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# Understanding public's preferences for information provided on multi-hazard platforms

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- Our focus
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- Main results
  - (i) Design of the start page
  - (ii) Hazard announcements
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- Conclusion
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# Multi-hazard platforms – Apps

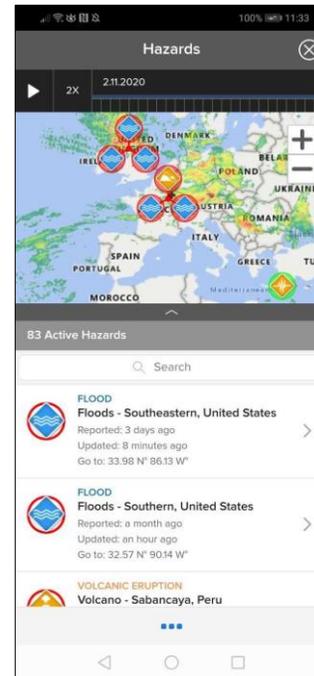
Triggered by technical progress that allows combining information about natural, anthropogenic and socionatural hazards, numerous multi-hazard platforms have been established over the last few years.



MeteoSwiss [1]  
(Switzerland)



AlertSwiss [2]  
(Switzerland)



DisasterAlert [3]  
(globally)



WarnWetter [4]  
(Germany)



KATWARN [5]  
(Germany)

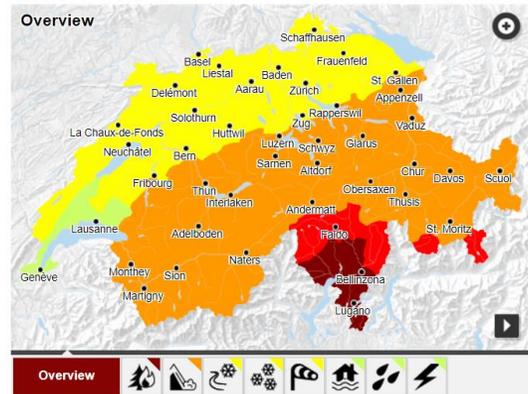
# Multi-hazard platforms – Websites

Current research has mainly focused on technical challenges [9-11].

## Current natural hazards situation in Switzerland

[Natural hazard bulletin](#)

Updated on: 11.02.2020, 11:39

Natural Hazards Portal [6] (Switzerland)

**GDACS**  
Global Disaster Alert and Coordination System

GDACS is a cooperation framework between the United Nations, the European Commission and disaster managers worldwide to improve alerts, information exchange and cooperation in the first phase after major sudden-onset disasters.

HOME ALERTS VIRTUAL OSOCC MAPS & SATELLITE IMAGERY KNOWLEDGE ABOUT

Latest news: Earthquake (ECHO 10 Feb 2020) South Africa - Flood (ECHO 10 Feb 2020)

Map of disaster alerts in the past 4 days, European Union, 2019. Map produced by EC-JRC. The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The listed events in the list below are the past events before last 4 days. For drought alerts, all the events listed in the homepage are ongoing events. In bold: (i) new events; (ii) events where a significant worsening has been assessed (+ 0.5 GDACS score or increase in the Alert Level); (iii) events where new information products are available (Global Drought Observation Portal).

EARTHQUAKES	TROPICAL CYCLONES	FLOODS	VOLCANOES	DROUGHTS
Papua New Guinea (6.2M) - 09 Feb 06:04	UESI-20 (148Mevh) - 11 Feb 08:00	Tanzania - 09 Feb 2020	Taal in Philippines - 02 Jan 2020	Zambesi Basin - 2019 - 18 weeks
South Georgia and the South Sandwich Islands (6.1M) - 08 Feb 14:32	DAMIEN-20 (170Mevh) - 09 Feb 12:00	Rwanda - 09 Feb 2020	Sheshajin in United States - 20 Jan 2020	Central America - 2019 - 73 weeks
Indonesia (5.6M) - 08 Feb 06:36	FRANCISCO-20 (18Mevh) - 08 Feb 2020	Brazil - 04 Feb 2020	Sarapan in Indonesia - 18 Jan 2020	Mainland Southeast Asia - 2019 - 64 weeks
Antarctica (6.4M) - 07 Feb 12:40	ESAM-20 (93Mevh) - 26 Jan 2020	Chile - 27 Jan 2020		

Global Disaster Alert and Coordination System [7] (globally)



Hazard map on the website HungerMap [8] (globally)



## Research is missing [12,13], answering the questions ...

Are consistent and compatible hazard announcements and maps correctly **understood** by the receivers?

