How forecasts can trigger humanitarian action

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2016 HEPEX Workshop
Quebec City
8 June, 2016

International Research Institute for Climate and Society
Earth Institute | Columbia University
Part 1: What comes first?
Researchers/MET

Probability of Monthly Averages (in a Season)
Rainfall Tercile Conditioned on ENSO

This map shows the historical probability (given in percentile) of seasonal average monthly rainfall falling within the upper (wet), middle (normal), or bottom (dry) one-third (“tercile”) of the 1983-2014 historical distribution in the country given the state of ENSO (El Niño, Neutral, La Niña) during that same season.

Here, the ENSO state for each season is defined according to the Oceanic Niño Index (ONI). It is using Sea Surface Temperature (SST) anomalies, based on 1981-2010 normal, in the geographical box (130°W, 5°S, 120°W, 5°N). A season is considered El Niño (La Niña) if it is part of at least 5 consecutive overlapping 3-month long seasons where the ONI is above 0.45°C (below -0.45°C). Use the controls on the page to select the season, temperature tercile category of interest, and ENSO state.

Clicking on the map will then display, for the selected point, yearly seasonal rainfall averages time series. The color of the bars depict what ENSO phase it was that year, and the horizontal lines show the historical terciles limits. This allows to quickly picture what years fell into what ENSO Phase and into what Rainfall Tercile category.
Researchers to (with) MET

Regional Gov’t/Red Cross
Researchers to (with) MET

Regional Gov’t/Red Cross

Local Gov’t
Researchers to (with) MET
Regional Gov’t/Red Cross
Local Gov’t
Community Action
Researchers to (with) MET

Regional Gov't/Red Cross

Local Gov't

Community Action

Who are the users??
Part 1: What comes first?
• Action
  • Length of time to prepare
  • How to execute the action
  • Reality in the community
  • Local culture
• Forecasts
• Skill
• Uncertainty
• Forecasts
• Skill
• Uncertainty

• Action
  • Length of time to prepare
  • How to execute the action
  • Reality in the community
  • Local culture
- Forecasts
- Skill
- Uncertainty

- Action
  - **Length of time** to prepare
  - How to execute the action
  - Reality in the community
  - Local culture
Warning for strong winds and large waves/Tahadhari ya upepo mkali na mawimbi makubwa 07-09/06/2016.

From: tma cfo
To: cmsangi@yahoo.com, Ewald bonifasi, fanosbert@yahoo.com, godfridaclement@yahoo.com, kazimilistephen@yahoo.com, konyonanai@pmo.go.tz, turuka@yahoo.com, carockilembe@yahoo.com, agnes. kijazi, massytambwe@gmail.com, ndungu karemeri, DMintern Africa, Renatus Mkarka, Andrew Kruczkiewicz, Geoffrey Mwana, Joseph Kimaryo, Director Disaster Management, kibri2006@yahoo.com, Vivabvna Shoo, Julie Arrighi, arrighi@climatecentre.org, joycekagaruki@yahoo.com

Please receive the warning information on strong winds and large waves along the entire coast from 07-09/06/2016.

Tafadhali pokea taarifa ya tahadhari ya upepo mkali na mawimbi makubwa katika ukanda wote wa pwani kuanzia tarehe 07-09/06/2016.

Thank you/Ahsante

Public Weather Services Department/Kitengo cha Huduma za Hali ya Hewa kwa Umma, Central Forecast Office/Ofisi Kuu ya Utabiri, Tanzania Meteorological Agency/Mamlaka ya hali ya Hewa Tanzania.
JAMHURI YA MUUNGANO WA TANZANIA
WIZARA YA UJENZI, UCHUKUZI NA MAWASILIANO
MAMLAKA YA HALI YA HEWA TANZANIA

Simu: 255 22 2460735/2460706
FAKSI: 255 22 2460735/2460700
Barua pepe: met@meteo.go.tz
Tovuti: www.meteo.go.tz

S.L.P. 3056
DAR ES SALAAM

06 Juni, 2016

Taarifa kwa Umma: Upepo mkali na mawimbi makubwa vinatarajiwa katika maeneo ya ukanda wa Pwani.

