



# The Influence of Gender on Students' Perception of Risk in Portugal

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**Keywords:** