



1 **Tsunami risk perception in Central and Southern Italy.**

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11 **Abstract**

12

13 The Tsunami Warning Center of the National Institute of Geophysics and Volcanology (CAT-
14 INGV) has been promoting, since 2018, the study of tsunami risk perception in Italy. Between
15 2018 and 2021 the semi-structured questionnaire on the perception of tsunami risk was
16 administered to a sample of 5,842 citizens residing in 450 Italian coastal municipalities,
17 representative of more than 12 million people. The survey was conducted with the Computer
18 Assisted Telephone Interview (CATI) methodology, described in Cerase et al. (2019) who
19 published the results of the first pilot survey (about 1,000 interviews). The large sample and
20 the socio-demographic stratification give an excellent representation of the resident population
21 in the surveyed Italian coastal municipalities. Moreover, in 2021 an optimized version of the
22 questionnaire was also administered via Telepanel (a tool for collecting proportional and
23 representative opinions of citizens) representative of the Italian population, which included
24 1,500 people distributed throughout the country.

25 In this work we present the main results of the three survey phases, with a comparison among
26 the eight surveyed regions, and between the coastal regions and some coastal metropolitan
27 cities involved in the investigations (Rome, Naples, Bari, Reggio Calabria and Catania).

28 Data analysis reveals heterogeneous and generally low tsunami risk perception. Some seaside,
29 in fact, show a good perception of tsunami risk while others, such as in Apulia and Molise,
30 reveal a lower perception, most likely due to the long time elapsed since the last event and the
31 lack of memory. We do not find relevant differences related to the socio-demographic
32 characteristics (age, gender) of the sample, whereas the education degree appears to affect
33 people's perception. The survey shows that the respondents' predominant source of
34 information on tsunamis is the television and other media sources (such as newspapers, books,
35 films, internet etc.) while the official sources (e.g. civil protection, local authorities, universities
36 and research institutes) do not contribute significantly. Also, we found an interesting difference
37 in people's understanding of the words tsunami and maremoto, the local term commonly used
38 in Italy until the 2004 Sumatra event, which should be taken into account in scientific and risk
39 communication. The nationwide sample shows lower tsunami risk perception compared to the
40 average of the coastal sample, confirming the need for thorough information campaigns
41 directed to tourists.

42 Our results are being used to drive our communication strategy aimed at reducing tsunami risk
43 in Italy, to activate dissemination and educational programs (data driven), to fill the data gap
44 on tsunami risk perception in the NEAMTWS area, and to implement multilevel Civil
45 Protection actions (national and local, top-down and bottom-up). Not least, outputs can address
46 a better development of the Tsunami Ready program in Italy.

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48 1. Introduction

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50 The Mediterranean region is highly exposed to tsunami risk, as witnessed by several recent
51 events (Yalçiner et al., 2017; Triantafyllou et al., 2021; Dogan et al. 2021), basin-wide or local
52 historical events (Maramai et al., 2014; Papadopoulos et al., 2014; Solov'ev et al., 2000;
53 Maramai et al., 2021), and by the recent assessment of seismically induced tsunami hazard
54 (Sørensen et al., 2012; Basili et al., 2021). However, the tsunami risk in the Mediterranean is
55 thought to be underrated, due to the low frequency of events, as for other regions of the world
56 (Dawson et al., 2004; Dogulu et al., 2014; UNESCO-IOC, 2017; Amato, 2020; Necmioğlu et
57 al., 2021). It is therefore important to raise awareness among people, as well as of local
58 authorities responsible for civil protection measures and emergency management, and national
59 / regional authorities.

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61 The Sendai Framework for Disaster Risk Reduction 2015-2030 gives high attention to Early
62 Warning Systems (EWS), suggesting to “invest in, develop, maintain and strengthen people-
63 centered multi-hazard, multisectoral forecasting and early warning systems, ...; develop such
64 systems through a participatory process; tailor them to the needs of users, including social and
65 cultural requirements, in particular gender...”. The strong emphasis on people means that any
66 communication strategy should be based on a preliminary assessment of people’s knowledge,
67 awareness and perception of the risk. Moreover, the “needs of users” must be studied and
68 understood, to reach people and communities in the right way using the best language and
69 communication channels, and to have an optimal response in case of an impending inundation.

70

71 The Italian Tsunami Alert Center (Centro Allerta Tsunami, CAT) of the Italian National
72 Institute of Geophysics and Volcanology (INGV) is part of the national Tsunami Warning
73 System called SiAM (Italian national warning system for tsunami of seismic origin),
74 established in 2017 with a Prime Minister Directive (G.U. n.128 del 05-06-2017). The SiAM
75 is coordinated by the Civil Protection national Department (DPC), and besides the CAT-INGV,
76 includes ISPRA. This latter acts as Tsunami Service Provider (TSP) for UNESCO Member
77 States of the NEAM region (Amato et al., 2021), as well as National Tsunami Warning Center
78 (NTWC) and Tsunami Focal Point (TFP) for Italy. Among the tasks of CAT, besides the
79 tsunami surveillance / warning and the hazard assessment, there are also scientific and risk
80 communications activities on tsunamis. CAT manages a dedicated web site
81 (www.ingv.it/cat/en/), where people can find information on tsunami hazard/risk, on the
82 warning system, on historical events, news on projects, papers, campaigns and drills.

83 In this perspective, the activities of the CAT include the assessment of tsunami risk people’s
84 perception. These researches aim to improve risk analysis and decision making, develop
85 methods for eliciting opinions about risk, provide a basis for understanding and anticipating
86 possible public reactions to tsunami hazards, enhancing risk communication among lay people,
87 technical experts and policy makers (Slovic et al., 1982; Slovic, 1987; Wildavsky and Dake,
88 1990; Slovic, 2001; Rippl, 2002).

89 This paper presents the data on tsunami risk perception collected in Central and Southern Italy
90 between 2018 and 2021. The study involved the administration of a semi-structured
91 questionnaire to a sample of 5,842 people in 450 coastal municipalities.

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93



94 **2. Studies on tsunami risk perception, a brief overview**

95

96 Risk perception studies taking into account the socio-cultural and psychological aspect, assess
97 people's response to natural hazards and the behaviors they would adopt in response to the
98 risks. People's perceptions - individually or collectively - of a natural hazard are also influenced
99 by individual factors such as personality, age, beliefs, gender, education level, knowledge, and
100 culture (Slovic, 1982; Slovic and Peters, 2006; McIvor et al., 2009; McNeill et al., 2013;
101 Wachinger et al., 2013).

102 Human behavior is driven by perceptions (Slovic, 1987) rather than scientific knowledge about
103 "facts" (Renn, 1990). Therefore, it becomes strategic for those involved in risk mitigation and
104 communication, to have in-depth studies on the process that influences our ability to assess the
105 risk of a natural phenomenon (Slovic, 1982) like tsunamis. Tsunamis are known to be a
106 phenomenon with a low probability of occurrence but high impact, able to produce devastating
107 consequences that would affect large areas and have serious consequences for human lives
108 (Behrens et al., 2021; Rafliana et al., 2022). The low occurrence frequency is one of the
109 variables that directly influence the risk perception, which makes these phenomena, in some
110 contexts such as the Mediterranean, out of the collective consciousness, often inducing
111 authorities not to undertake effective actions to reduce the risk.

112 However, tsunamis' low frequency of occurrence does not reduce their destructive potential.
113 Moreover, how important it is to study people's perceptions of natural hazards (Lindell, 2000;
114 Paton, 2010; Wachinger, 2013; Bonaiuto, 2016), particularly tsunami risk perceptions, emerges
115 in various studies conducted in at-risk countries that were affected by tsunamis, such as for
116 example, the 2004 Indian Ocean tsunami or the 2011 Japan tsunami (Kurita et al., 2007;
117 Sugimoto et al. 2010; Alam, 2016; Arias, et al., 2017; Akbar et al., 2020).

118 The historical catalog of tsunami effects in the Mediterranean (Maramai et al., 2014) cites over
119 200 documented events for the whole area. More recently, in the Euro-Mediterranean area, 26
120 earthquakes above magnitude 5.5 occurred at sea or near the coast between 2017 and July 2022,
121 triggering the activation of CAT. Among them, 10 earthquakes generated an alert level for
122 possible sea level change including 6 Advisory (possible sea level change, less than 1 meter)
123 and 4 Watch (possible sea level change with estimated run-up values above 1 meter), two of
124 which caused damages in Greece and Turkey (Yalçiner et al., 2017; Dogan et al., 2019; Cirella
125 et al., 2020; Dogan et al., 2020; Triantafyllou et al., 2020)

126 In addition, variables to be considered from a comprehensive perspective include the large
127 growth in population living along the Euro-Mediterranean coasts. This phenomenon, occurring
128 since the Second World War and intensified in recent decades, also includes the development
129 of tourist facilities and large industrial complexes. These intensive forms of settlements require
130 multi-risk analytical hazard approaches where the socio-cultural and psycho-social aspect
131 becomes prominent. In this framework, strengthening tsunami risk perception studies that
132 survey the opinions of employees, daily commuters as well as seasonal workers and tourists
133 who increase the coastal human presence and consequently the risk is needed. The need to
134 assess tsunami risk perception has been highlighted by several authors as a key to improving
135 emergency behaviors and minimizing population risk by limiting casualties and infrastructure
136 damage (Ho et al., 2008; Martin et al., 2009; Ritchie and Roser, 2014; EMDAT, 2019).