<table>
<thead>
<tr>
<th>Taarifa Na.</th>
<th>201606-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muda wa Kutolewa</td>
<td>06 Juni Saa 10:00 Alasiri</td>
</tr>
<tr>
<td>Saa za Afrika Mashariki</td>
<td></td>
</tr>
<tr>
<td>Daraja la Taarifa:</td>
<td>Tahadhari</td>
</tr>
<tr>
<td>Kuanzia:</td>
<td>07 Juni, 2016</td>
</tr>
<tr>
<td>Tarehe</td>
<td>09 Juni, 2016</td>
</tr>
<tr>
<td>Mpaka:</td>
<td>09 Juni, 2016</td>
</tr>
<tr>
<td>Tarehe</td>
<td>07 Juni, 2016</td>
</tr>
<tr>
<td>Aina ya Tukio</td>
<td>Upepo mkali unaozidi kasi ya km 40 kwa saa na mawimbi makubwa yanayozidi mita 2.0.</td>
</tr>
<tr>
<td>Linalotarajiwa</td>
<td>Wastani (70%)</td>
</tr>
<tr>
<td>Kiwango cha uhakika:</td>
<td></td>
</tr>
<tr>
<td>Maeneo yanayotarajiwa kuathirika</td>
<td></td>
</tr>
<tr>
<td>Mwambao wa mikoa ya Tanga, Pwani, Lindi, Mtwara, Dar es salaam pamoja na visiwa vya Unguja na Pemba.</td>
<td></td>
</tr>
<tr>
<td>Maelezo:</td>
<td>Msukumo wa upepo wa Kusi unaotokana na uwepo wa mgandamizo mkubwa wa hewa katika Pwani ya Afrika Mashariki.</td>
</tr>
<tr>
<td>Angalizo:</td>
<td>Watumiaji wa bahari na Wakazi wa maeneo tajwa wanashauriwa kuchukua tahadhari na hatua stahiki.</td>
</tr>
<tr>
<td>Maelezo ya Ziada</td>
<td>Mamlaka ya Hali ya Hewa inaendelea kufuatilia kali hii na itatoa mrejeo kila itakapobidi.</td>
</tr>
</tbody>
</table>

Imetolewa na
Mamlaka ya Hali ya Hewa Tanzania.
Part 2: Forecast Based Financing

Actions: Who/When/Where?

Funding

Acting in vain
The Usual Surprise
The Usual Surprise

The Proposed Innovation
No early action

Response

Suffering

Forecast-based Financing for Preparedness Actions

Preparedness

Response

Act in Vain + Set-Up

Suffering
Thresholds, Funding and Action

No early action:
- Response: $$$$$$
- Suffering: hands in water

Forecast-based Financing for Preparedness Actions:
- Preparedness
- Response
- Act in Vain + Set-Up
- Suffering
Risk Knowledge: What is a disaster?
Risk Knowledge: What is a disaster?
Risk Knowledge: What is a disaster?

95\textsuperscript{th} Percentile of historical daily discharge
Action Option: Preposition Stocks
Action Option: Preposition Stocks

Step 1: Acquire and stock Non food Items (NFI)
- NFI kits (large)
- NFI kits (small)
- Mosquito nets
- Gum boots
- Rain suits
- Hygiene booklets
- Water purification tablets
Warning Response: Other actions to take?

<table>
<thead>
<tr>
<th>Action</th>
<th>Time required to complete the action (lead time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water storage and purification: distribute jerry cans, soap, and a 30-day supply of chlorine tablets to vulnerable households</td>
<td>4 days</td>
</tr>
<tr>
<td>Water drainage and water source rehabilitation: clear drainage, rehabilitate broken boreholes</td>
<td>4 days</td>
</tr>
<tr>
<td>Food Storage: Move vulnerable items into storage facilities on high ground</td>
<td>7 days</td>
</tr>
</tbody>
</table>
Action Option: Strengthening houses
How long will it take to strengthen Houses?

3 Months
Hygiene Kits
Warning Response: Act in vain?
Warning Response: Act in vain?

50%
## Possible Outcomes

<table>
<thead>
<tr>
<th>ACTION</th>
<th>Does the extreme event materialize?</th>
<th>INACTION</th>
<th>Does the extreme event materialize?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DISASTER</td>
<td></td>
<td>NO DISASTER</td>
</tr>
<tr>
<td><strong>&quot;Worthy Action&quot;</strong></td>
<td>“Act in Vain”</td>
<td><strong>&quot;Fail to Act&quot;</strong></td>
<td>“Worthy Inaction”</td>
</tr>
<tr>
<td>Faster response post-flood, reduced disease burden</td>
<td>Extra transport costs, reputational costs, perception</td>
<td>Disaster</td>
<td>Regular day</td>
</tr>
</tbody>
</table>
Part 3: Challenges

• Thresholds. When to act in the area of interest? Seasonality? Nodes of variability? Trend?
• Developing SOPs (Standard Operating Procedures). Reaching consensus.
• Inciting action at the community level.
• Perfect forecast = perfect action?

https://vimeo.com/152150976
Challenges

Act if forecast $\geq$ threshold 1
Floods!

Togo Daily Data

Climate Data

Date

2008  2009  2010  2011
Floods!
Floods!

2 False Alarms in 1 year!
Alternative *threshold* 2

Missed 1!
THANK YOU!!!