TSUNAMI QUESTIONNAIRE
SURVEY IN HERAKLION TEST SITE, CRETE ISLAND, GREECE

Antonia PAPAGEORGIOU¹, Christina TSIMI¹, Katerina ORFANOGIANNAKI¹, Gerassimos PAPADOPOULOS¹, Maria SACHPAZI¹, Franck LAVIGNE² and Delphine GRANCHER²

¹Institute of Geodynamics, National Observatory of Athens, Athens, Greece
antoniapapageorgiou@gmail.com, christinant@gmail.com, kath_orf@noa.gr, papadop@noa.gr, m.sachp@noa.gr

²Laboratoire de Geographie Physique, CNRS, Meudon, France,
franck.lavigne@univ-paris1.fr, delphine.grancher@lgp.cnrs.fr
Test Site: Heraklion

Heraklion city (Crete Island, Greece) one of the test-sites for the EU-FP7 ASTARTE tsunami project.

EU-FP7 ASTARTE (WP9) aims at building tsunami resilient societies in Europe

- Organize questionnaire surveys among the populations of the several ASTARTE test-sites
- The central concept is to better understand what people know about tsunamis
- Preparedness

Fig.1a Heraklion city centre  
Fig.1b Crete island
Test site: Heraklion

**Socioeconomic context**

- Largest city and administrative capital of Crete island
- Fourth largest city in Greece (population of about 170,000 - nearly doubles during the summer vacation period)
- Important shipping port and ferry dock (fig.2,3)

*Fig.2 Old and new port next to each other

*Fig.3 View of Heraklion harbour*
International airport of Heraklion is the second busiest in Greece. Heraklion is a major tourist and holiday destination.

Hotel complexes, marinas, tourist attractions and crowded beaches in and around the city.

Fig. 4 International airport of Heraklion

Fig. 5 Chani Kokkini beach, 10 km from the city centre
Test Site: Heraklion

*Tsunami Risk*

*Earthquake and volcano related tsunami hazard – past events*

Tsunamis in the wider area of the test site Heraklion are mainly generated by earthquakes but also by volcanic processes as historical, geological and instrumental data have shown. This table includes tsunamis that have hit Heraklion in the past (after Papadopoulos, 2011).

<table>
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<th>MONT</th>
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<td>25.42</td>
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</table>

*Table 1. Tsunamis that have hit Heraklion.* k indicates tsunami intensity (in Sieberg-Ambraseys 6-grade scale) and K indicates tsunami intensity (in Papadopoulos-Imamura 12-grade scale).
Tsunami risk management: previous projects & studies


- Paphthoma et al (2003): Vulnerability assessment for the west part of Heraklion, Crete (PhD study)

- POSEIDON EU DG-ECHO tsunami drill project (October 2011): “Earthquake followed by Tsunami in the Mediterranean Sea”
  - Large scale European civil protection exercise in Crete
  - Four levels of civil protection (local, regional, national, European).
Crisis management

- The national tsunami warning centre operated by the Institute of Geodynamics, NOA (NOAIG), which is also a candidate tsunami watch centre for NEAMTWS/IOC/UNESCO, covers also the area of Crete island.
- As soon as a submarine earthquake of $M \geq 5.5$ has taken place, NOAIG issues a tsunami information/warning bulletin which is directed to the General Secretary for Civil Protection (GSCP, Athens) as well as to the other candidate tsunami watch centres of NEAMTWS.
- Local authorities in collaboration with GSCP are primarily
Test Site: Heraklion
Profile of the interviewed people

<table>
<thead>
<tr>
<th>Numbe r of questionnaires</th>
<th>Place of Interviews</th>
<th>Sex ratio</th>
<th>Age</th>
<th>Geographical origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>113</td>
<td>65.5% city centre (cafeterias, restaurants, bars, etc) - 34.5% beach (3 different, crowded beaches next to Heraklion)</td>
<td>- 54% women - 46% men</td>
<td>Age ranged from 15 to 65.</td>
<td>46% local people and residents (living in Heraklion more than 1 year) - 54% tourists (25.66% of them are foreign tourists from all over Europe)</td>
</tr>
</tbody>
</table>

**Fig. 7. Age of the participants in %, ASTARTE survey, 113 answers**
Main Hazards that could affect Heraklion:
1. Earthquakes (33%)
2. Hydrolysis of the Syrian chemicals (8%)
3. Fire (8%)
4. Floods (7%)
5. Tsunamis (6%).

