



Introducing Basic Concept on Vulnerability, Adaptation and Climate Change Impact

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THE CONCEPT: Relationship between coping range, vulnerability, climate change and adaptation

Critical thresholds are a special category, being assessed to determine the point at which the risk of an impact becomes 'dangerous' (cf. Parry et al. 1996).

Pittock & Jones (1999) argue that stakeholders should ideally be involved in the process of determining *user-defined thresholds* especially if they are to be involved in planning or implementing adaptation options.

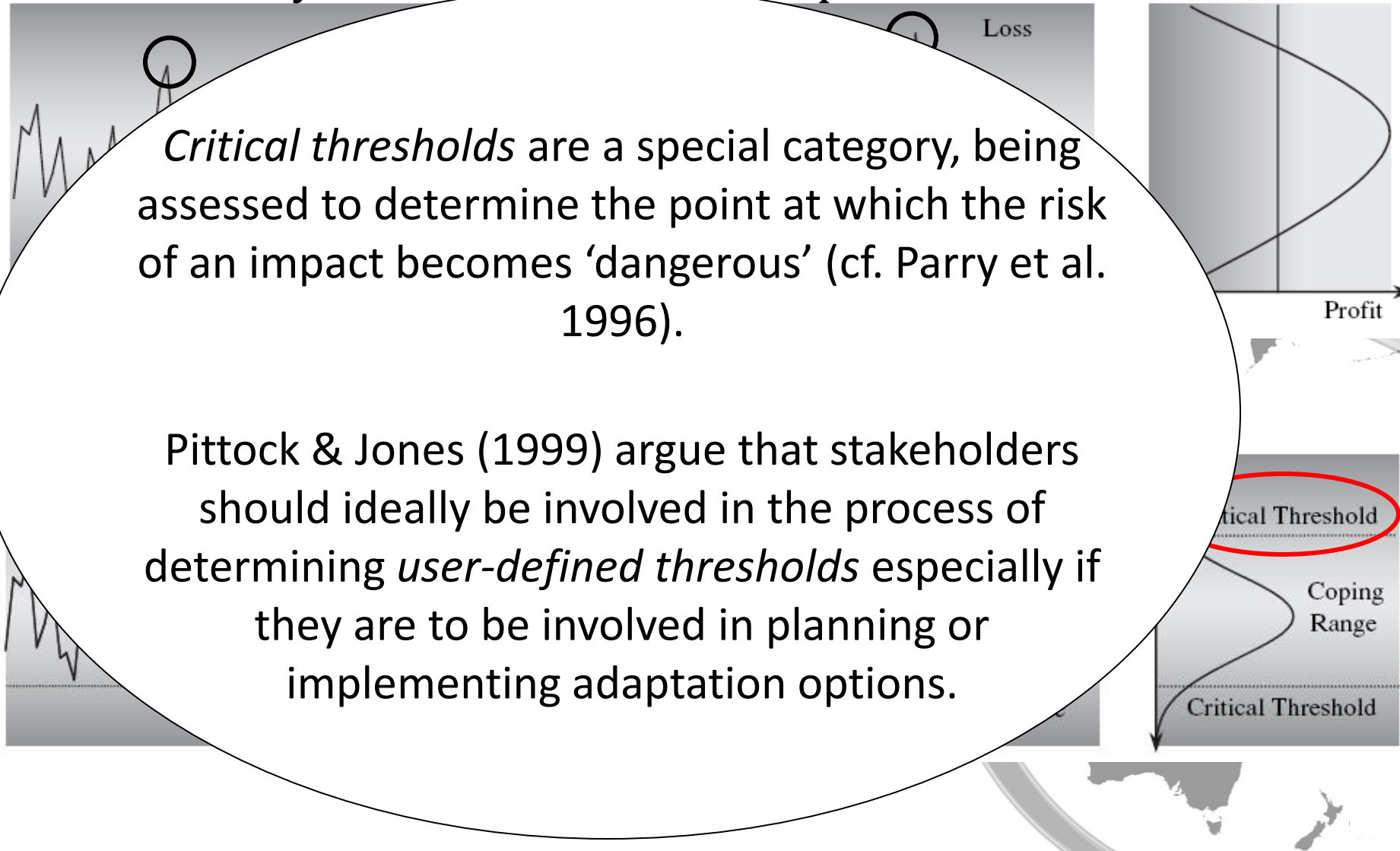
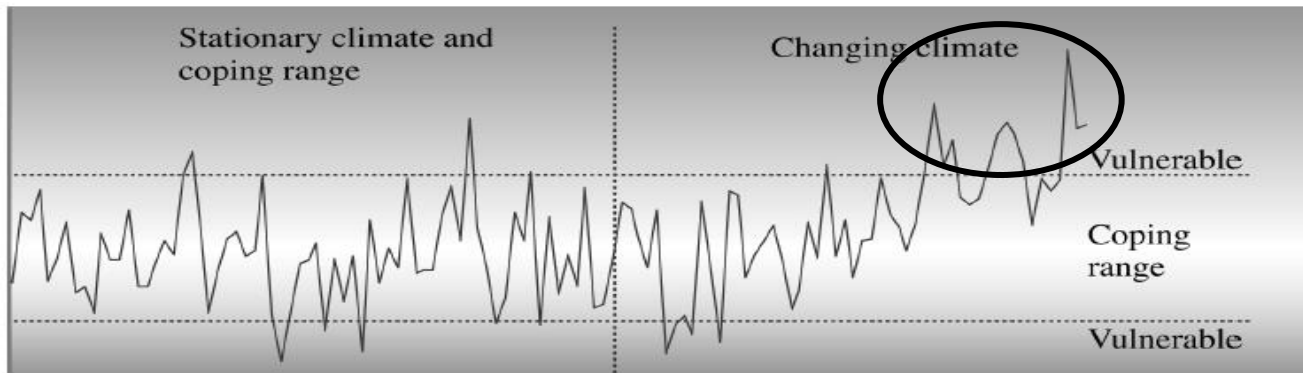
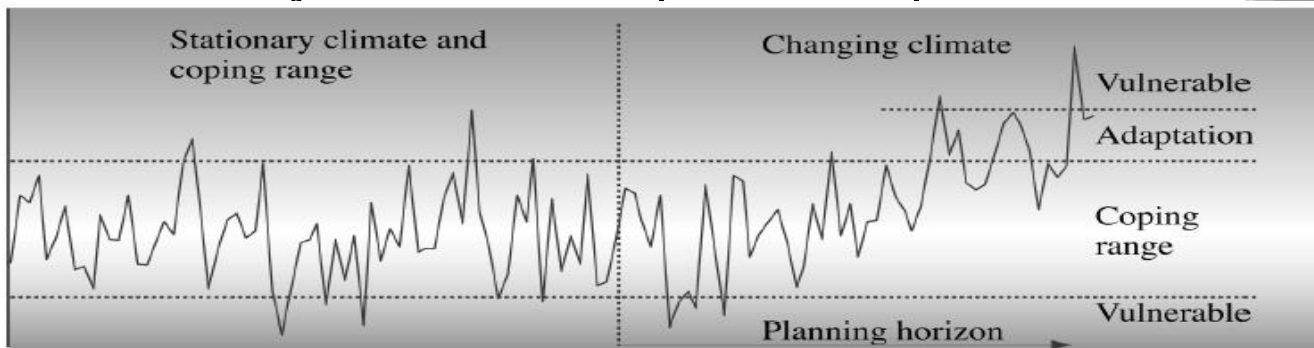