Which information **content** do the users **prefer**?

Even if information about earthquake and other hazards is embedded in frequently used weather apps, do the users **look at this information at all**?

Do the information provided on multi-hazard platforms actually increase societal resilience in **comparison to earthquake-specific platforms**?

Do the app functionalities aiming to increase society's preparedness levels **actually have an impact**?

Which **individual, societal and contextual factors** influence people's preferences for, and **ability to handle information** provided on multi-hazard platforms?

What are **end-users preferences** and **needs**?

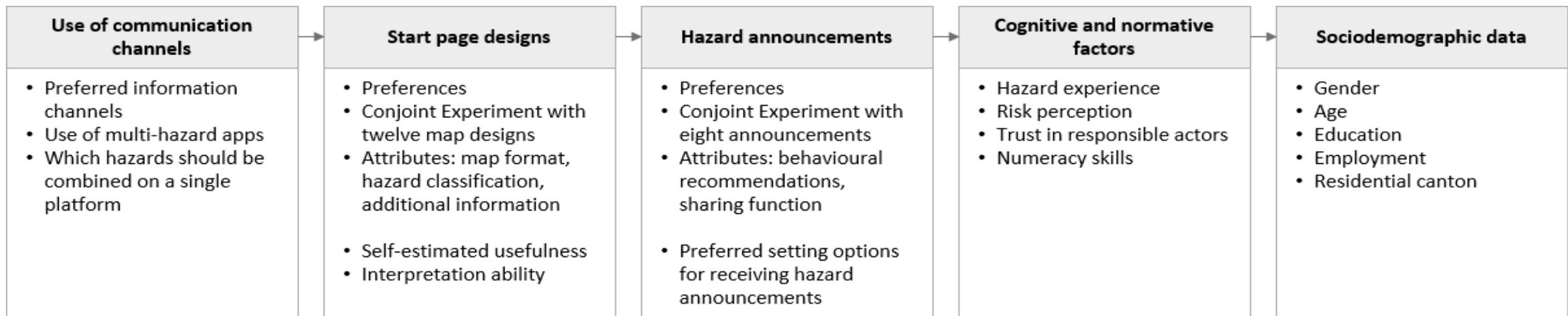


## Filling the research gap...

- As most multi-hazard platforms use maps on the start page, we especially focused on the different approaches to presenting multiple hazards and to compiling contents of hazard announcements attached to the maps.
- With an online conjoint experiment (N=768, full randomized design) in Switzerland, we empirically tested participants' preferences for start page designs and hazard announcements.
- Research questions:
  - (i) Does the public prefer and actually use multi-hazard platforms to get information about the current hazard situation?
  - (ii) Which elements of start page design does the public prefer, correctly interpret and perceive as useful?
  - (iii) What contents of hazard announcements does the public prefer?

# Method – Conjoint Choice Experiment

The survey consisted of five question blocks (Fig. 1). As part of the second and third question blocks (start page designs & hazard announcements) we applied conjoint choice experiments [14,15]. Regarding the start page designs, to each participant three consecutive pairs of different start page designs were randomly displayed. First, they had to rate them separately before having to choose one of them. Regarding the hazard announcements, each participant received a pair of earthquake announcements and a pair of thunderstorm warnings. As before, they first rated them separately before indicating which of the two they prefer.



**Fig. 1. : Structure of the survey.**

# Material I

In Table 1, the attributes we varied for the start page designs and for the hazard announcements respectively are listed (first column). In the second column, the levels of each attribute is described in detail. And in the third column, some examples of platforms with the corresponding attribute levels are mentioned.