137 **3. The CAT-INGV tsunami risk perception studies**

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139 Amid increasing international attention to tsunami risk, CAT-INGV since 2018 has been
140 promoting tsunami risk perception studies to provide oriented support to civil protection
141 activities and develop data-driven, context-appropriate risk communication strategies.



142 Moreover, the CATI questionnaire's structuring and administration methodology make it an
143 excellent tool to collect a large, standardized, retraceable and cost-effective amount of data.
144 (Dawson et al., 2004, Cugliari et al., forthcoming). Furthermore, The questionnaire as a survey
145 method to study tsunami risk perception is widely used in the international context (see for
146 example Apatu, 2013; Sun, 2013; Lindell, 2015; Lindell, 2016; Jon., 2016; Fraser, 2016; Wei,
147 2017; Buylova, 2020)

148 **3.1 The tsunami risk perception questionnaire**

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150 In this study we have used the questionnaire designed and described in Cerase et al., 2019 (and
151 available in the English version in the 2019 paper's SOM), consisting of 6 sections and 27
152 items that allow us to detect respondents' opinions regarding knowledge, tsunami risk
153 perception, tsunami representation, cultural attitudes toward risks (Douglas and Wildavsky,
154 1982), and through which channels respondents have been informed about tsunamis and would
155 like to receive an alert in case of tsunami.

156 The same questionnaire, implemented and administered in 2018 was subsequently
157 administered in 2020 and 2021 by the same CATI methodology to extend the coverage to six
158 more Italian regions and achieve better statistical representativeness.

159 **3.2 - Study area and sample characteristics**

160
161 The coastal belts are the most densely populated territory and where the largest urban centers
162 are developed. 20% of the EU's approximately 500 million inhabitants live in the coastal area,
163 and in 2018, in Italy, 28% of the total population (more than 17 million inhabitants) resided in
164 coastal municipalities. Between 1951 and 2011, the increase in coastal population was about
165 29%. Sardinia, Sicily, Apulia and Calabria together represent about 64% of the national
166 coastline. The Italian region with the most coastal population is Latium (due to the presence of
167 the municipality of Rome, a metropolitan city) followed by Sicily and Campania. Coastal areas
168 are also among the most densely populated with an average of 398 inhabitants per km^2 ,
169 compared to 167 in noncoastal areas. This is also due to the presence of large urban centers
170 including 10 regional capitals (Report ISTAT, 2020).

171
172 Our survey was carried out in three different phases. The first survey phase, concluded in 2018
173 (April 4 to May 4, 2018) covered Apulia and Calabria regions where 1021 questionnaires were
174 collected (Cerase et al., 2019). In the second survey phase, carried out between Dec. 27, 2019
175 and Jan. 8, 2020, 614 questionnaires were collected in the coastal municipalities of Molise,
176 Basilicata and Eastern Sicily. In the third survey phase, completed in 2021 (between Dec. 21,
177 2020 and Jan. 8, 2021), 4,207 questionnaires were collected in the coastal municipalities of
178 Latium, Campania, Sardinia, southern and northern Sicily.

179 The 2021 administration included all the coastal metropolitan cities of central and southern
180 Italy (ISTAT, 2020). This is relevant for Civil Protection because Naples, Rome, Palermo
181 Messina and Catania areas are some of the most densely populated Mediterranean coastal cities
182 (UNESCO-IOC, 2020; Eurostat, 2022). Adding to these cities also Bari, Reggio Calabria and
183 Cagliari, also sampled in 2018 and 2021, we reach about 6 million inhabitants.

184 All these regions were chosen because southern Italy, particularly the Ionian side, have the
185 highest tsunami hazard (Basili et al., 2021; Basili et al., 2019) compared to other Italian regions
186 (Liguria, Marche, Abruzzo, Veneto, etc.) with lower hazard. By the way, it is our intention to
187 complete the survey in the next one-two years in order to have a comprehensive view of the
188 Italian coastal territory on tsunami risk perception.



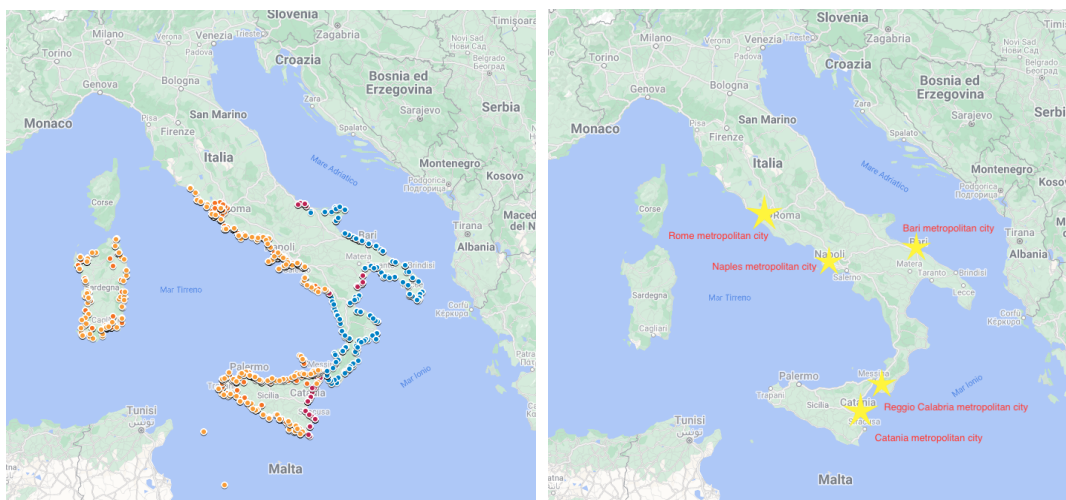
	1st Stage		2nd Stage			3rd Stage				Total
	Apulia	Calabria	Molise	Basilicata	Eastern Sicily	Latium	Campania	Sicily (except eastern)	Sardinia	
Total Residents	1,716,797	1,120,698	43,800	58,385	834,881	3,786,704	1,925,984	2,137,306	859,721	12,484,236
Coastal Municipalities	67	116	4	7	29	20	40	96	71	450
No. Respondents	722	491	100	140	374	1,034	1,170	1,221	782	5,842
Total	1021 Respondents		614 Respondents			4207 Respondents				
2018 / 2020 / 2021 – Territorial and socio-demographic distribution										
	Regions	No. of provinces	Coastal municipalities		Respondents	Km of coast surveyed				
	8	37	69,8% (450/645)		5,842 (12,484,236 pop tot)	77,9% (6,166km)				

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Table 1. Sample distribution in the three survey stages

Table 1 shows the distribution of the sample by survey stage and region. The survey covered a total of 8 regions, 37 provinces, achieving 69.8% coverage of coastal municipalities for a total of 6,166 km of coasts surveyed and 5,842 interviews conducted, that are considered representative of 12,484,236 residents (ISTAT, 2021).

The sampling design was structured respecting robust statistical standards with attention to the population representativeness of even smaller coastal municipalities. The sample is stratified by age, gender and coastal regions. In order to have a more statistically robust sample, education degree was considered as a stratification variable for the third survey stage (n=4,207).



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Figure 1. (Maps Data modified from: © Google Maps, 2022) Maps of the CATI interview distribution (left) and coastal metropolitan cities (right). The different color dots, on the left map, indicate the different survey phases: blue shows the interviews in the first survey phase (2018), red shows the second survey phase (2020), and yellow shows the distribution of interviews in the third survey phase (2021). Yellow stars, on the right map, indicate metropolitan cities (provincial capitals) where population density is high for a wide territorial area.



207 **3.3 - Sample validation for the three survey phases (Cronbach's alpha and T-test),**
208 **statistical data processing**

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210 The three surveys were carried out in different years, this required a greater methodological
211 accuracy and some preliminary statistical operations to validate and verify the data.

