

# Mobile Pictographs for Alerting

Findings from Sri Lanka and the Philippines



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Sahana Software Foundation

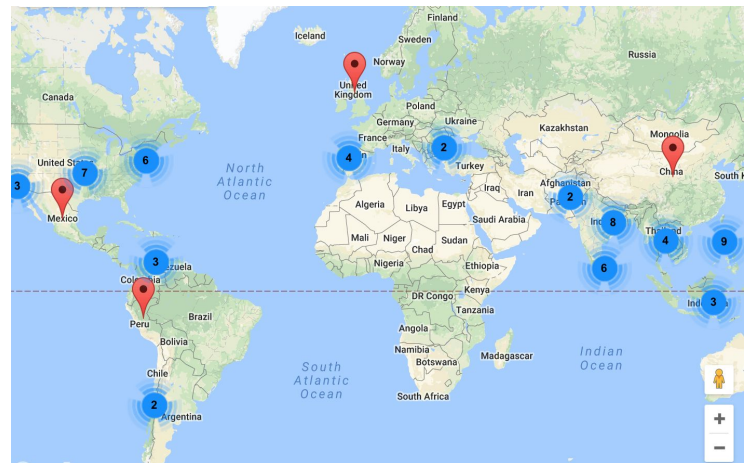
CAP Implementation Workshop  
Rome, Italy – Sep 21, 2017

# What is Sahana?



**For over a decade, Sahana provides high quality information management systems for emergency preparedness, response, recovery and resilience-building accessible to all.**

- Built upon a global community
- Free and open source – no licensing fees or restrictions to use
- More than 65 deployments over more than 25 countries around the world



**BAD WEATHER WARNING F**

**2016 ඔක්තෝබර් මස 30 වන දින 1200 පැයෙන්  
සිට ක්‍රියාත්මක වන පරිදි දිවයින පැය 48 කදකා නිකුත්  
කරන ලදී.**

**ROUGH SEA AREAS FOR SOUTH**

VALI

ber 2016

The very severe cyclonic storm (12.9 N, 84.2 E) around 600 km from the west coast of Sri Lanka and it is likely to move northwards tomorrow evening.

(කාලගුණ විද්‍යා දෙපාර්තමේන්තුවේ, ස්වභාවික විපත් පිළිබඳ පූර්ව අනතුරු ඇඟවීමේ මධ්‍යස්ථානය මගින් 2016 ඔක්තෝබර් මස 29 වන දින 1300 පැයට නිකුත් කරන ලදී.)

ography)  
al is located (approximately 600 km to the north-east of Sri Lanka) and it is likely to cross Chennai coast on tomorrow evening.

**Under Influence of the above cyclonic storm, very heavy showers are expected for fishing and naval activities.**

2016 ඔක්තෝබර් මස 30 වන දින සිට (විශේෂයෙන් සවස් කාලයේදී) දිවයිනේ බොහෝ ප්‍රදේශවල සවස 2.00 න් පමණ පසු වැසි හෝ ගිගුරුම් සහිත වැසි ඇතිවීමේ හැකියාව ඉහල මට්ටමක පවතී. සමහර ස්ථානවලට විශේෂයෙන්, උෘට්, මධ්‍යම සහ නැගෙනහිර පළාත්වල (මිලි මීටර් 100-150 පමණ) තද වැසිද බලාපොරොත්තුවේ.

mph), Very rough sea areas and heavy rain is expected to enter. Sea conditions are not suitable for fishing and naval activities.

Due to the active cloudiness in the region, heavy rain is expected associated with sudden increase in wind speed.

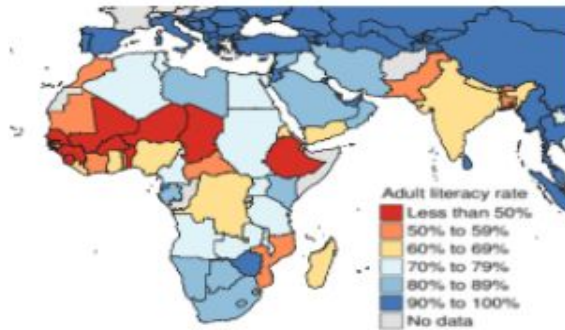
low sea areas, very rough seas can be expected.

