The 2011 Thailand flood: climate causes and return periods

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Introduction

- Thailand is one of the most developed and wealthiest countries in Southeast Asia. However, its tropical location, local topography and seasonal monsoon rains make it prone to floods.
- The insured loss from the 2011 Thailand flood (US $12 billion) ranks as the highest ever from a freshwater flood disaster worldwide (Swiss Re, 2012).
- The 2011 flood ranks 5th in terms of magnitude and 1st in terms of duration (Brakenridge, 2012).
- The return period for the 2011 flood (based on table below) is 5.6 years.

Flood overview & historical ranking

- During 2011 Thailand saw above average rainfall from the summer monsoon and from the remnants of four tropical storms in the country’s north.
- Flooding was exacerbated by poor management of the country’s main dams.
- The 2011 flood ranks 5th in terms of magnitude and 1st in terms of duration (Brakenridge, 2012).
- The return period for the 2011 flood (based on table below) is 5.6 years.


<table>
<thead>
<tr>
<th>Year</th>
<th>Magnitude</th>
<th>Duration (days)</th>
<th>Area Affected (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>7.0</td>
<td>315,000</td>
<td>314,000</td>
</tr>
<tr>
<td>2005</td>
<td>7.3</td>
<td>300,000</td>
<td>315,000</td>
</tr>
<tr>
<td>2004</td>
<td>7.5</td>
<td>59</td>
<td>378,000</td>
</tr>
<tr>
<td>2011</td>
<td>7.9</td>
<td>213,000</td>
<td>372,000</td>
</tr>
<tr>
<td>2002</td>
<td>7.1</td>
<td>67</td>
<td>300,000</td>
</tr>
<tr>
<td>2000</td>
<td>7.1</td>
<td>107</td>
<td>59</td>
</tr>
<tr>
<td>2003</td>
<td>7.6</td>
<td>134</td>
<td>7,000</td>
</tr>
<tr>
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<td>45</td>
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</tr>
<tr>
<td>1995</td>
<td>7.5</td>
<td>35</td>
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</tr>
</tbody>
</table>

Climate causes

- Thailand precipitation in 2011 was 23% above normal.
- A strong Southeast Asian summer monsoon contributed to a rainfall anomaly of +34% for the May-October (MJJSO) period.
- A positive correlation exists between August-October (ASO) Southern Oscillation Index (SOI; Trou, 1965) and ASO precipitation (Sinhathra et al., 2005).
- A moderately high SOI value of +7 for ASO 2011 (Australian Bureau of Meteorology, 2012) enhanced the summer monsoon.
- The remnants of four tropical storms brought high rainfall to northern Thailand between June and October - one third of the anomalously high rainfall in 2011.
- The 2011 flood return period may be estimated from pan tropical storm rainfall only: 10 years (Northern site = 10 years; Southern site = 20 years).

Flood severity

- Severity depends on the estimated recurrence interval of floods in the region affected and is defined on a scale between 1 and 2.

Flood magnitude = \log(\text{Duration} \times \text{Severity} \times \text{Area Affected})

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References