212 First, we verified that the samples were statistically uniform, independent, and representative
213 in estimating the reference population mean. Further, whether the datasets could be aggregated
214 into a single matrix to produce robust outputs and correlations. For this, we used the T-test
215 (Student, 1908). The T-test (or Students' test) is widely used to study the connection between
216 natural hazards and risk by considering a specific variable to compare statistical averages
217 within a group (see e.g., Buylova, 2020; Musacchio, 2021; Liu, 2021). The T-test was applied
218 to questionnaire's items nr. 8; 12; 14; 16; 20 which are multiple choice questions, and to 21;
219 23; 24 which are Likert scale questions batteries, between the first and the second surveys
220 (2018-2020) and in the first and third surveys (2018-2021), respectively. The results of T-test
221 with a confidence interval of 95% confirm that the samples are statistically uniform, together
222 correlable and, consequently, analyzable in a single data matrix.

223 Once obtained the T-test confirmations, we verified that the data collected were consistent and
224 significant as a part of a robust sample. We calculated Cronbach's alpha (Cronbach, 1988;
225 1951) on the items comprising questionnaire sections numbers: 2, 3, 4, 5 and 6. The resulting
226 alpha values between $0,61 \leq \alpha \leq 0,83$ are generally considered optimal to corroborate the
227 variable reliability (Nunnally, 1975). Particularly, values near $\alpha=0.80$ or greater have an
228 optimal consistency degree (Peterson, 1994). The alpha values resulting from our comparisons
229 ranged from $0,74 \leq \alpha \leq 0,89$.

230 **3.4 - The national sample (National Sample)**

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232 The third survey phase (2021) also included the questionnaire administration to a sample
233 representative of the whole Italian population distributed by proportional shares.

234 This has been done through a digital platform that reaches users - who are registered with the
235 proprietary company - through a link on their smartphones (named TelePanel by the company).
236 The link allows access to the on-line, re-adapted questionnaire, that users independently
237 complete. Survey respondents are subscribed to the service and are paid by the commissioning
238 company. The company, as owner of the sample, takes care that it respects scientific criteria
239 and that the sample reproduces the same compositions of the population strata. The sample is
240 generally used to survey shared-interest opinions, political polls, national trends and customs.
241 Proportional shares are respected and the sample is stratified according to the following
242 variables: age, gender, geographic area, educational qualification and profession.

243 The national sample questionnaire surveyed the opinions of 1,500 respondents and was
244 administered in the same period of the CATI survey.

245



246 **4. Results and discussion**

247

248 The principal results of the three surveys are presented in two paragraphs: Tsunami risk
249 perception and Knowledge about tsunami.

250 The map below (fig. 2) shows the geographical positions of the coastal areas where the survey
251 was conducted (by region) and the seas surrounding Italy.



252 **Figure 2.** (Maps Data modified from: © Google Maps, 2022). Map of surveyed Italian coasts and corresponding seas.

253

254 **4.1 Tsunami risk Perception**

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256 The risk perception is preliminary calculated considering the item Q13 “*In the Mediterranean*
257 *Sea the occurrence of a tsunami is...?*” and Q16 “*Do you think that the coast of your*
258 *municipality could be hit by a tsunami?*”.

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260 Survey data show that tsunami risk perception differs in relation to the seaside.

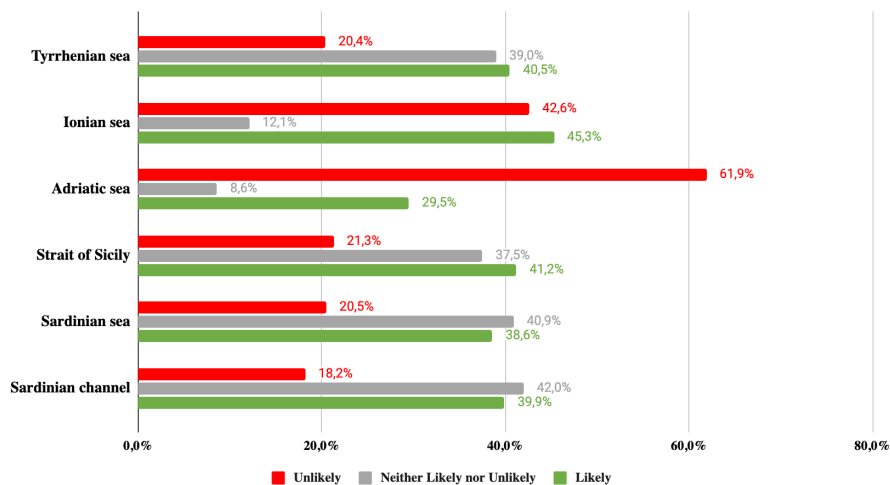
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263 **Q13 - Possibility of tsunami in the Mediterranean Sea**

Q13 - In the Mediterranean area the possibility of tsunami occurrence is...?

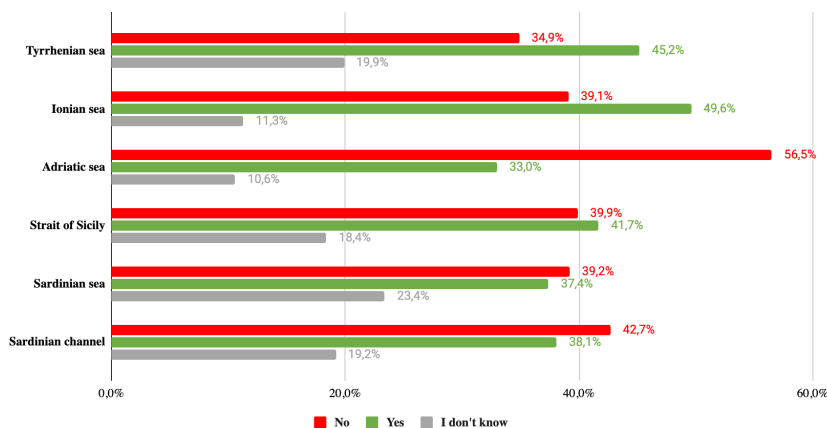


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 265 **Figure 3. - Q13 - Tsunami risk perception in the Mediterranean sea by coastal regions**

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 267 Figure 3 shows tsunami risk perception for events in the Mediterranean divided by respondents'
 268 coastal seaside. In general, about 40% of the interviewed believe that a tsunami is likely to
 269 occur in the Mediterranean area. While respondents from the Adriatic coast disagree: 62% think
 270 a tsunami cannot occur.

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 272 **Q16 - Possibility of your municipality's coasts being hit by a tsunami**

Q16 - Do you think that the coast of your municipality can be hit by a tsunami?



286 **Figure 4. - Q16 - Tsunami risk perception in respondents' municipalities by coastal regions**



287 Figure 4 shows the distribution of answers to the specific question about the likelihood of a
288 tsunami hitting the respondents' municipalities. The sample from the Ionian and Tyrrhenian
289 sides seem to have a higher tsunami risk perception (49.6% and 45.2%, respectively).
290 Differently, in the Adriatic coast municipalities, respondents have a lower perception of
291 tsunami risk, as for the previous question (Fig. 2). In fact, only 33% of them believe that their
292 municipality may be affected by a tsunami and 56.5% believe it will not.

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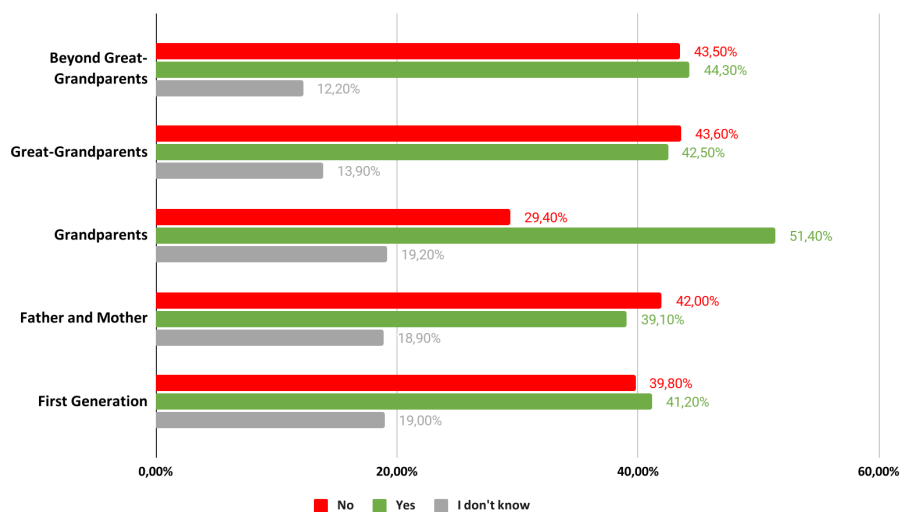
294 In the three-stage survey sample (n = 5,842), no significant variations are observed for the
295 tsunami risk perception in relation to the gender of the respondents.