Illustration for defining the coping range, vulnerability, climate change and adaptation



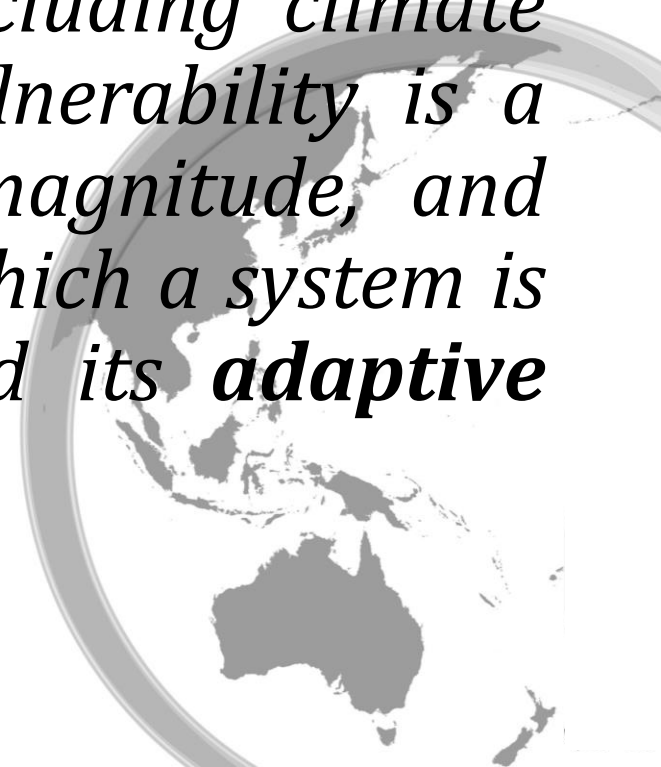
In the future when climate is changing and the coping range remains the same, the system will be exposed to frequent hazards



Need to do adaptation actions to widen the coping range

Defining Vulnerability and Adaptive Capacity?

- *According to IPCC (2001), vulnerability is defined as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity”*



Vulnerability is function of exposure, sensitivity level and adaptive capacity

- *Exposure* is the degree, duration and/or extent in which the system is in contact with, or subject to, the perturbation (Adger 2006 and Kasperson et al. 2005)
 - Turner, II et al. (2003) defines “perturbation” as a major spike in pressure (e.g., extreme rainfall, a tidal wave or hurricane) beyond the normal range of variability in which the system operates.
- *Sensitivity* is internal to the system and is determined by the human and environment conditions
- *Adaptive capacity* is the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (AC)



Vulnerability Analysis and Climate Change Impact Assessment

Climate Variability
and Climate Change

*Level of
Exposure*

*Level of
Sensitivity*

*Adaptive
Capacity*

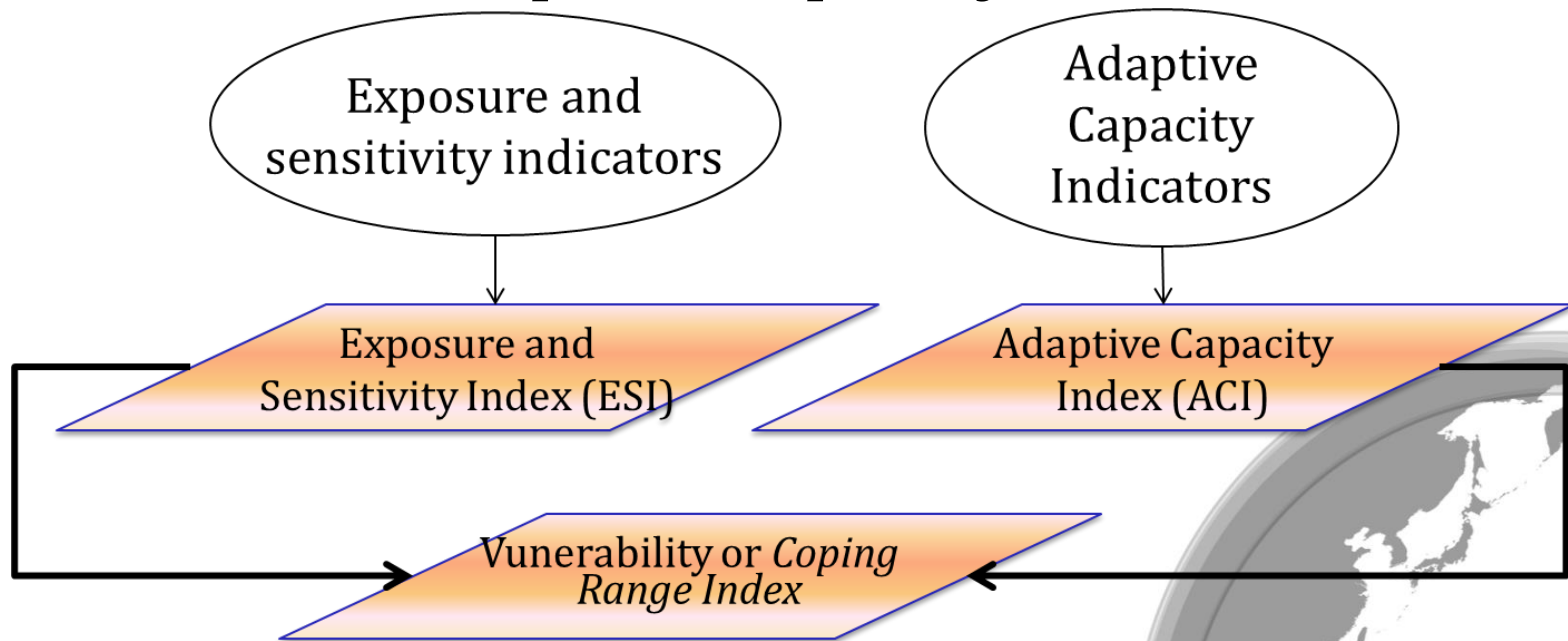
Implementation of
adaptation
activities
(institution, policy,
strategy, programs
and adaptation
actions)

