate of students who doesn't finish primary school and the rate of students who finished high school and technical school; according to the information available in the country at the spatial scale level requested for the local risk index.

The formula used for this index is:

Educ. Att. index =0.75 * primary passed +0.25*(secondary passed/primary passed)

Remarks:

Same as enrolment (years for each educational level)

Key literature:

UNCSD (2007);UNESCO Institute for Statistics ; The Central Bureau of Statistics (BPS)

Adaptive Capacity	
Indicator: C *Proportion of female-headed villages*	
Measuring unit *Proportion of head of village positions held by women, expressed as a percentage of all in a district.*	**Spatial and temporal scale** *District*
Periodicity of Data: annual (Every year the main topic differs from the last year: Agriculture, Economy and Population)	
Data sources The Village Potential Statistics (PODES) 2006	
Relevancy of indicator Women's representation in governmental positions is one aspect of women's opportunities in political and public life, and it is therefore linked to women's empowerment. This indicator gives an idea of the progress of women participation in the highest levels of society, such as the decision making process, and becoming a leader and voice of the community (UNDP 2009).	
Validity/limitations of indicator: Normally, in Indonesia norm-wise, the head would be male. For this reason it is expected by the BPS expert consulted that the variation of this indicator would be small.	
Remarks: Cultural issues could be considered to weight this indicator, according to the particular context where could not be very representative.	
Key literature: UNDP (2009); The Central Bureau of Statistics (BPS)	

Adaptive Capacity

Indicator: D

Ecological Footprint

Measuring unit	**Spatial and temporal scale**
gha (global hectare)	*Province*

Periodicity of Data: annual

Data sources: *Indonesian Directorate General of Spatial Planning*

Relevancy of indicator

The ecological footprint has been widely used as an indicator of environmental sustainability.

The United Nations Environment Programme (UNEP) recognizes the ecological footprint into the Global Environmental Outlook (GEO) as an index of the area of productive land and aquatic ecosystems required to produce the resources used and to assimilate the wastes produced by a defined population at a specified material standard of living, wherever on Earth that land may be located (UNEP, 2007).

Validity/limitations of indicator

The method used for the Ecological Footprint of Indonesia is the one developed by the Global Footprint Network in 2003.

The index gave a portrait of the goods and services needed by the population from the environment that is depicted in net consumption from categorized products such as agricultural, faming, forestry and fishing products, the need of space, land and energy consumption. Net consumption is actual consumption that affected the trading activities (export-import). The calculation of actual consumption will add imported goods and took out exported goods displayed in the equation:

Net Consomption/Total (ton) = Local Production (ton) + Import (ton) – Export (ton)

Ecological footprint (EF) for every type of land is:

$$EF = \frac{P}{Y_N} \cdot YF \cdot EQF$$

P = amount of a product harvested or wasted emitted
Y_N = national average yield for P
YF = Yield Factor
EQF = Equivalence Factor for the land use type calculated

Remarks:

"Bioproductive area can be defined as all areas that contributes to de biocapacitiy that economically supplies concentrated biomass. Biologically productive land and water is the land and water (both marine and inland waters) is that supports significant photosynthetic activity and the accumulation of biomass used by humans" (Ministry of Public Works of Indonesia, 2010:3).

Key literature:

Ministry of Public Works of Indonesia (2010); Global Footprint Network; UNEP (2007)

Adaptive Capacity

Indicator: **E**
Economic diversification

Measuring unit	**Spatial and temporal scale**
Relative measurement scale	*District*

Periodicity of Data: annual

(Every year the main topic differs from the last year: Agriculture, Economy and Population)

Data sources: National Socioeconomic Survey (SUSENAS) 2006

Relevancy of indicator

The composition of employment by economic sector is considered an indicator for the economic and social context of decent work, for the new employment indicators at the Millennium Development Goals. In the paper "Measuring Decent Work with Statistical Indicators" Anker et al. mention that there are industries by nature safer, likely to be unionised and with higher average compensation (Anker et al. 2002).

A diverse economy is also representative for economical stability, where usually the government can rely on resources provided by regular taxes.

At the district level it is important to count on a differentiated economy representation to recover by itself from a natural disaster or crises (according to their magnitude) without waiting only for national or international aid. Particularly reconstruction activities could be done faster, e.g. recovering distribution lines infrastructure and critical infrastructure, by having not only the physical and material resources but also counting on trained professionals.

Validity/limitations of indicator

Economy diversification is the expected squared difference from the equal distribution of the frequency, based on the frequency from economical activity by sectors. The equation used to calculate it is:

$$\sqrt{1 - \sum_{Job\ section\ i=0}^{Job\ section\ i=n} \left(\frac{number\ of\ jobs\ by\ economical\ sector\ i}{number\ of\ all\ jobs} - \frac{1}{n} \right)^2 \times \frac{n}{n-1}}$$

It should be one if all sectors are equally distributed and zero if one sector is the only one.