**Naval and fishing communities should be advised to suspend activities tomorrow.**

වෙරළබඩ ප්‍රදේශවල උදාසන කාලයේ දී වැසි ඇති වීම.

**I fishing activities today and tomorrow.**

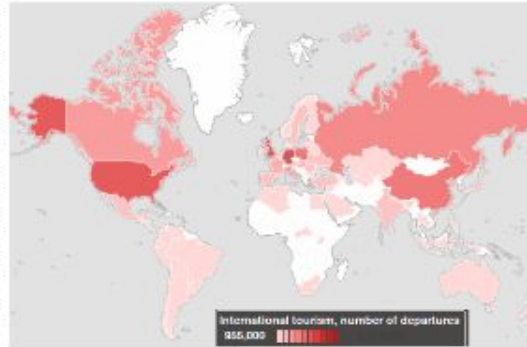
# The Need for Pictographs



~30% avg in South/West Asia and Sub-Saharan Africa are illiterate

~ 10% avg improvement in the last 20 years

Source UNESCO:  
<http://tinyurl.com/bwj3stl>



~ 955,000 million/year international tourism departures 2008-2012

~ 1.6 billion/year foretasted for 2020

Source World Bank:  
<http://tinyurl.com/bwj3stl>

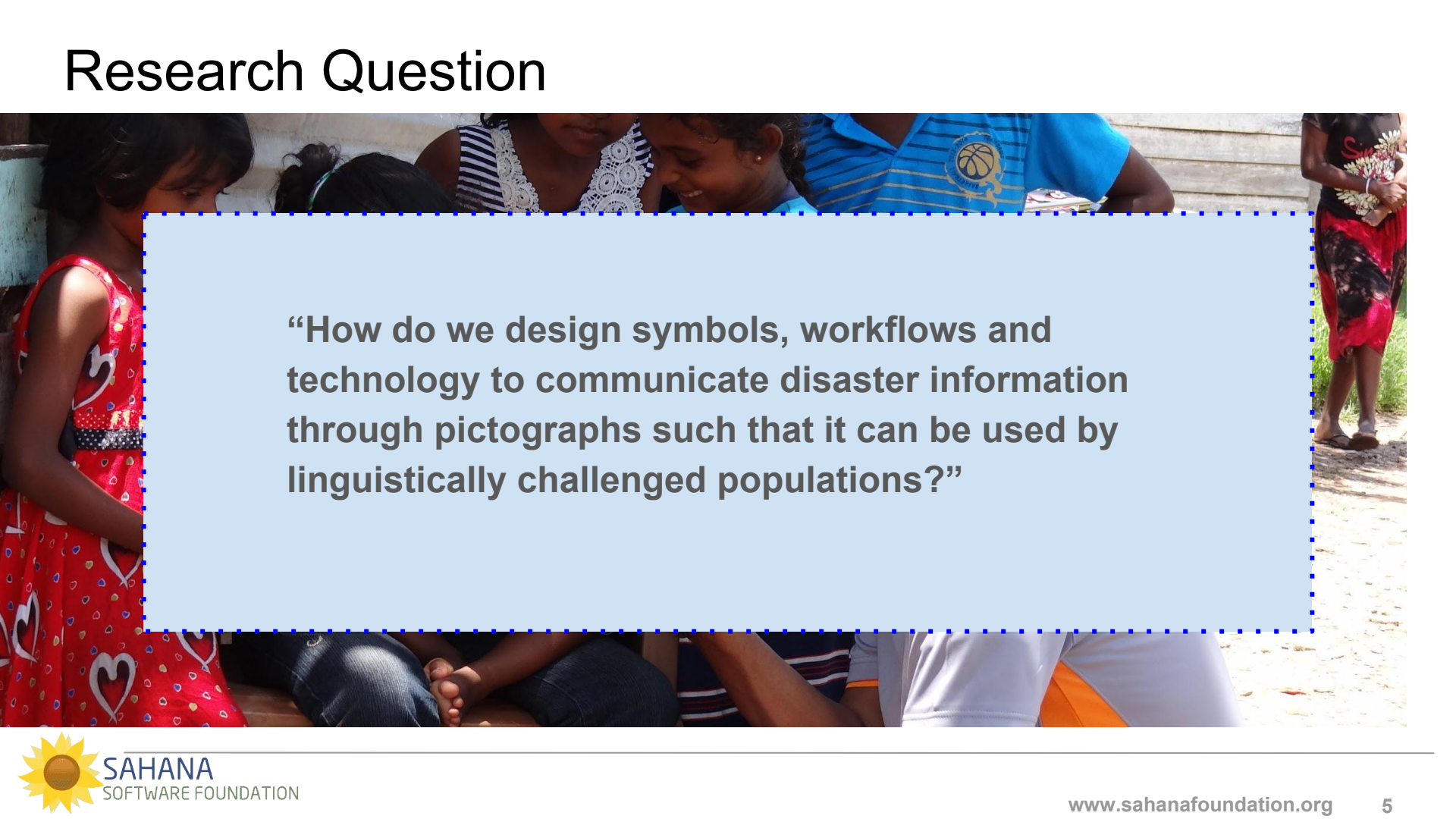


Most countries speak more than one language

Many of them with over 50 languages

Source Ethnologue world languages:  
<http://tinyurl.com/csfg45v>

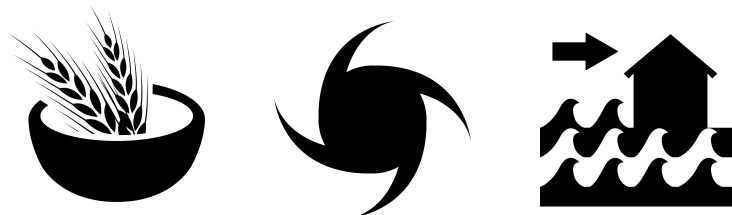
# Research Question

A photograph of a group of children and adults in a community setting. In the foreground, a young girl in a red dress with white heart patterns is looking down. Behind her, several other children and adults are visible, some looking at each other. A large, light blue rectangular box with a dashed blue border is overlaid on the center of the image, containing the research question text.

**“How do we design symbols, workflows and technology to communicate disaster information through pictographs such that it can be used by linguistically challenged populations?”**

# Existing Pictograph Resources

- Usually designed for use on *maps* and/or signage, not for alerting
- Symbols often concentrate on *incident* and omit response actions. Not representing complex situations.