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297 More significant differences emerge in relation to educational degrees. The sample with low
298 educational degree showed more uncertainty in responses associated with the "I don't know"
299 modality (23.4% and 23.1%, respectively, versus 11.2% of those with high educational degrees
300 and 15% of those with medium educational degrees); a high educational degree is correlated
301 with a significantly higher tsunami risk perception (48.2%) compared to 37.9% for those with
302 a low educational degree.

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Q16 - Do you think that the coast of your municipality can be hit by a tsunami?



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Figure 5. Tsunami risk perception in municipalities according to the numbers of generations of residence in the area.

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The graph in fig. 5 - reporting the tsunami risk perception in municipalities according to the numbers of generations of residence in the area - shows an interesting finding. In fact, risk perception is highest at 51,4% for the third generation (*my grandparents lived there*), whereas the average response rate for other generations is about 40%. These findings are consistent with recent studies based on an interdisciplinary historical-anthropological approach (e.g., Garnier and Lahournat, 2022). Indeed, these studies highlight the role of memory transmission of past disasters, more generally cultural memory, as an effective tool for DRR (Brokensha et al., 1980; Fernando, 2003; Gregg et al., 2006; Cohen, 2011; Sutton et al., 2021).



316 4.1.1 Tsunami risk perception in surveyed regions

317

318 This subsection moves from the results of our previous paper where a significant difference in
319 tsunami risk perception between Apulia and Calabria was found, despite the comparable, high
320 tsunami hazard of the two regions (Basili et al., 2021). In the first region only 30% of
321 respondents think their region could be hit by a tsunami and 57.5% think it could not, whereas
322 the results for Calabria are very different, with more than 66% yes and 25% no (Fig. 6).

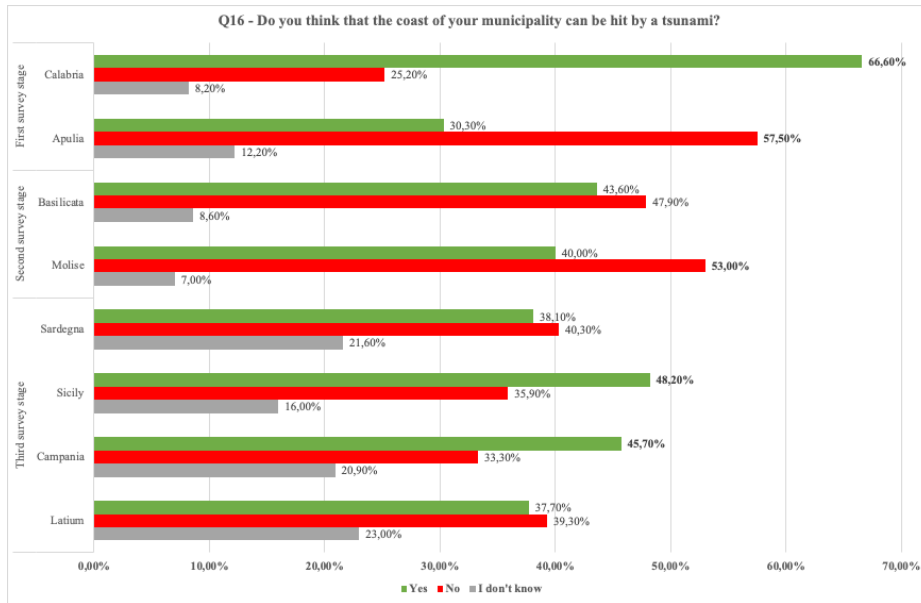
323 In order to verify the perception of other regions' inhabitants, we have compared the answers
324 to the same question (Q16) related to the regions investigated in the second and third survey
325 phases.

326 The graph below (fig. 6) shows the percentages of responses collected for Q16 question for all
327 the regions. The results show a strong heterogeneity among different regions, with the
328 aforementioned Calabria and Apulia as end-members of risk perception. Molise, adjacent to
329 Apulia in the Adriatic Sea, is on the low perception side with slightly higher values than this
330 latter (40% yes, 53% no). Basilicata, with a few municipalities facing on both the Ionian and
331 the Tyrrhenian coasts, has a slightly higher perception, with 44% yes and 48% no. Moving to
332 the Central Tyrrhenian Sea, Latium and Sardinia show equal distributions of yes and no with a
333 large number of "I don't know" (40, 40, and 20, respectively). Historical catalogs do not report
334 relevant tsunamis for these two regions. Southern Tyrrhenian regions (Campania and Sicily)
335 exhibit higher risk perception (48% and 46% yes, 36% and 33% no, respectively), even if not
336 as high as Calabria. This can be explained with the presence of known tsunamis (as the 1908
337 event) or known potential tsunami sources, as active volcanoes of the Neapolitan area and the
338 Southern Tyrrhenian).

339 These results are consistent with the similar study, by Gravina et al. (2019). In that case,
340 inhabitants from southern Italian regions facing the Tyrrhenian Sea were asked: "Do you
341 consider to be actively exposed to a tsunami risk?". 21% of interviewees answered "highly",
342 more than 42% "quite" and over 30% "low". Nonresponses were 9%.

343 In addition, these regions, including Calabria, are highly seismically active, and people
344 experienced frequent and even strong earthquakes. The traces of these events, present in the
345 territory, rises people's memory from generation to generation.

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Figure 6. - Q16 - Tsunami risk perception in respondent's municipalities according to the regions.

349 **4.1.2 Tsunami Risk Perception in Metropolitan area and seaside**

350 We started from the research hypothesis that the perception of tsunami risk could be different
 351 between the inhabitants of metropolitan cities and those residing in the municipalities of the
 352 relative coast. In our opinion, this comparison is particularly relevant for metropolitan cities in
 353 which the exposed value (in terms of human lives, industries and infrastructures) is
 354 considerably higher than the adjacent, less populated coasts.

355 The following graphs (figures 7-11) show the risk perception surveyed in coastal metropolitan
 356 cities (Rome, Napoli, Bari, Reggio Calabria and Catania) in relation to the risk perception of
 357 the seaside on which the city lies (tab. 2).

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Region	Latium	Campania	Apulia	Calabria	Sicily
Metropolitan coastal city	Rome	Naples	Bari	Reggio Calabria	Catania
Sub demographic areas	6	5	2	5	2
Total municipalities	121	92	41	97	58
Total residents	4,342,000	4,250,000	1,261,000	549,000	1,068,000
Resp by metropolitan city	824	938	169	134	155
Resp by seaside	3201	3201	549	910(Ioni)/3201(Thyrr)	910

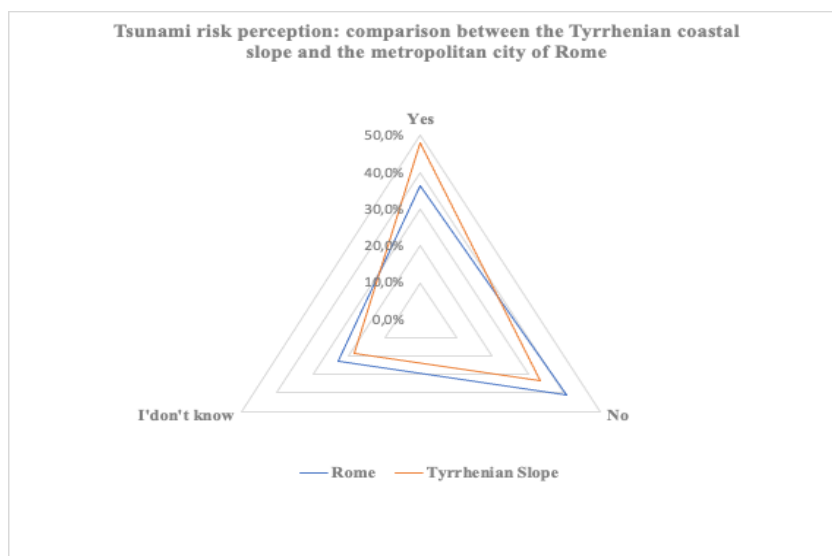
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Table 2. Demographic data of in-depth metropolitan areas and sample size by city and seaside (Source ISTAT, 2022. Database accessed on 07/2022 at: <http://dati.istat.it/index.aspx?lang=en&SubSessionId=2e2456e1-fbc4-45fa-bdd3-bab2caf314ac>)

363 To prevent statistical bias the data for each individual metropolitan city were removed from
 364 the coastal data on which the city is located. We also carried out the T-test for independent
 365 samples from which a significant difference between the averages of the two samples



366 (metropolitan cities and coastal slopes) were found. We used the test to indicate the sample
367 statistical uniformity and comparability.
368 The graph in Figure 5 shows the comparison between the sample of the Metropolitan city of
369 Rome and the relative Tyrrhenian coastal slope. In the case of the metropolitan city of Rome it
370 is important to remember that Rome (2.7 million inhabitants) cannot be considered entirely a
371 coastal city, even if some densely populated districts (like Ostia, with its 231,000 inhabitants)
372 are entirely located on the seaside.
373 This is probably the reason why the average of the tsunami risk perception in Rome (fig. 7)
374 seems to be lower than the Tyrrhenian. Indeed, only 36.3% of the respondents believe that a
375 tsunami may hit their municipality, versus the 48,2% of respondents living in the Tyrrhenian
376 seaside.