*Defining vulnerability level or
coping range*

*Magnitude impact due to climate
variability and climate change*



Defining Exposure, Sensitivity and Adaptive Capacity Indices



$$ESI = \sum_{i=1}^n [(w_i * E_i) + \sum_{j=1}^m (w_j * S_j)]$$

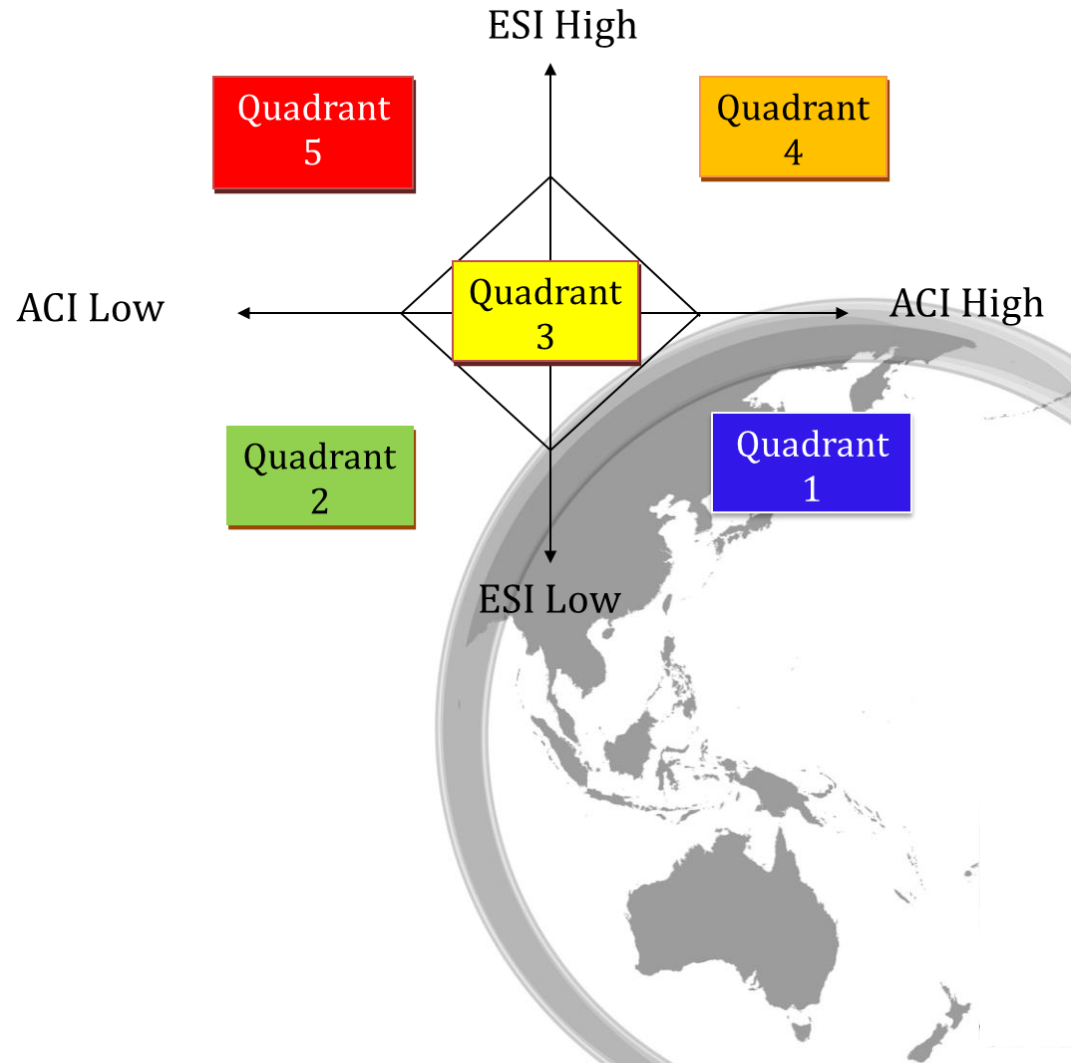
$$ACI = \sum_{k=1}^o (w_k * AC_k)$$

Modified from Boer et al., 2010

Assessing Vulnerability or *Coping Range Using Quadrant Method*

To assess relative position of village based on vulnerability index, we can use quadrant method to