- Designed and evaluated with *professionals* in mind
- *Not* explicitly addressing illiterates / linguistically challenged



UN-OCHA Humanitarian Icons



Guemil icon set



FDGC Emergency Symbols

# Findings from Literature and Field Work

- **Local Design:**
  - Pictographs must be designed locally with target audiences to address cultural differences
- **User-centered Symbology**
  - Usual recommendations for icon design might not hold for illiterates due to deficiencies in abstraction and categorization
- **Level of abstraction**
  - Choosing level of abstraction is crucial due to different cultural background and experiences
- **Time and Numbers:**
  - Abstract concepts like time and numbers must be handled with care – important, but hard to communicate clearly
- **Response actions**
  - Usually not considered, but crucial part of the information
- **Limited success**
  - Evaluations do not show required comprehension rates, even with professionals

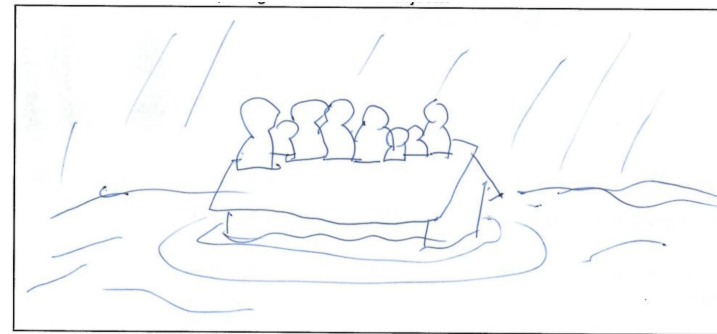
Literature survey available: [www.researchgate.net/project/Pictographs-for-Disaster-Communication](http://www.researchgate.net/project/Pictographs-for-Disaster-Communication)

# Exercise, CAP Workshop Bangkok, 2016



# Findings from the Experiment

- Details were often omitted, especially numbers. If at all, they were indicated through depictions of context (e.g., flood height on a house)
- Arrows served for both location markers (“going downhill”) as well as to indicate time sequences. Both was well understood
- Time was represented by clocks.



