MODULE 8.2: VULNERABILITY INDICES
Objectives

Present worldwide used hazards, vulnerability and risk datasets

- University of Notre Dame Global Adaptation Indexes (ND GAIN)
- German Watch Global Climate Risk Index
- Index for Risk Management (INFORM)
University of Notre Dame Global Adaptation Index (ND GAIN)

**ND-GAIN** Country Index is composed of two dimensions:

1. Vulnerability Index measures a country's exposure, sensitivity and ability to adapt to the impact of climate change. ND-GAIN measures the overall vulnerability by considering six life-supporting sectors – food, water, health, ecosystem service, human habitat and infrastructure.

2. Readiness Index measures a country’s ability to leverage investments and convert them to adaptation actions. ND-GAIN measures overall readiness by considering three components – economic readiness, governance readiness and social readiness.

[http://index.gain.org/](http://index.gain.org/) data available online
<table>
<thead>
<tr>
<th>Sector</th>
<th>Exposure component</th>
<th>Sensitivity component</th>
<th>Adaptive Capacity component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>Projected change of cereal yields</td>
<td>Food import dependency</td>
<td>Agriculture capacity (Fertilizer, Irrigation, Pesticide, Tractor use)</td>
</tr>
<tr>
<td></td>
<td>Projected population change</td>
<td>Rural Population</td>
<td>Child malnutrition</td>
</tr>
<tr>
<td>Water</td>
<td>Projected change of annual runoff</td>
<td>Fresh water withdrawal rate</td>
<td>Access to reliable drinking water</td>
</tr>
<tr>
<td></td>
<td>Projected change of annual groundwater recharge</td>
<td>Water dependency ratio</td>
<td>Dam capacity</td>
</tr>
<tr>
<td>Health</td>
<td>Projected change of deaths from climate change induced diseases</td>
<td>Slum population</td>
<td>Medical staffs (physicians, nurses and midwives)</td>
</tr>
<tr>
<td></td>
<td>Projected change of length of transmission season of vector-borne diseases</td>
<td>Dependency on external resource for health services</td>
<td>Access to improved sanitation facilities</td>
</tr>
<tr>
<td>Sector</td>
<td>Exposure component</td>
<td>Sensitivity component</td>
<td>Adaptive Capacity component</td>
</tr>
<tr>
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<td>----------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Ecosystem services</td>
<td>Projected change of biome distribution</td>
<td>Dependency on natural capital</td>
<td>Protected biomes</td>
</tr>
<tr>
<td></td>
<td>Projected change of marine biodiversity</td>
<td>Ecological footprint</td>
<td>Engagement in International environmental conventions</td>
</tr>
<tr>
<td>Human Habitat</td>
<td>Projected change of warm period</td>
<td>Urban concentration</td>
<td>Quality of trade and transport-related infrastructure</td>
</tr>
<tr>
<td></td>
<td>Projected change of flood hazard</td>
<td>Age dependency ratio</td>
<td>Paved roads</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Projected change of hydropower generation capacity</td>
<td>Dependency on imported energy</td>
<td>Electricity access</td>
</tr>
<tr>
<td></td>
<td>Projection of Sea Level Rise impacts</td>
<td>Population living under 5m above sea level</td>
<td>Disaster preparedness</td>
</tr>
<tr>
<td>Component</td>
<td>Indicators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Readiness</td>
<td>Doing business(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governance Readiness</td>
<td>Political stability and non-violence</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control of corruption</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rule of law</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regulatory quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Readiness</td>
<td>Social inequality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ICT infrastructure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Innovation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
German Watch Global Climate Risk Index

The index measures the impacts of weather-related events and climatological events both in terms of direct economic losses and fatalities.

The CRI is calculated as an average ranking of countries in four categories:
- Death toll,
- Deaths per 100 000 inhabitants,
- Total losses in million US$,
- Losses per unit GDP in %

The Long-Term Climate Risk Index measures the degree of exposure which is calculated on annual average data.

https://germanwatch.org/en/12978

Note: Data are not directly available online, would need to be retrieved from German Watch
Source of data: Munich RE NatCatSERVICE
Countries most affected by weather events