According to the production approach for the GDP the production units are grouped into 10 sectors of industrial origin:

1) Agriculture, Livestock, Forestry and Fishery; 2) Mining and Quarrying; 3) Manufacturing; 4) Electricity, Gas and Water Supply; 5) Construction; 6) Trade, Hotel and Restaurant; 7) Transport and Communication; 8) Finance, Real Estate and Business Services; 9) Services including services provided by government; and 10) Others.

Indonesia national statistics consider the economically active age as 15 years and above.

Key literature:

The Central Bureau of Statistics (BPS); Anker et al. (2002)

Calculation of the Local Risk Index

For the calculation of the Local Risk Index, the components susceptibility, coping capacity and adaptive capacity are in a first step aggregated to the vulnerability index. Following the concept of risk being a function of hazard and vulnerability, the vulnerability index is then multiplied with the exposure index. Exposure is thus a precondition for risk.

Figure 4 shows the aggregation of the different components, which is the same as in the WorldRiskIndex.

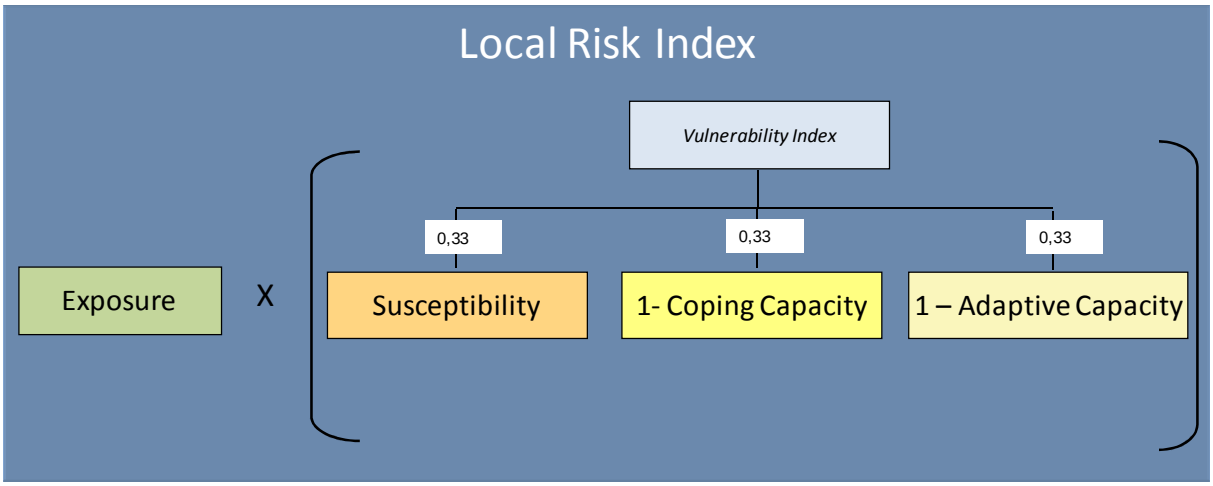

Figure 4: Aggregation of the Local Risk Index, source: own figure

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Main Data Sources for Indonesia:

The Central Bureau of Statistics (BPS)

- The National Census:

A population census has been conducted every decade between 1961 and 2000. This is a key source of data for planning purposes and setting the framework for sample surveys conducted over the inter-censual period. The 2000 Census was especially important because it was a complete count rather than a sample census, as had been the case from 1961-1990, it gave a picture of the country`s situation at the end of the 1997-1999 economic crisis. For the first time detailed census data could be utilized for very small area analysis - at the district, sub district and even the village levels, over almost the whole nation.

- The National Socioeconomic Survey, *Survei Sosial Ekonomi Nasional* (SUSENAS):

It is the principle source of information on household welfare. It consists of a core annual survey and more in-depth modules repeated every three years. The SUSENAS has been conducted since 1984 and was expanded into its present form of core plus modules in 1993, when representation increased from the national to the provincial level. The current sample size for the core is over 210,000 households (representative up to district level). Poverty measurement is based on the detailed consumption module of 65,000 households (representative up to provincial level). Since the core component of the survey also contains information on expenditures by consumption category, poverty estimates can also be made annually, based on inflation rates for the items in the consumption category from their values and weights in the consumption module. This is of course a less precise method than that based on the consumption model. The official annual poverty estimates for the non-consumption module years have been calculated by BPS since 2002.

- The Village Potential Statistics, *Potensi Desa Survei* (PODES):

Provide information about village/desa characteristics for all of Indonesia, with a sample of +/- 65,000 villages. It is surveyed in the context of the periodic censuses (Agriculture, Economy and Population). The data in PODES are collected based on the available regional and sectoral data in every village, which consequently cause variation in data quality throughout the sample villages.

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