“Moderate Flooding”

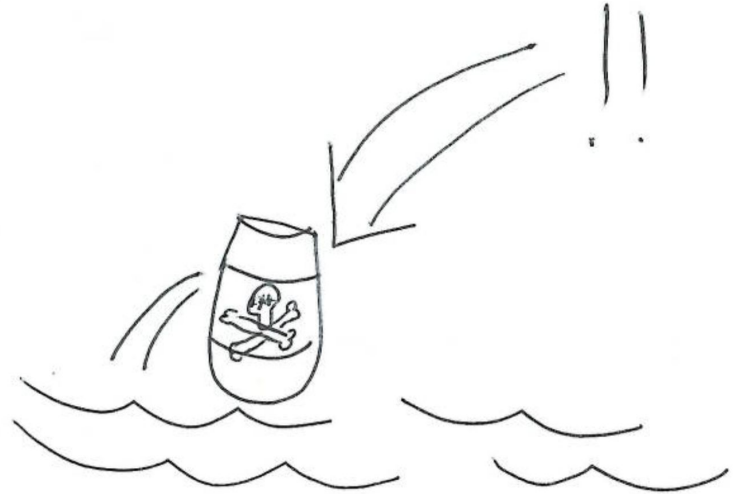


“Severe Flooding”

# Universal Symbology?



**“Chemical Spill!”**



**“Help, Pirates!”**

# User Centered Design



Deaf Community  
Cebu City, Philippines



Rural Community  
Ratnapura, Sri Lanka



Rural Community  
Colombo Region, Sri Lanka



Urban Community  
Colombo, Sri Lanka

# Participant selected pictographs

Flood (3, 1)



Landslide (8, 10)



Heavy Rain (17)



Storm (11, 14)



Shelter (23)



Evacuate (36, 40)



Observe (42, 43)



Prepare (51)



Rescue (58, 60)



All Clear (63, 62)



Injured (68, 70)



People (72, 73)



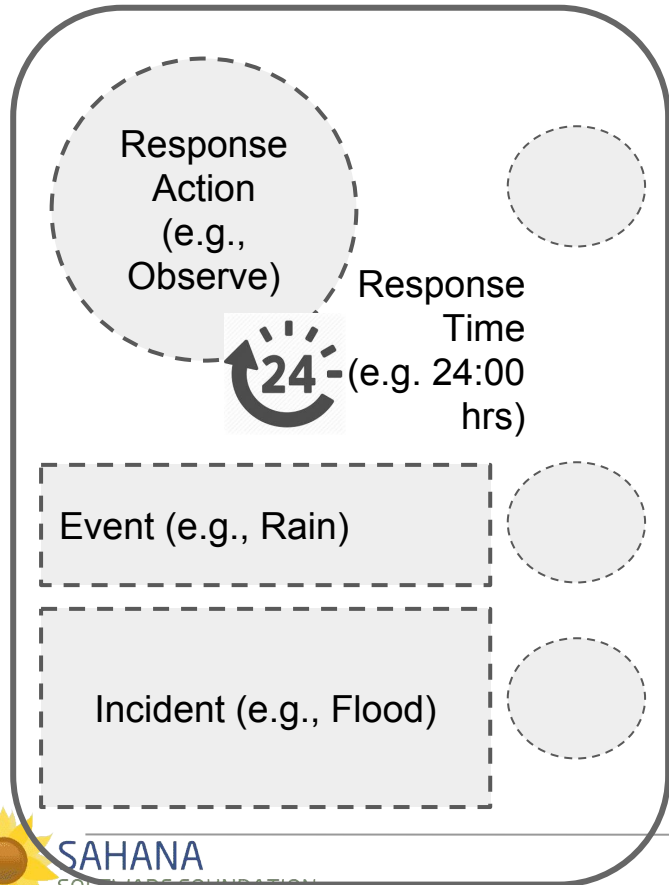
Direction (77, 78)



Food (46, 50)



# Alerting Pictograph Layout



Urgency  
(e.g.,  
“Expected”)

Severity  
(e.g.,  
“Extreme”)

Certainty,  
(e.g.,  
“Likely”)