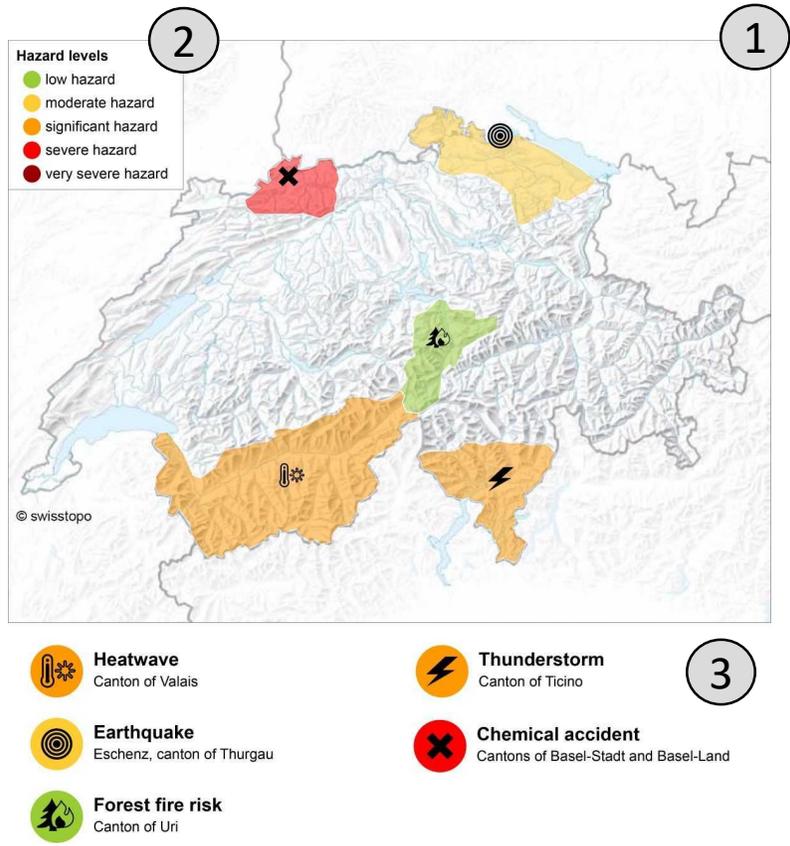
When selecting and varying the attributes we followed both current practice in different fields as well as best practice from research.

**Table 1: Attributes selected and varied**

<b>Start page designs</b>		
<b>Attribute</b>	<b>Levels</b>	<b>Examples of platforms</b>
Map format	<ol style="list-style-type: none"> <li>1. Single map displaying all current hazards</li> <li>2. Separate maps for each current hazard</li> </ol>	<ol style="list-style-type: none"> <li>1. HungerMap, Disaster Alert</li> <li>2. Vigilance météorologique, ThinkHazard</li> </ol>
Hazard classification	<ol style="list-style-type: none"> <li>1. Three categories: considerable hazard / severe hazard / very severe hazard (orange / red / dark red)</li> <li>2. Four categories: information / warning / alert / all-clear (blue, orange, red, green)</li> <li>3. Five categories: low hazard / moderate hazard / significant hazard / severe hazard / very severe hazard (green, yellow, orange, red, dark red)</li> </ol>	<ol style="list-style-type: none"> <li>1. Global Disaster Alert and Coordination System</li> <li>2. AlertSwiss, KATWARN</li> <li>3. Natural Hazards Portal, MeteoSwiss, WIND</li> </ol>
Additional information around the map	<ol style="list-style-type: none"> <li>1. List with textual information (hazard type, hazard category and location) below the map</li> <li>2. Pictograms of the current hazards below the map (single maps) or in the upper left corner (separate maps)</li> </ol>	<ol style="list-style-type: none"> <li>1. Disaster Alert, AlertSwiss</li> <li>2. WarnWetter, MeteoSwiss</li> </ol>
<b>Hazard announcements</b>		
<b>Attribute</b>	<b>Levels</b>	
Behavioural recommendations	<ol style="list-style-type: none"> <li>1. Textual</li> <li>2. Pictured</li> </ol>	<ol style="list-style-type: none"> <li>1. NINA, AlertSwiss</li> <li>2. LastQuake, First aid app</li> </ol>
Sharing function	<ol style="list-style-type: none"> <li>1. Available</li> <li>2. Not available</li> </ol>	<ol style="list-style-type: none"> <li>1. FEMA, LastQuake</li> <li>2. On most</li> </ol>