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398 **Figure 7. Tsunami risk perception: comparison between the Tyrrhenian coastal slope and the metropolitan city of**
399 **Rome. (Q-16. Do you think that the coast of your municipality could be hit by a tsunami?)**

401 Tsunami risk perception in the Naples metropolitan city (fig. 8) is slightly higher than the
402 average surveyed on the Tyrrhenian side. 47.2 % of respondents said that a tsunami could hit
403 the coasts of their municipality compared to the Tyrrhenian slope average, which - excluding
404 the metropolitan city of Naples - has a value of 44.9 %.

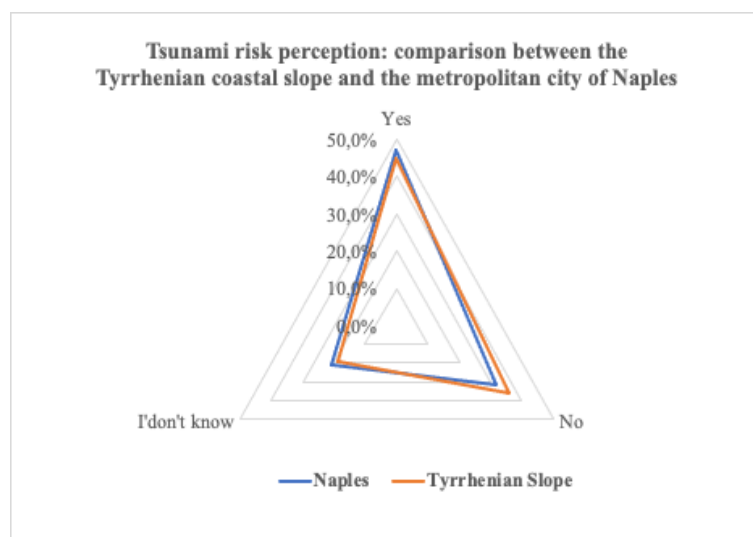
405 31.8% of respondents believe that a tsunami is unlikely to hit their municipality's coast, and
406 21% say they don't know the answer.

407 These data are consistent with the seaside average and it diverges from the starting hypothesis.
408 These data could be related to multi-hazard variables that lead the municipalities' residents to
409 express a greater risk perception due to the presence of the Vesuvius volcano, the seismic
410 memory of the 1980 Irpinia earthquake, and the frequent bradiseisms and micro-earthquakes
411 that occur in the Neapolitan area (i.e., in the Phlegrean Fields). Traces of these events are also
412 found in the literature, such as the case of the tsunami of 1345, documented by the Italian
413 famous writer Francesco Petrarca in his "*Letters on Familiar Matters*" (Bernardo and Petrarca,
414 1985), and recently described in Rosi et al. (2019).

415 Moreover, the city of Naples and the coastal municipalities of its hinterland, have high exposure
416 due to civil settlements and industrial complexes including some Major Accident Hazard



417 Industries (Tinti and Armigliato, 2003; De Pippo et al., 2008; Grezio et al., 2012) that are
418 located on the coast. Last but not least, the metropolitan city of Naples has one of the highest
419 coastal population densities in Europe, with concentrations ranging between 500 and 2,500
420 inhabitants per km^2 (ISTAT, 2020).



441 **Figure 8.** Tsunami risk perception(Q-16): comparison between the Tyrrhenian coastal slope and the metropolitan city
442 of Naples.

444 The average risk perception for the metropolitan city of Bari is low (fig. 9), in line with the
445 Adriatic coast. In fact, we observe that only 34.3 % of respondents believe that a tsunami could
446 hit their municipality, versus 32.4 % of those residing in municipalities on the Adriatic coast.
447 We also observe that 54.4% of respondents say a tsunami could not hit their coastal
448 municipality, compared to 57.4% of the average of those living in coastal municipalities on the
449 same seaside.

450 The perception results appear to be low compared with the estimated hazard for the southern
451 Adriatic coast and Bari metropolitan city, which is medium/high (Basili, et al., 2021). The
452 estimated hazard takes into account the strong earthquakes occurring along the Hellenic arc,
453 able to generate tsunamis that would hit the Adriatic and Bari coasts. The low tsunami risk
454 perception may also be influenced by the absence of recent tsunami events (Maramai et al.,
455 2019) as already noted in our previous paper.



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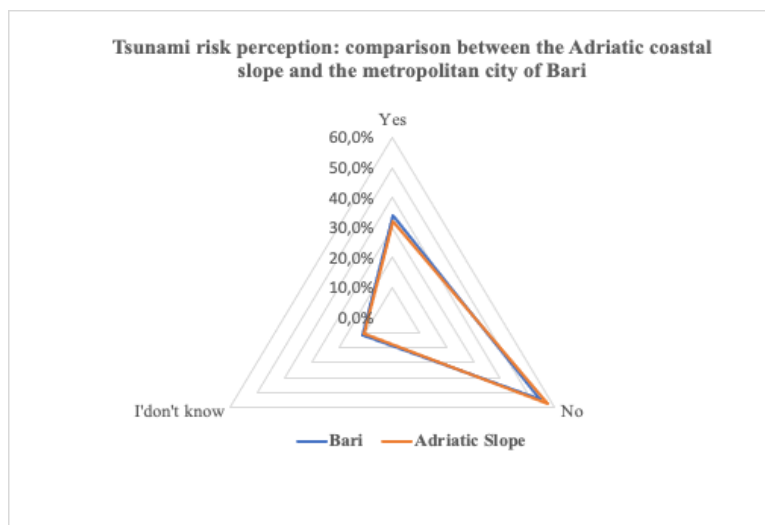


Figure 9. Tsunami risk perception (Q-16): comparison between the Tyrrhenian coastal slope and the metropolitan city of Bari

The tsunami risk perception in the metropolitan city of Reggio Calabria is on average high (fig. 10). The graph shows that 70.9% of respondents believe that the city may be hit by a tsunami compared to the average of 46.5% of respondents living in the Ionian slope's remaining municipalities and 45% of those living in the Tyrrhenian slope's municipalities. Furthermore, data analysis shows that only 8.9% of respondents answered “*don't know*” to the specific question. This percentage could indicate that residents of the metropolitan city of Reggio Calabria, have a greater tsunami risk knowledge of their area, compared to the other metropolitan cities considered in the analysis. The high tsunami risk perception is likely related to the 1908 tsunami, which had a strong impact on the territory, causing widespread damage and about 2,000 casualties (attributed to the tsunami), which still today holds a high media echo, currently in resident's memory.

In addition, residents' tsunami risk perception is in line with the high tsunami hazard estimated for the Reggio Calabria area (Basili et al., 2021).



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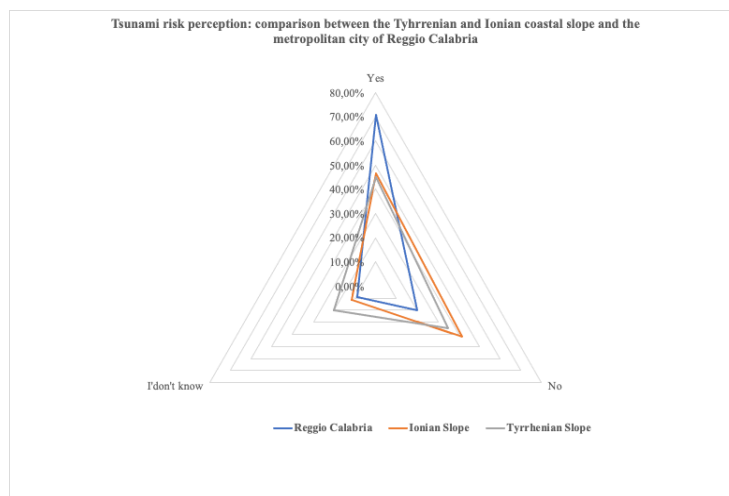


Figure 10. Tsunami risk perception(Q-16): comparison between the Tyrrhenian coastal slope and the metropolitan city of Reggio Calabria

The tsunami risk perception in Catania metropolitan city (fig. 11) is slightly higher (49,7%) than the risk perception of respondents of the Ionian coastal slope (45,8%). Only 11,6% of the respondents answered “I don't know”, in line with the responses from the other coastal slope municipalities. The percentage of tsunami risk perception in Catania, is probably associated with the presence of easily recognized hazards (e.g., volcanic risk and ash management due to the close Etna volcano, frequent earthquake shaking, etc.). In addition, industrial complexes and refineries along the coast increase the exposed value, and possibly the risk perception. Not least, the tsunami hazard (Basili et al., 2021) in the Catania area is quite high, due to both local and distant tsunamis.