# Research Questions for Second Survey

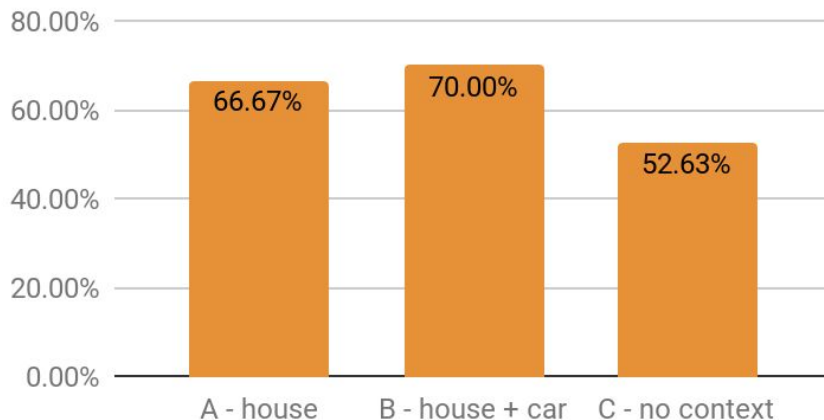
- Do people understand more complex pictographs?
- Does context/reference objects have an effect on comprehension?
- Do people recognize response actions as response actions?
- Do people understand indications of time?
- Does indication of response actions/time have negative/positive effects on comprehension?
- Do certain aspects affect impression of severity?



# Context

- Adding contextual entities (house and car) adds to comprehension.
- Only 52% understood the meaning without context

## Comprehension and Context

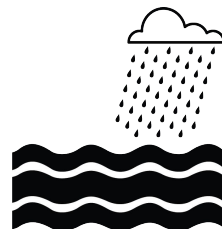


Comprehension

67%

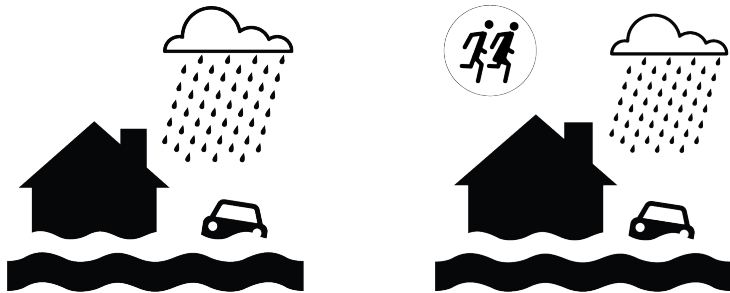


70%



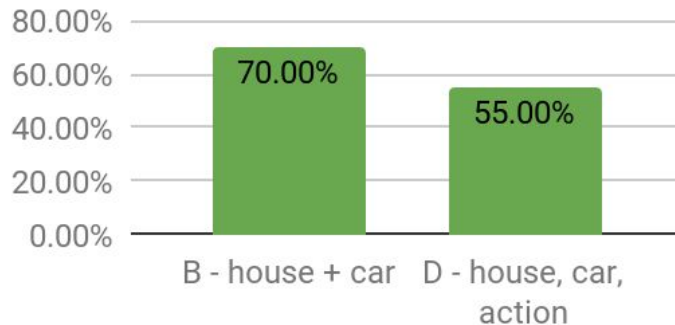
53%

# Response Actions

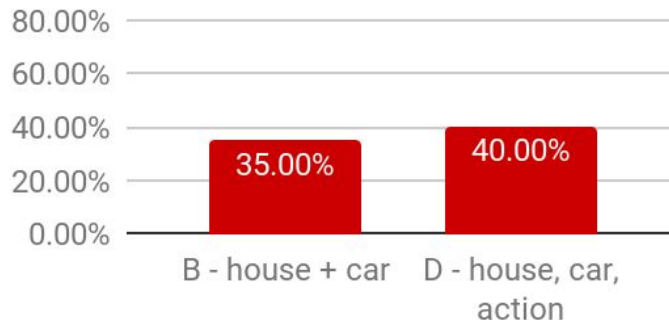


- Additionally depicting a response action “evacuate” (right) caused confusion – comprehension rate drops
- However, understanding of what to do (correct response action) slightly increased – even if overall comprehension was lower

