A geo-spatial assessment of flood impacts on agriculture in Quang Nam province, Vietnam

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Photo: Hoang Dinh Nam
Presentation Outline

- Problem statement
- Background
- Methodology
- Results
- Conclusion and recommendations
Despite advances in technology, agriculture still relies upon natural weather patterns and climate cycles for its productivity.

The recent weather events highlight Vietnam’s vulnerability.

Little research has been done to linking flood models with economic models.

**Aim of this stage**: To undertake a geo-spatial assessment of flood impacts on agriculture in Quang Nam province.
Quang Nam’s topography and river systems.

- **Area**: 10,400 km²
- **Coastline**: 85 km
- **Mountainous and highland areas**: 80% of land
- **Tropical monsoon climate zone**
- **Prone to natural disasters**
- **Population**: 1.5 million
- **Mostly agricultural province**
- **GDP**: USD 447 mill (2010).

*Sources: General Statistics Office of Quang Nam*
Background

**Structure of economic sectors**

- Agriculture, forestry and fishing
- Industry and construction
- Service

**Gross Domestic Product at current prices by economic sectors**

Sources: General Statistics Office of Quang Nam.
Percentage of labour force by sector – Quang Nam 2007

Source: www.gms-eoc.org/CEP/Comp4/docs/ISDP/Group_VNM.pdf
**Quang Nam agriculture:**

- More than 80% of population live in rural areas and rely upon agriculture
- 65% of the provincial labor force
- Main source of income
- 20% of province’s GDP annually

**HOWEVER,**
Dien Ban district - Quang Nam

National highway No.1 at Duy Xuyen District inundated in the November 2007 flood.

A village completely flooded in Quang Nam on Oct. 1, 2009.

Photo: Vũ Trung

Photograph by: Hoàng Đình Nam, AFP/Getty Images
Methodology

Identify natural extreme events

Analyzing events

Quantifying events' impacts on agriculture

Agriculture sector
# Results

## Type, frequency and influential level of extreme events in Quang Nam.

<table>
<thead>
<tr>
<th>No</th>
<th>Type of event</th>
<th>Frequency</th>
<th>Risk level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flood</td>
<td>Frequent</td>
<td>Very high</td>
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<tr>
<td>2</td>
<td>Storm</td>
<td>Frequent</td>
<td>Very high</td>
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<tr>
<td>3</td>
<td>Drought and salt intrusion</td>
<td>Frequent</td>
<td>Moderate</td>
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<td>4</td>
<td>Southeast monsoon</td>
<td>Frequent</td>
<td>Moderate</td>
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<tr>
<td>5</td>
<td>Thunderstorm, Whirlwind, Lightening</td>
<td>Frequent</td>
<td>Moderate</td>
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<tr>
<td>6</td>
<td>Flash flood, landslide</td>
<td>Frequent</td>
<td>High</td>
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<tr>
<td>7</td>
<td>Seaside erosion</td>
<td>Frequent</td>
<td>Moderate</td>
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<tr>
<td>8</td>
<td>Fog, hail</td>
<td>Frequent</td>
<td>Low</td>
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<tr>
<td>9</td>
<td>Northeast monsoon</td>
<td>Frequent</td>
<td>Low</td>
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</tbody>
</table>
Total damage caused by natural disasters in Quang Nam province from 1997 to 2009

> 90% of damages caused by floods.

Source: Central Committee for Flood and Storm Control
Flood in Quang Nam province

- Average annual rainfall: 2612 mm
- 75% of annual rainfall drops in Sep – Dec
- Steep slopes and short rivers
- On the East: national highway No.1, rail way, sand dunes, high tides
- On the West: Mountain.

Floods are:
- Frequent
- High intensity
- Sharp peak
- High magnitude.

Results

- The inundation basin considered comparatively closed;
- Assume that the basin is a retarding basin;

Using DEM to identify the possible inundation risk impacts on agriculture.
### Flood scenarios:

<table>
<thead>
<tr>
<th>Return period</th>
<th>Probability</th>
<th>200</th>
<th>100</th>
<th>20</th>
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<tbody>
<tr>
<td></td>
<td>0.5%</td>
<td>9,372</td>
<td>8,574</td>
<td>6,628</td>
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<td>Thanh My Station</td>
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<td>Nong Son Station</td>
<td>5%</td>
<td>13,579</td>
<td>12,620</td>
<td>10,233</td>
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</tbody>
</table>

Source: Nguyen Ba Quy, 2011
Flood scenarios:

Distribution of inundation depth of historical flood (flood in 2009) extracted from DEM30.

Distribution of inundation depth at 20 years return period flood (flood in 2007) extracted from DEM30.
### Crop structure and season in Quang Nam

<table>
<thead>
<tr>
<th>Crops</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
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<th>Sep</th>
<th>Oct</th>
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<td>Spring paddy</td>
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<td>Autumn paddy</td>
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<td>Sweet potatoes</td>
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<td>Animal raising</td>
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<td>Aquaculture</td>
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<td>Tropical cyclone season</td>
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<td>Flood season</td>
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</tbody>
</table>

**Results**
Land use affected by historical flood (110,951ha – 11% total area).

Land use affected by 20 years RP flood (76,515ha – 7% total area).
The impacts of flood scenarios in Quang Nam.

<table>
<thead>
<tr>
<th>Flood scenarios</th>
<th>People</th>
<th>Agri. land (ha)</th>
<th>Rice (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 years RP</td>
<td>424,000</td>
<td>37,630</td>
<td>27,951</td>
</tr>
<tr>
<td>Historical flood</td>
<td>769,285</td>
<td>50,255</td>
<td>36,728</td>
</tr>
<tr>
<td><strong>Total of province</strong></td>
<td><strong>1,452,413</strong></td>
<td><strong>120,119</strong></td>
<td><strong>77,396</strong></td>
</tr>
</tbody>
</table>

Note: The agricultural land include: agricultural, aquacultural and salt production land.
Agriculture is very vulnerable to floods:

- 20 year RP: 30% of agricultural land, 36% of rice land
- Historical: 41% of agricultural land, 47% of rice land.

Most impact: populated, flat and highest agricultural production areas

Combined with likely sea level rise, impacts are likely to be greater.
Flooding can not and should not be eliminated:

- Keep flood and people separate or
- Live with flooding.

Hard and soft solutions are needed to mitigate the impacts:

- Early warning system
- Emergency response plan
- Recovery plan
- Construction measures.

Flood risk analysis based on CBA is necessary to evaluate the effectiveness and feasibility of proposed solutions.
References