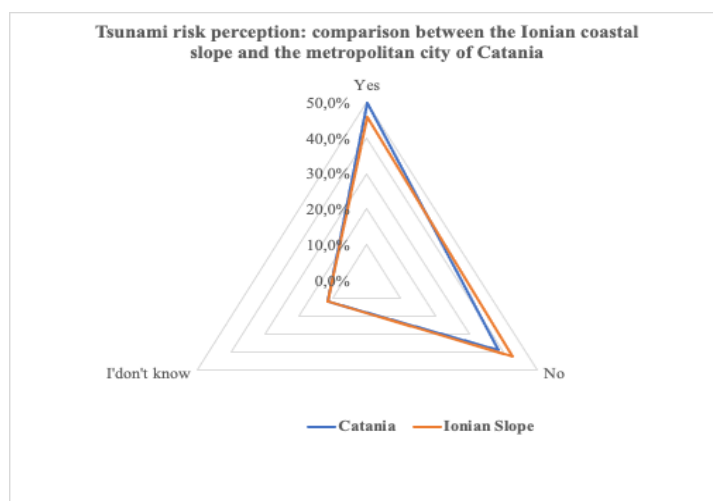
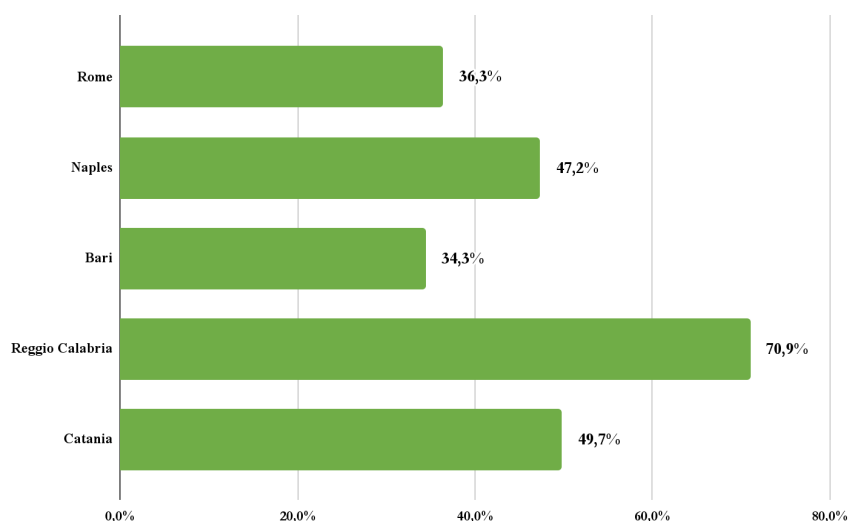


Figure 11. Tsunami risk perception (Q-16): comparison between the Ionian coastal slope and the metropolitan city of Catania



558
559 Comparison among metropolitan cities (fig. 12) shows a higher tsunami risk perception in
560 Reggio Calabria, Catania, and Naples. These cities, throughout history, have been repeatedly
561 affected by disruptive natural events including strong earthquakes, volcanic eruptions and
562 tsunamis. The difference in risk perception between metropolitan areas and coastal slopes
563 remains the subject of further study. Bari metropolitan city has a low tsunami risk perception
564 even though it is located in a stretch of coastline where tsunami hazard is considered
565 medium/high. This could be associated with events that occurred in the distant past and the low
566 frequency of occurrence of earthquakes.

Q-16. A comparison between tsunami risk perception in metropolitan cities



567
568 **Figure 12. Tsunami risk perception (Q-16): comparison between the metropolitan cities**

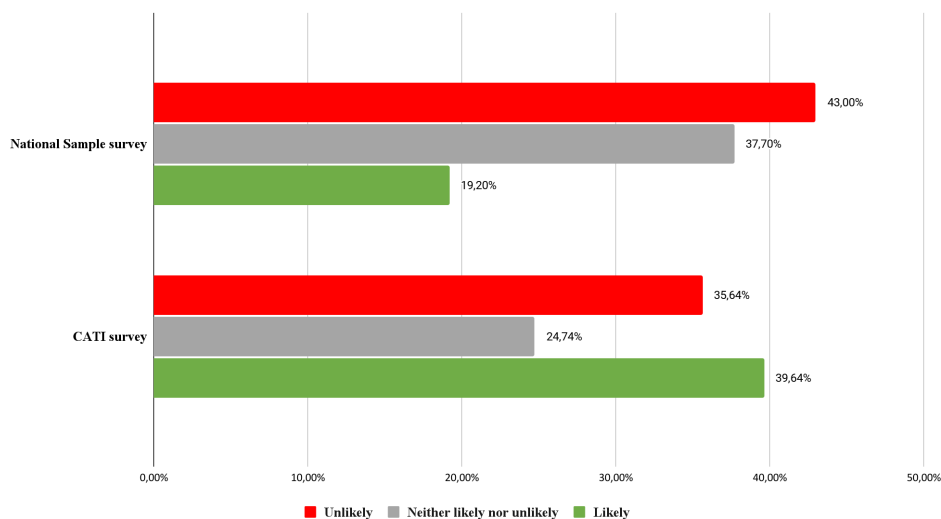
569 **4.1.3 Tsunami risk perception: comparison with a national sample**

570
571 In this section, we compare the tsunami risk perception in the Mediterranean area (Q-13),
572 surveyed among the whole coastal population and a national population sample (National
573 Sample survey n = 1,500). From the graph (Fig. 13), it can be seen that risk perception is higher
574 in coastal communities (39.4%, CATI survey) and lower in the national average (19.2%
575 National Sample survey). Minor variations can be observed in the other response modes. A
576 difference of 13% also emerges in the central mode “*Neither likely nor unlikely*” from which
577 low tsunami knowledge is assumed.
578 The National Sample survey becomes of primary relevance to also investigate the risk
579 perception of the population not living in coastal areas who might face this risk in a summer
580 vacation context even in non-national territories. This result is not surprising, considering the
581 lower familiarity of non-coastal inhabitants with sea activities - and hazards - compared to
582 coastal cities residents. Also, we should consider that the tsunami risk for people spending for
583 instance a two-week’s vacation in a seaside location is statistically much lower compared to



584 the risk to which a coastal resident is exposed. We anticipate that this result strongly suggests
585 the need for a communication effort specifically oriented to tourists.
586 These data can be considered representative of the national mean related to the tsunami risk
587 perception and may be used for comparison with data related to the same specific groups of
588 population living on the coasts.
589

Tsunami risk perception in Mediterranean sea by National Sample (TelePanel) and CATI Survey, a comparison.



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591 **Figure 13: Tsunami risk perception in Mediterranean Sea by National Sample and CATI Survey, a comparison.**

592 4.2 Tsunami Knowledge

593 4.2.1 Phenomenon description: elicitations of the terms tsunami and maremoto

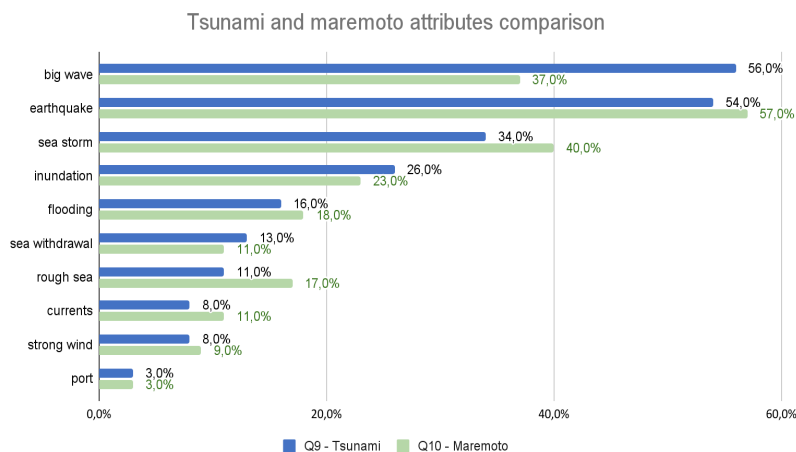
594 In order to deepen understanding of people's tsunami knowledge we continued the
595 investigation on qualitative attributes of the tsunami phenomena started the our previous paper.
596 The first step is aimed at exploring the differences between the Japanese word "*tsunami*",
597 broadly used in the international scientific community, and the word "*maremoto*" (literally
598 seaquake), being a common alternative in colloquial Italian language. The overall results of
599 this research confirm the different meanings attributed to these two terms by respondents.