locate position of a village in the quadrant based on the Exposure and Sensitivity Index (ESI) and Adaptive Capacity Index (ACI). If ESI and IKA value in Quadrant 5, we can define the village has *narrow coping range or very vulnerable*.

Boer et al., 2010



Possible Vulnerability Indicators for Village Level

List of Data

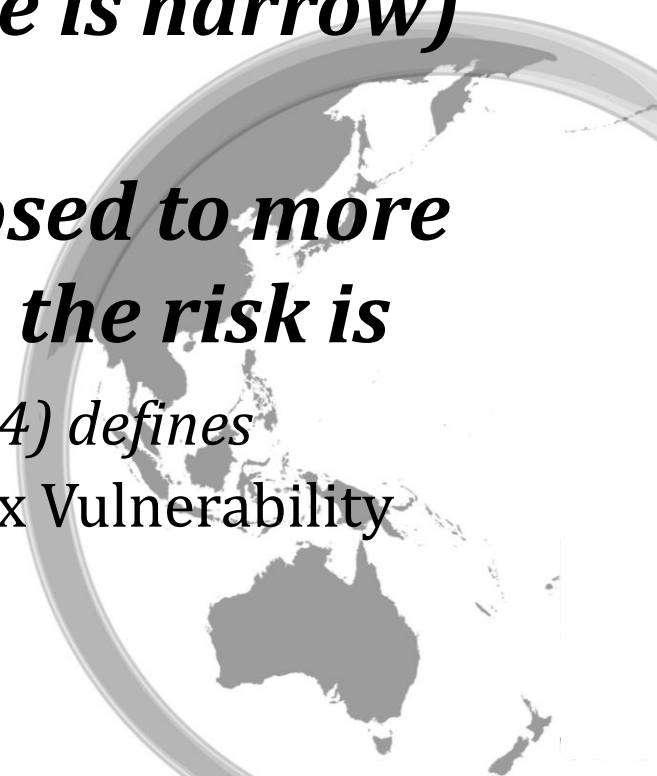
1. Population by age
2. Total of households
3. Level of education
4. External wall of house
5. Source of energy for lighting
6. Source of drinking water