## Comprehension of Incident



## Comprehension of Response



# Severity Understanding



A



B



C

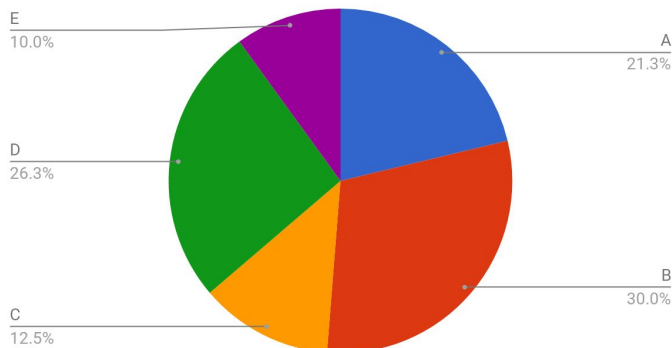


D

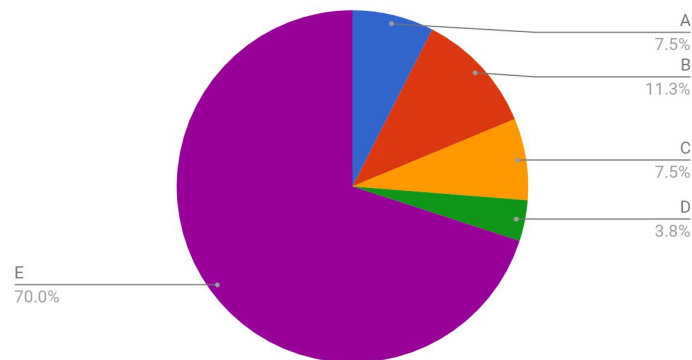


E

Rated Most Severe

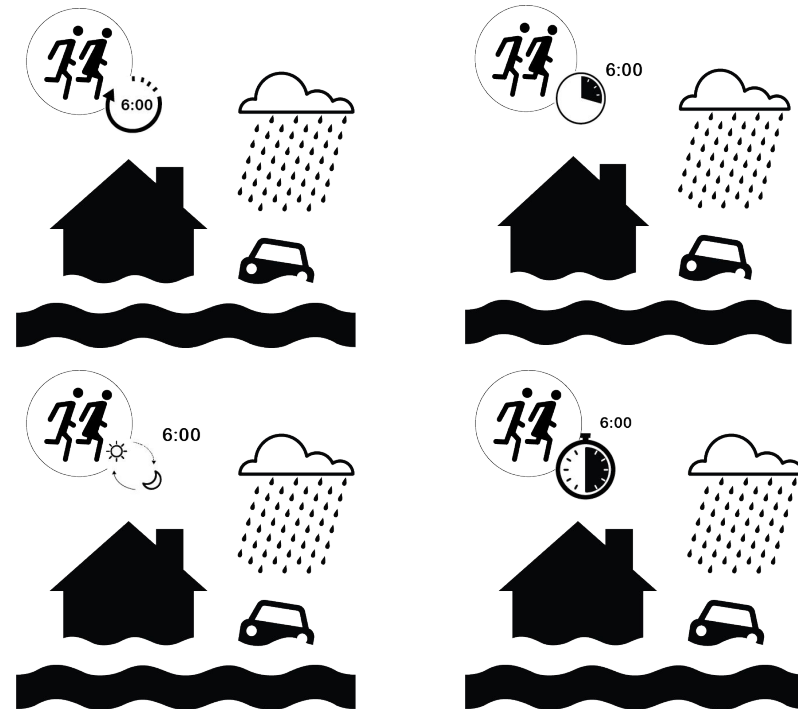


Rated Least Severe



# Time Comprehension

- Time representations are generally **not** correctly understood
- Several representations of “for six hours” were tested
- >95% understood this is “about time”, but:
- Comprehension rate: **7.5%** (for “in/for 6 hours”)



# Conclusions

- Pictograph-based alerting works for the target users – but it needs careful design to make them successful
- There won't be a universal pictograph language – pictographs will need to be tailored to the target users in a participatory design effort
- Representation of response actions must be researched further, also considering different modalities – e.g., animations

# Further Plans and Upcoming Research

Sahana will continue research in a next project phase:

- In-depth studies on pictograph comprehension with participatory design approach
- Adding functional concepts for severity/urgency and time,
- Prototype development for mobile pictograph-based alerting
- Further research on incident reporting to give the linguistically challenged a voice

# Thank you!

More information:

[www.sahanafoundation.org/pictographs](http://www.sahanafoundation.org/pictographs)

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