600 Figure 14 shows that the largest part of the sample shows greater familiarity with the term
601 "*tsunami*" (57%) while "*maremoto*" drops by several percentage points (43%). The word
602 "*tsunami*" seems to sound more familiar for those who have higher education levels (66%) and
603 less familiar to people over 65. Some interesting differences regarding the usefulness of the
604 two terms are related to local characteristics and will be further investigated. For example in
605 Reggio Calabria metropolitan city interviewees generally use the term *maremoto* to identify
606 the phenomenon (57%) whereas in Naples the term *tsunami* is more familiar (63%).

607 We could hypothesize that past events do differently shape the way the phenomenon is
608 acknowledged and understood, as culture provides different resources to address these events,
609 where traditional environmental knowledge plays a prominent role along with scientific



610 communication. These aspects are reflected in social representations (Moscovici, 1961) as well
611 as in language being used to express such representations (Moscovici, 1976).
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Figure 14: Tsunami and maremoto attributes comparison

Data in fig. 12 show that the word “tsunami” is mostly associated with *big wave* (56%), *earthquake* (54%) and *sea storm* (34%), and in a more detached position *inundation* (26%), *flooding* (16%) and *sea withdrawal* (13%). Instead, the word “maremoto” is first associated with *earthquake* (57%), then with *sea storms* (40%) and *big waves* (37%). *Inundation* (23%) and *flooding* (18%) are still present along with *rough sea* (17%).



624 4.2.2 - Knowledge about causes of tsunamis

625

626 With regard to the alleged causes of tsunamis, they are generally attributed correctly to
627 earthquakes 74% as the main cause, then to volcanic eruptions (44%), in agreement with the
628 most frequent tsunami causes worldwide (NCEI/WDS, 2022) and in the Mediterranean
629 (Maramai et al., 2014).

630 In general, it is observed that tsunami knowledge is not directly related to the gender and
631 distribution of the interviewees but directly increases with instruction level and decreases with
632 age (young, highly educated people under 50 years old are best informed).

633 Meteorological phenomena are mentioned by 19% of the respondents. In general terms this
634 is somehow overestimated, but we know that meteotsunamis are rather frequent in the
635 Mediterranean, especially in the Adriatic Sea (Šepić et al., 2009; Vilibić et al., 2009; Maramai
636 et al., 2022). However, it is possible that people confuse sea storms with (meteo)tsunamis. To
637 verify this, we carried out a bivariate analysis that can provide some clues for this belief.
638 Indeed, data highlight higher percentages for those who live in municipalities overlooking the
639 Sea of Sardinia as well as the Channel of Sardinia which are frequently swept by strong winds
640 of Maestrale, which can locally originate sea storms with waves several meters high.

641 We also note that weather conditions are most frequently mentioned by people with low
642 education levels (22%) versus 15% of the sample with high educational level.

643 Furthermore, landslides are properly indicated as a possible tsunami caused by 14,8% of
644 respondents, as well as meteorites and space objects. A similar question, about tsunami risk
645 perception induced by rock landslides, was asked in the survey conducted in Norway during
646 the ASTARTE project by Goeldner-Gianella (2017). In Norway, respondents correctly show
647 high tsunami risk perception induced by rock landslides. This result is mainly due to the
648 frequency of rock collapses occurring locally, and to citizens' trust in local institutions for how
649 tsunami risk is managed and how information is disseminated (Goldner Gianella et al., 2017).

650 4.2.3 - Knowledge about tsunami effects

651 Knowledge about tsunami effects are investigated by Q22 (*Try to figure out the effects of a*
652 *tsunami / tsunami on the coasts of your region. How far do you agree with the following*
653 *statements? Results show that in general, people are well aware about tsunami possible effects*
654 *on the coasts of their region. In particular, deaths and serious injuries are recalled by 93,9% of*
655 *their sample; damages to houses, buildings and infrastructures by 93.1%, and negative impacts*
656 *on economy and occupation and on economy are both indicated by 89,4%. Worth to say that*
657 *despite high rates of knowledge about tsunami possible impacts, women, most educated people,*
658 *and people aged up to 65 years show slightly higher percentages, as well as the inhabitants of*
659 *the municipalities included in the area hit by the 1908 Messina Strait tsunami. As to resume,*
660 *these kinds of effects are well known and present to interviewees.*

661 The data also show a catastrophic representation of tsunami effects that does not correspond to
662 the expected effects on the Italian coasts where moderate-sized tsunamis are more likely to
663 occur. This scenario probably comes from the diffusion of the catastrophic images of the
664 tsunamis that occurred in Sumatra in 2004 and in Japan in 2011, widely conveyed by television
665 and social media. Given that macro-effects of a tsunami are well recognized and understood,
666 micro-effects at local and individual level seem to appear unfamiliar to respondents.

667 Indeed data show that large coastal flooding is acknowledged by 83% and sea withdrawal by
668 77%, and the possibility that a small tsunami might drag an adult into the sea is known by 75%
669 (Q23). Only 24% of respondents think that fleeing to the beach after a strong earthquake is an



670 appropriate behavior. The question about the possibility that a large tsunami with waves up to
671 20 meters may occur in the Mediterranean Sea raises some concerns, as only 46% of the overall
672 sample considers it as a real possibility. Cross-tables highlight some unexpected surprises, such
673 as higher rates of youngsters (31%) and women (27%) who consider fleeing to the beach a
674 proper response to a massive earthquake.

675 **4.2.4 - Data on the sources information**

676 Data on the sources of information being used by the interviewees provide a relevant
677 framework to address and improve tsunami risk communication. As for the previous paper, we
678 have decided to group different sources into homogeneous categories. Data provide a clear
679 indication on the central role of television, that is indicated as an information source by almost
680 90% of the sample. More in detail, TV news reaches 83% of respondents and documentaries
681 or scientific channels reach 23%. Other traditional broadcast media, considered as a unique
682 category including newspapers, books, radio and movies, are found to reach 58% of the public.
683 Considering disaggregate penetration rates, newspapers were mentioned by 35%, books by
684 19%, movies by 12% and finally radio had 8%. Surprisingly enough, the whole internet sources
685 show a penetration rate of about 18% and interpersonal sources such as friends, relatives and
686 neighbors weigh for 5%.

687 As noticed in the first step of the research, the impact of institutional and scientific sources
688 appear to be a problematic issue urging the development of a proper and effective risk
689 communication strategy, since their overall penetration rate is a mere 3,5%. More in detail,
690 single rates are about 2% for the Civil Protection, 1,6% for Universities and Research
691 Institutions and barely a 1% for local administrative entities such as the Region, the Province
692 and the Municipalities. The residual category other has been mentioned by only 35 people,
693 corresponding to 0,6%. This suggests that a strong effort is needed for institutional parties to
694 fill this gap, offering more capillary information using state-of-the-art communication
695 channels.

696 Of course, data deserve further analysis by means of data reduction procedures, aimed at
697 aggregating variables into new indicators and producing synthetic more effective
698 understanding of the considered phenomena.
699



700 5. Discussion and conclusive remarks

701

702 The three surveys on tsunami risk perception, conducted between 2018 and 2021, started from
703 the necessity to study and understand the level of knowledge of tsunami risk and the awareness
704 of Italian citizens living in or visiting coastal areas exposed to tsunami hazard.

705 To date, these surveys represent a relevant sample of the Italian population, both for the number
706 of interviewees and for the adopted methodology (5,842 CATI interviews carried out on over
707 6000 km of coastline with moderate to very high tsunami hazard, plus a nation-wide “telepanel”
708 sample representative of the whole Italian population).

709

710 The main results show that the tsunami risk perception varies significantly according to the
711 coastal region. In particular, regions in the Adriatic (Apulia, Molise) show very low levels of
712 risk perception compared to Calabria, Sicily and Campania, both on the Ionian and the
713 Tyrrhenian seaside. Latium and Sardinia lie in the middle, with equal numbers of people
714 thinking that a tsunami could hit their region.

715 Educational degree affects tsunami risk perception indeed: the higher the educational degree,
716 the higher the tsunami risk perception.

717 On the contrary, data analyses show that tsunami risk perception is not influenced by either
718 gender or age. A slight difference is observed in the middle age group in which interviews of
719 35-49 years appear to have a slightly higher perception. The elderly show the lowest frequency
720 percentage in the response modality “*I don't know*” associated with low tsunami risk
721 perception.