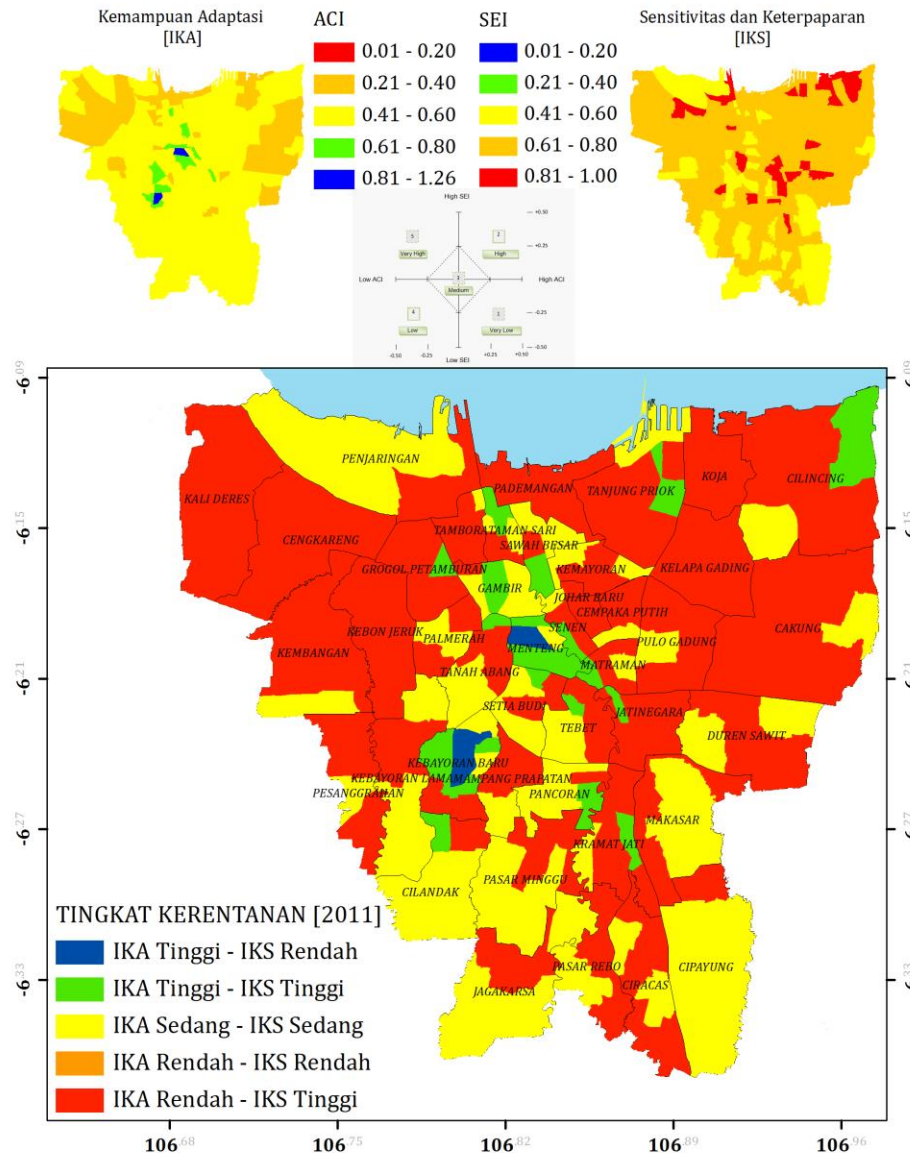
Impact of Climate Change on System is expected to be high if vulnerability of the system is high (coping range is narrow)

If vulnerable system is exposed to more frequent climate hazards, the risk is increasing. Jones et al (2004) defines

Risk = Probability of climate hazard x Vulnerability

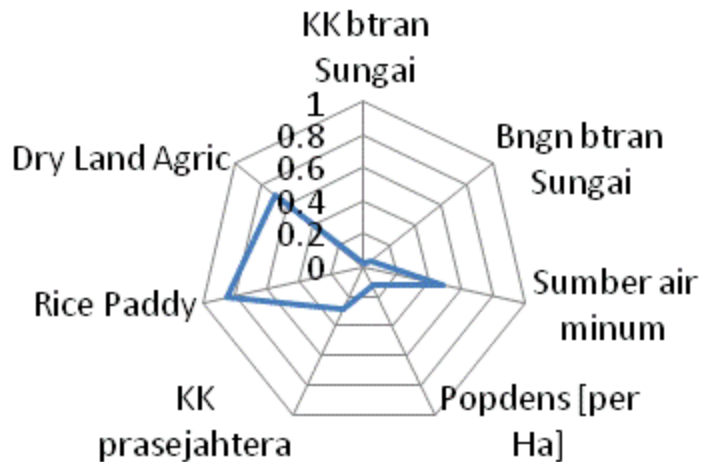


Vulnerability Index [DKI Jakarta]