38% economic crisis, politicians etc
“What is a tsunami?”:
1. Big wave  46.2%
2. Huge wave in the sea caused by an earthquake  24.5%
3. Tidal wave  19.8%
4. Don’t know  8.5%

“In your opinion, how is a tsunami created?

- Earthquakes (71.7%)
- Volcanos (12.4%)
“Where did you learn about tsunamis?”
- TV (32.09%)
- Intense media coverage after a big event (14.97%)
- School (12.30%)
- Internet (11.23%)

Most of the participants consider that earthquake and sea withdrawal are precursors of a tsunami.

**Fig. 9. Social Knowledge on tsunamis.** in %, ASTARTE survey, 113 answers
Test Site: Heraklion

Perception of a future tsunami event in Heraklion

Most of the respondents (54%) think that Heraklion has already been affected by a tsunami and 69% of them agree that Heraklion could be affected by a tsunami in the future.
Maximum wave height in case of a tsunami in Heraklion

- 27.43% don’t know what the maximum wave height could be in case of a tsunami in Heraklion
- 22.12% believe that the maximum wave height could be more than 10m.

Maximum wave height in case of a tsunami in Heraklion in relation with people’s residence

- Local people: 37.78% don’t know about the wave’s height in case of a tsunami
- Foreigners: 29.03% answered that the maximum wave height could be more than 10m
- Greek tourists: 35.71% believe that the wave’s height could be 2-5m.

*Fig. 11. Supposed wave's height in relation with people's residence (in %, ASTARTE survey, 113 answers)*
Test Site: Heraklion

Tsunami alert-Evacuation

“Is there a tsunami warning system in Herakleion?”
- Don’t know (70.5%)
- No (25%)
- Most foreigners and greek tourists believe that there are 10-30 minutes between tsunami alert- first wave
- Most local people don’t know the time between tsunami alert- first wave

Fig.12. Time needed between a tsunami alert and the first tsunami wave in relation to people’s residence. (in% ASTARTE survey, 113 answers)
“Evacuation time in relation with people’s residence”
- Foreigners (25.81%) : 10-30 min.
- Greek tourists (32.14%) : 10-30 min
- Local people (37.78%) :

Don’t know

“What could prevent you from evacuating?”
- Nothing (28.9%)
- Panic (26.3%)
- Traffic (23.7)

90.3 of the participants said that they would escape in case of tsunami.

Fig. 13. Perceived evacuation time in relation with people’s residence.
(in% ASTARTE survey, 113 answers)
**Test Site: Heraklion**

*Risk exposure*

*Heraklion: a city exposed to tsunamis*

- Coastal city
- 170,000 population - nearly doubles in summer
- Densely built environment
- Hotel complexes - crowded beaches
- Industrial area (4 km SE)
- International airport (4 km E)
- Power plant unit
- Administrative buildings close to the coast
- Tsunami events in the past

*Fig. 6 View of the densely built environment of the coastal city Heraklion*
Conclusions

The Herakleion area is characterized by high tsunami risk due to

- geographic location of the city
- high seismicity of the wider area
- destructive events in the past
- high exposure of the socioeconomic and the built environment

People’s perception about tsunami hazard in Herakleion area

- Very few knowledge about tsunamis from local people
- Visitors have better knowledge
- The majority of both local people and visitors believe that there is no preparedness for tsunami
- 90% of the interviewed people said that they would escape in case of tsunami.