1. Honduras
2. Myanmar
3. Haiti
4. Nicaragua
5. Philippines
6. Bangladesh
7. Pakistan
8. Vietnam
9. Guatemala
10. Thailand
<table>
<thead>
<tr>
<th>Ranking CRI</th>
<th>Country</th>
<th>CRI score</th>
<th>Death toll</th>
<th>Deaths per 100 000 inhabitants</th>
<th>Absolute losses (in US$ PPP)</th>
<th>Losses per unit GDP in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Madagascar</td>
<td>42.50</td>
<td>78.80</td>
<td>0.42</td>
<td>160.88</td>
<td>0.634</td>
</tr>
<tr>
<td>22</td>
<td>Mozambique</td>
<td>43.33</td>
<td>101.80</td>
<td>0.47</td>
<td>94.40</td>
<td>0.584</td>
</tr>
<tr>
<td>38</td>
<td>Djibouti</td>
<td>54.17</td>
<td>3.50</td>
<td>0.47</td>
<td>33.60</td>
<td>1.803</td>
</tr>
<tr>
<td>63</td>
<td>Namibia</td>
<td>69.50</td>
<td>11.25</td>
<td>0.57</td>
<td>26.11</td>
<td>0.160</td>
</tr>
<tr>
<td>66</td>
<td>Ethiopia</td>
<td>70.33</td>
<td>88.35</td>
<td>0.12</td>
<td>153.93</td>
<td>0.199</td>
</tr>
<tr>
<td>74</td>
<td>The Gambia</td>
<td>76.67</td>
<td>4.90</td>
<td>0.32</td>
<td>7.09</td>
<td>0.339</td>
</tr>
<tr>
<td>80</td>
<td>Malawi</td>
<td>79.00</td>
<td>11.55</td>
<td>0.08</td>
<td>56.97</td>
<td>0.487</td>
</tr>
<tr>
<td>80</td>
<td>Niger</td>
<td>79.00</td>
<td>12.40</td>
<td>0.09</td>
<td>49.09</td>
<td>0.426</td>
</tr>
<tr>
<td>80</td>
<td>Zimbabwe</td>
<td>79.00</td>
<td>17.40</td>
<td>0.14</td>
<td>46.21</td>
<td>0.206</td>
</tr>
<tr>
<td>83</td>
<td>Mauritania</td>
<td>79.17</td>
<td>4.35</td>
<td>0.14</td>
<td>40.52</td>
<td>0.384</td>
</tr>
</tbody>
</table>
Index for Risk Management (INFORM)

INFORM is a dataset to assess crisis and disasters, the probability of their occurrence and their likely impact. It measures 3 dimensions: 1. Vulnerability, 2. Hazards and Exposure, 3. Coping Capacity.

Example of indicators:
- Physical exposure to flood, tropical cyclone and drought
- People affected by drought
- Frequency of drought events
- Agricultural drought probability
- Food security
- Child mortality
- Human development

[http://www.inform-index.org/](http://www.inform-index.org/), data available online

Vulnerability

Hazard and Exposure to climate-related events
Hazard specific vulnerability index used by Cambodia’s National M&E framework for Climate Change

**Indicator 1:** Percentages of communes vulnerable to climate change

**Indicator 2:** Families affected due to floods, storms and droughts

**Indicator 4:** GHG emissions per capita

2-3 indicators per sector
Indicators of Outcomes or Impacts

Resilience/vulnerability Indicator

- % of communes vulnerable to climate change

Composed of

- Poverty
  - Proxies of poverty include
    - % families with motors
    - % houses with electricity
    - % families with water less than 150m from house

- Agriculture
  - Proxies of Agri include
    - % of irrigated rice farms
    - Number of tractors per 1,000 families

- Health
  - Proxies of Health include
    - Dengue deaths per 100,000

- Education
  - Proxies of education include
    - Average distance to school
    - Number of primary schools with access to water

- Environment
  - Proxies of environment include
    - % families with access to garbage collection
    - % families exposed to pollution

Well being or loss & damage indicator

Percentage of families affected by storms/ floods and droughts.
Communes vulnerable to storms

- Percentage of communes vulnerable to storms in 2014 = 64%
  - 31% : Highly vulnerable
  - 32.5%: Quite vulnerable

<table>
<thead>
<tr>
<th>Province</th>
<th>% of highly vulnerable communes</th>
<th>% of quite vulnerable communes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banteay Meanchey</td>
<td>63%</td>
<td>10%</td>
</tr>
<tr>
<td>Kampong Chhnang</td>
<td>45%</td>
<td>13%</td>
</tr>
<tr>
<td>Takeo</td>
<td>14%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Map showing the distribution of storm vulnerability with different colors indicating the levels of vulnerability.
Percentage of communes vulnerable to floods in 2014 = 56%
- 15%: Highly vulnerable
- 41%: Quite vulnerable

Communes vulnerable to Floods

- Otdar Meanchey
  % of highly vulnerable communes: 55%
  % of quite vulnerable communes: 23%

- Stung Treng
  % of highly vulnerable communes: 24%
  % of quite vulnerable communes: 34%

- Ratnakiri
  % of highly vulnerable communes: 29%
  % of quite vulnerable communes: 54%

Flood Vulnerability Index 2014
- High (> 0.407)
- Quite (0.28 - 0.407)
- Low (< 0.28 - 0.182)
- Very low (< 0.182)
Methods and steps used in developing the hazard specific VI

1. **Step 1:** Develop a list of predictive indicators (data points) of Vulnerability from the national database*. E.g. socio economic indicators

2. **Step 2:** Identify appropriate climate sensitive vulnerability indicators based on their ability to predict climate impacts. E.g. Based on co-relations between socio-economic indicators and losses due to floods, droughts or storms.

3. **Step 3:** Assigning weights to indicators

4. **Step 4:** Discarding indicators and adding new ones. Any indicators that did not convincingly link vulnerability to impacts in the context of specific climate hazards were discarded.

5. **Step 5:** Constructing a vulnerability index by hazard type.
THANK YOU

FAO CBIT AFOLU TEAM

CAPACITY BUILDING INITIATIVE FOR TRANSPARENCY

FAO CBIT – AFOLU PROJECT

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