# Material II – two examples

- ① Map format
- ② Hazard classification
- ③ Additional information around the map



- ① Behavioural recommendations
- ② Sharing function

**Thunderstorm**

**Zurich, Tue, 06. Aug. 14pm – Wed, 07. Aug. 18pm**

- **Type of the thunderstorm:** pulling storm
- **Side effects:** hail, gale-force winds, heavy rain

**Behavioural recommendations**

- Keep an eye on local weather developments, and act appropriately, according to the information you receive on the conditions
- Avoid mountain ridges, exposed trees, groups of trees, masts and towers, all of which are at risk of lightning strikes
- Seek shelter – in a building or car (acts as a Faraday cage)
- Do not go hiking in the mountains or walking in forests
- Stay away from metal objects and water
- If a thunderstorm takes you by surprise when swimming, get out of the water immediately
- Drive slowly on flooded stretches of road, or avoid these altogether
- Avoid stream beds and steeply inclined slopes
- Always follow the official recommendations

**Contact**

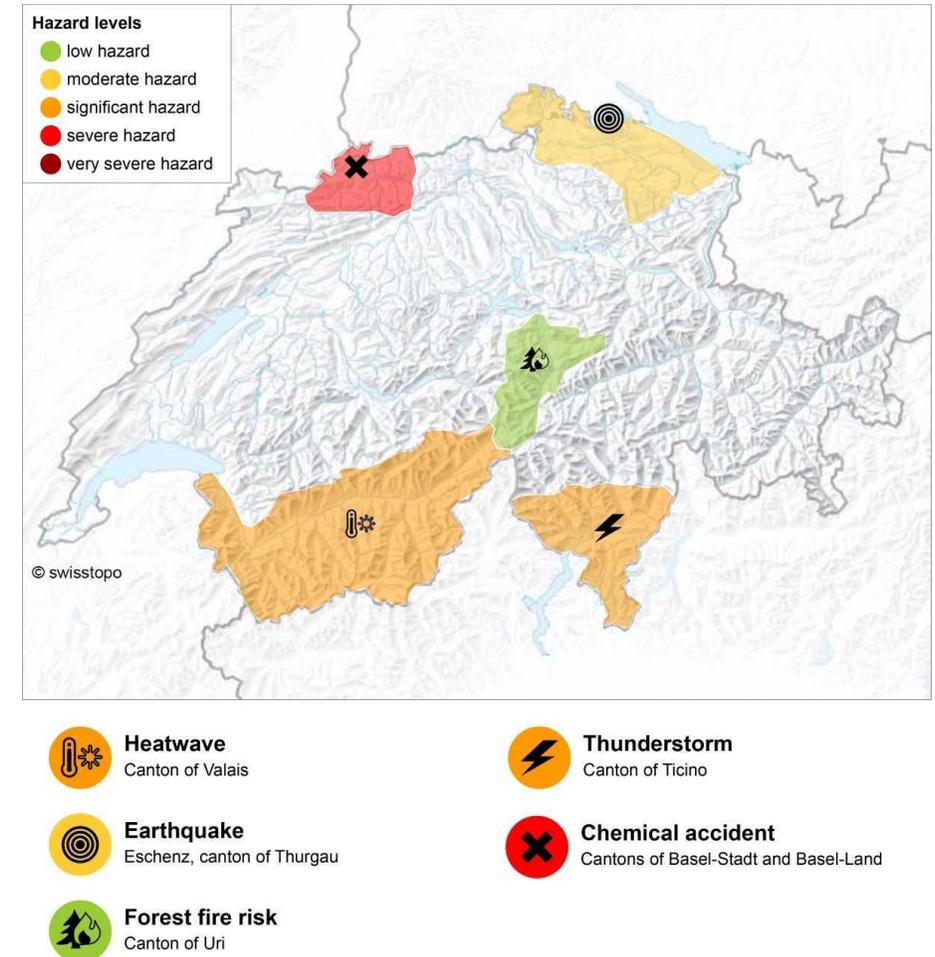
Responsible federal authority: [Federal Office of Meteorology and Climatology MeteoSwiss](#)