722

723 These data agree with several studies carried out on local cultures have shown how
724 communities that have experienced disastrous natural events in their past, developed better
725 resilience and preparedness (Dekens, 2007) to these calamitous events. Such knowledge, which
726 differs from scientific knowledge (Flavier et al., 1995), is associated with the historical memory
727 of past experiences learned and transmitted through rituals, traditions, narratives and folk songs
728 (e.g. Smong Song in Simeulue Island) (McAdoo et al., 2006; Rahman et al., 2017; Rahman et
729 al., 2018; Sutton et al., 2021) and defined in a different way as: “local knowledge”, “traditional
730 knowledge”, “*indigenous technical knowledge*”, “*peasants knowledge*”, “*traditional
731 environmental knowledge*” and “*folk knowledge*” (Sillitoe, 1998; Mercer et al., 2007; Mercer
732 et al., 2012).

733 Memories of previous disasters both inform people's knowledge of their environment and
734 vulnerability and also influence their risk interpretation and response to future disasters
735 (Arunotai, 2008). Collective memory, relying on oral tradition shared by a specific group, most
736 commonly the family, tends to disappear with the death of the last eyewitness to the event (the
737 three-generation limit). Cultural memory, supported by documents (such as newspapers,
738 archives, images) and memorials as tangible signs for the community, ensures that disaster
739 meanings and interpretations are recorded and transmitted from generation to generation. These
740 forms of cultural memory, considered by Mercer (Mercer et al., 2010) as an existing or acquired
741 knowledge set by local communities are born and maintained through the accumulation of
742 experiences, social relations, community practices and institutions, and their transmission
743 across generations.

744 Garnier and Lahournat's (2022) study highlights how Japan Stone Monuments, representing
745 elements of both tangible and intangible culture for the population, demonstrate the existence
746 of disaster memory and reflect a desire to commemorate and transmit significant past events to
747 current and future generations. These findings highlight the importance of oral transmission
748 between generations about tsunami risk and could be very useful for designing effective



749 information and communications activities about tsunami risk reduction (Spahn et al., 2010;
750 Løvholt et al., 2014; Oktari et al., 2018; Sutton et al., 2020).

751

752 In the work we also carried out a comparative analysis on tsunami risk perception between the
753 metropolitan areas and the respective coasts (see paragraph 4.1.1), starting from the hypothesis
754 that risk perception could be different among the population residing in a large city and the
755 population of small municipalities distributed along the seaside. The territorial units analyzed
756 were selected based on exposure (higher coastal population density or proximity of major urban
757 settlements to the coast) and territorial vulnerability (high concentration of anthropogenic
758 activities such as industries or intensive tourism activities) according to ISTAT (Italian national
759 statistical institute) data.

760 The goal of this comparison is both to highlight possible differences in perceptions associated
761 with densely populated urban areas, and to provide a solid basis for targeted risk mitigation
762 actions in specific contexts (for example to improve and better address the Tsunami Ready
763 Program - Valbonesi et al., 2019; Valbonesi, 2022).

764 The results indicate that in Reggio Calabria, Catania and Naples indeed there are significant
765 differences in the tsunami risk perception compared to the relative seaside. This data is most
766 evident in Reggio Calabria (71%) with a difference of over 25 percentage points compared to
767 the Tyrrhenian (45%) and Ionian (46%) sides of the same region (Calabria).

768 The data continues to be significant, albeit less evident, for Catania (50%) and the Ionian
769 seaside (46%) and for the city of Naples (47%) and the Tyrrhenian seaside (45%). It is useful
770 to underline that the metropolitan city of Bari, despite being in a stretch of coast considered to
771 be at high risk, has significantly lower values of perception of the tsunami risk (34%), in line
772 with the data for the whole Adriatic coast (32%). Tsunami risk perception in the metropolitan
773 area of Rome seems to be lower than on the Tyrrhenian coast. Probably this is because Rome
774 cannot really be considered a coastal town because most of its over 3 million inhabitants live
775 far from the sea. The presence within the metropolitan area of Rome of the town of Ostia, a
776 very populous municipality (over 231,000 inhabitants) lying along the Tyrrhenian coast, is not
777 enough to raise the overall risk perception of the capital. It would be interesting to deepen this
778 aspect with specific analysis of the local residents, commuters and visitors. Given the city's
779 proximity to the coast (about 20 km), it is also worth considering the large daily (as well as
780 seasonal) tourist flows that in the summer period occur.

781

782 The Telepanel data (n = 1,500), collected in the same time period as the third survey, deserve
783 particular attention because they are a representative sample of the population at the national
784 level, that means people predominantly living far from the seaside. Comparing the tsunami risk
785 perception of the Telepanel with the surveys carried out on the coastal population, it emerges
786 that the coastal population on average has a perception of risk significantly higher than the
787 national average of about 20 percentage points. These data suggest that it is necessary to pay
788 particular attention to the coastal tourist areas where every year millions of people spend their
789 holidays. Providing capillary information along the beaches and in the harbors, indicating
790 escape routes and meeting points, establishing redundant alarm systems, are the main tools to
791 be put in place to reduce the tsunami risk of both residents and tourists.

792

793 As for the knowledge of tsunamis, we started by considering the different associations linked
794 to the two terms that are commonly used in the Italian language: tsunami and maremoto.

795 Results indicate that most of the sample is more familiar with the term tsunami (57%). The
796 word tsunami is more familiar to those with a higher level of education (66%) and less familiar
797 to people over 65 years old.



798 However, there are some differences that appear to be linked to local characteristics and which
799 will be the subject of further investigation.

800 It is interesting to notice that the two terms are associated with different phenomena. For
801 instance, the term tsunami is mostly related to the occurrence of a great destructive wave, while
802 the word tsunami is more often related to the occurrence of an earthquake.

803
804 As for the knowledge of the causes that generate tsunamis, in general the sample correctly
805 attributes the occurrence of a tsunami to earthquakes and to volcanic eruptions, in line with
806 scientific knowledge. Furthermore, tsunami knowledge does not seem to be linked to the
807 gender and the areas of residence of the interviewees but increases according to the educational
808 degree and inversely to age (people with higher education degree and younger than 50 years
809 old appear to be more informed).

810
811 Our data indicate that in general people are aware of the possible effects of tsunamis on their
812 regions. However, this knowledge appears to be closely influenced by the media representation
813 of the great tsunamis that occurred in Japan (2011) and Sumatra (2004). This type of media
814 representation could turn out to be misleading with respect to the more modest phenomena that
815 can be generated by smaller tsunamis, more frequently expected in the Italian coastal territory,
816 but also capable of causing serious damage and victims.

817 Moreover, our data indicate that television continues to play a central role in conveying
818 information relating to the tsunami risk, while the information role played by social media and
819 the web appears to be still marginal. A particularly problematic aspect concerns the poor
820 visibility of scientific institutions, civil protection and local authorities to be recognized by the
821 interviewees as official sources of information on the tsunami risk.

822
823 Our results suggest that the loss of memory of past events affects the perception of risk by
824 citizens and communities, making more difficult and even ineffective risk mitigation actions
825 (see for example Kurita et al, 2007; Sugimoto et al. 2010; Arias et al., 2017 and Wei et al.,
826 2017). Memory and recollections (such as commemorations of past events) are relevant for the
827 development of risk mitigation strategies and to increase the population resilience. More
828 specifically, a work of awareness raising aimed at attributing a sense and a meaning to the
829 memory is needed in order to reduce the risk. We believe that the results of this study, although
830 limited to central and southern Italy, can be used in other countries of the NEAM region and
831 worldwide to orient communication strategies and risk reduction actions.

832
833 In the near future, given the large amount of data collected in the three surveys, we will focus
834 on the creation of synthetic indexes for the perception and knowledge of tsunami risk.

835 We are also working to deepen the knowledge related to the cultural differences in the
836 perception of risk which seem to be very influenced by the local culture of reference. We are
837 confident that this will allow us to better explain the differences in perception and knowledge
838 that the data show in the different slopes and metropolitan cities. Finally, our efforts will be
839 focused on translating the results of risk perception analyzes into effective communication
840 strategies for tsunami risk reduction. Not least, the 2018 pilot survey results - published in in
841 the our previous paper - were extensively used in developing and improving the CAT website
842 content. Moreover, several relevant aspects of the study made it possible to better address
843 approaches in risk awareness campaigns such as "Io Non Rischio" (a Civil Protection
844 campaign) as well as undertake dissemination campaigns aimed both to raise awareness and
845 survey tsunami risk perception in schools (one of the Tsunami Ready program indicators).



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