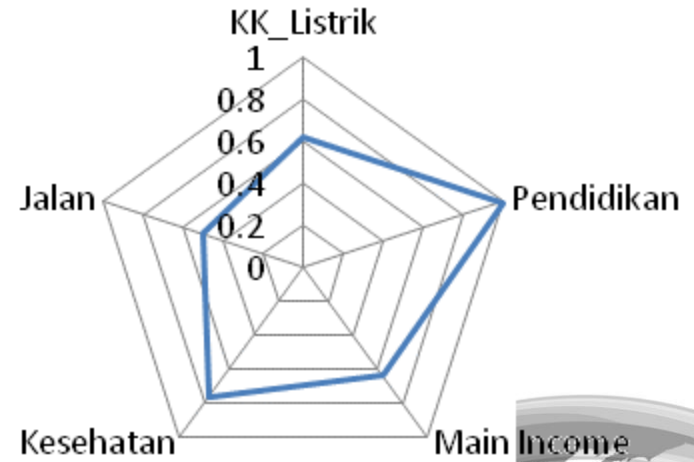


Spider graph SEI and ACI: 2008

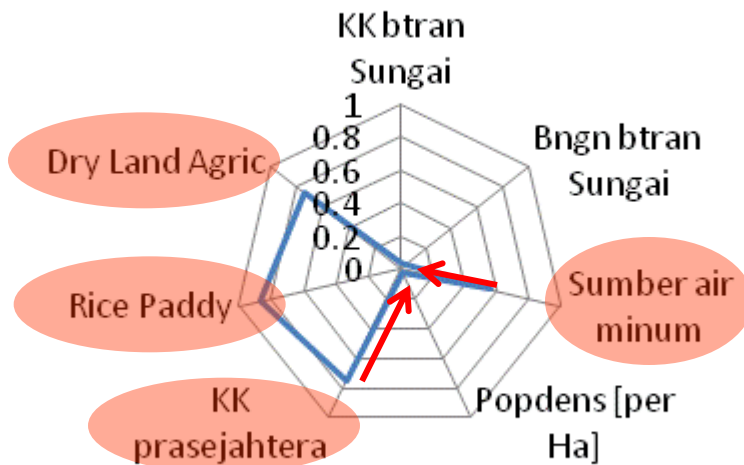
Nilai IKS-Tipe 1



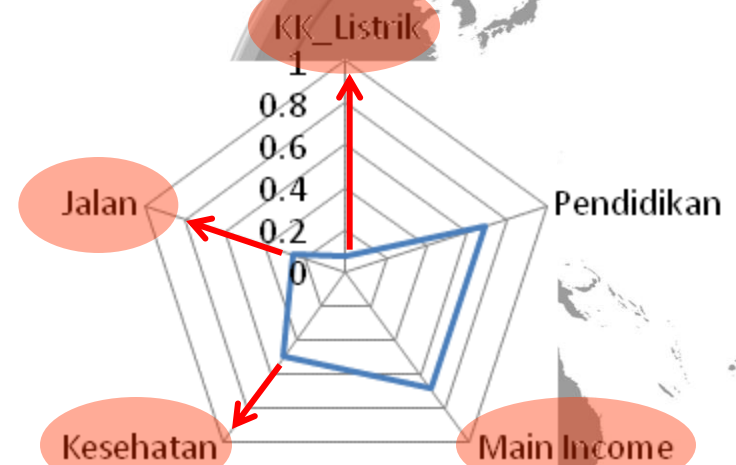
Nilai IKA-Tipe 1



Nilai IKS-Tipe 5



Nilai IKA-Tipe 5



THANK YOU