Inform your family and friends:

②

# Design of the start page

- Participants prefer a start page with (Fig. 2)...
  - ... a single map displaying all current hazards,
  - ... textual information about the current hazards below the map,
  - ... and the use of a hazard classification with four or five categories.
- Participants with high levels of *trust in actors involved in the communication process* and high *risk perception* rated the start page designs in general higher.
- Participants indicated that they were more motivated to seek further information and to take (precautionary) actions when the hazards were combined on a single map.
- Participants are not aware that even if a earthquake-risky area is not colored at the moment they still have to be prepared for an earthquake.
- High numeracy skills lead to a better understanding of the information presented.



**Fig. 2. : Start page preferred by the participants.**

# Hazard announcements

- Hazard announcements with a sharing function are preferred.
- For thunderstorm warnings, textual behavioural recommendations are favored.
- For earthquake announcements, no significant tendency.  
→ In the comments a combination of textual and pictured announcements is wished (Fig. 3).
- Participants with a high risk perception and high levels of trust in the responsible actors rated the hazard announcements overall better.



## Earthquake

**Eschenz**, region of Lake Constance

4:15pm Earthquake with a magnitude of about 4.5 at Eschenz (TG). Widely felt. Minor damages possible.

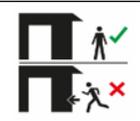
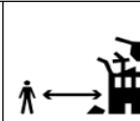
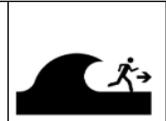
**Behavioural recommendations**

Inside the building

		
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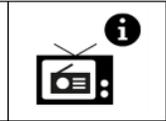
- Take cover (e.g. under a sturdy table) and keep calm
- Beware of falling objects (e.g. shelves, heavy furniture, televisions, stereos and light fittings) and keep away from windows and glass walls, which may shatter.
- Only leave the building when the surrounding area is safe (when there are no more falling objects such as roof tiles, etc.)

Outside

		
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- Stay outside, do not seek shelter in a building
- Keep away from buildings, bridges, electricity pylons, large trees, and other things that could collapse or fall
- Keep away from the shores of bodies of water

In a vehicle

		
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- Stop the vehicle and do not leave it during the quake
- Do not stop on a bridge, at an underpass, or in a tunnel, and keep away from buildings at the side of the road (danger of collapse)

**Contact**

Responsible federal authority: [Swiss Seismological Service at ETH Zürich](#)

Inform your family and friends:   

**Fig. 3. : Preferred earthquake announcements.**



# Discussion

## **Design of the start page:**

- A combination of maps and textual information is recommended in order to minimize erroneous interpretation [16,17].
- Various individual factors such as risk perception and trust in the authorities significantly influence people's preferences, interpretation abilities and motivation to take actions [18-21].

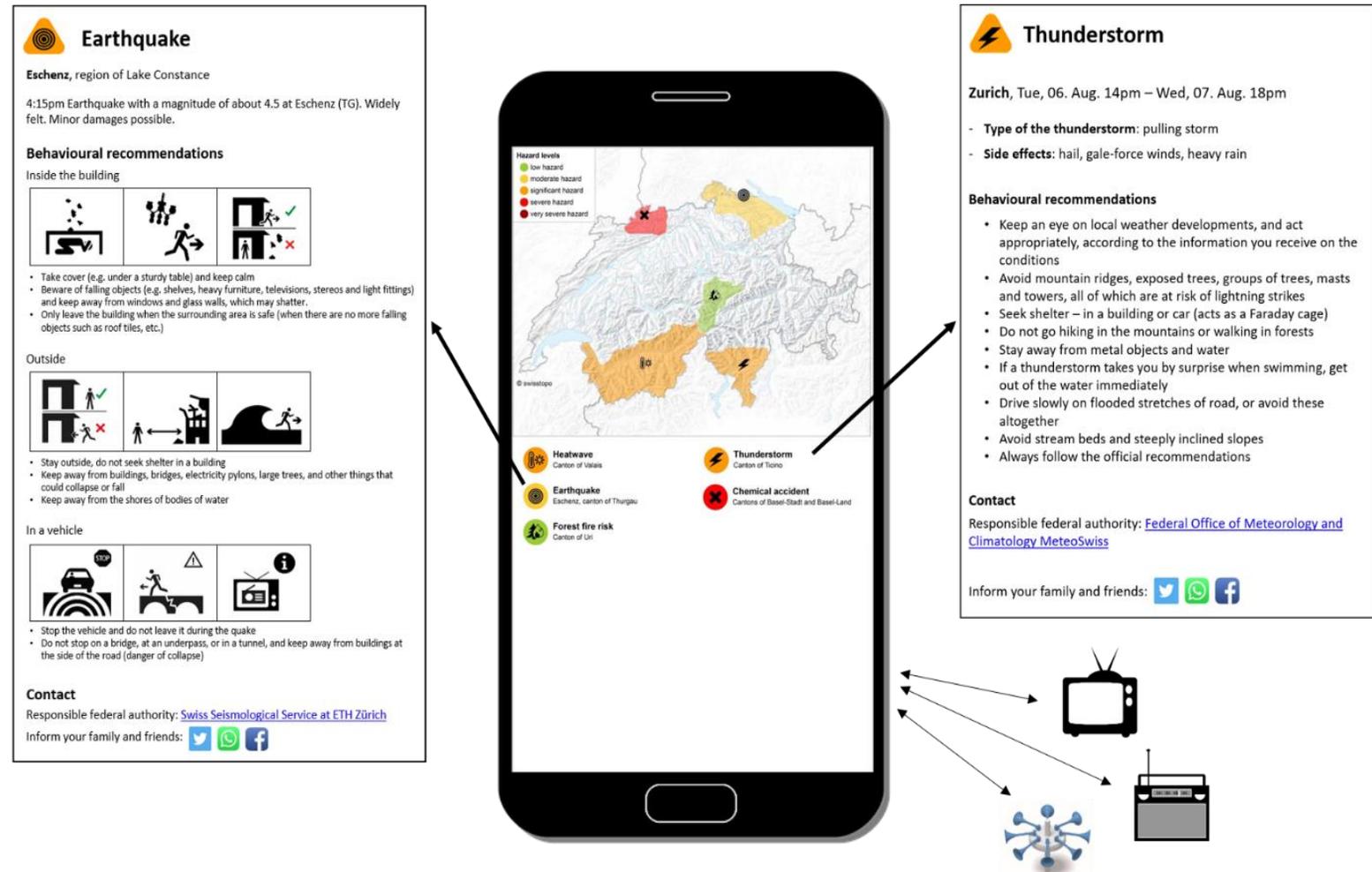
## **Hazard announcements:**

- A combination of pictured and textual behavioural instructions is recommended. The main reasons are that not all pictograms are understood at first glance, and people not speaking the language in which the message is issued could still look at the pictograms [22,23].
- People appreciate to share a hazard announcement received with their family members and friends. The increasing use of social media might also be a future potential for emergency managers to get further insights about an event from the public [22,24-25].

# Conclusion

To conclude, results indicate that the design of multi-hazard platforms and individual characteristics affects the public's preferences for information and hazard announcements presented (Fig. 4).

Therefore, in parallel of the continuous improvement of scientific-technical products, scientists should systematically examine the communication and perception of these products in order to increase society's resilience.



**Fig. 4. : Participants' preferred start page and favored hazard announcements.** The symbols on the bottom right represent the need of a multi-channel communication strategy in order to inform as many people as possible, and to compensate the failure of other channels.



## Limitations and future research

- Our findings are restricted to the five attributes we varied for the different alternatives.
- We only displayed five hazards on the maps. The upper complexity threshold of information presented on one map should thus be analyzed in future research.
- With respect to the hazard announcements, further issues like the length of the message, the inclusion of information about impacts etc. should as well be analyzed [26-28].
- Besides the four cognitive factors we tested, many other factors such as social interactions, milling, self-efficacy influence people's preferences for certain information and abilities to react before, during and after an event [28-32].
- Future research is needed assessing the usefulness of and preferences for other app functionalities and contents such as test-warnings [33-34].

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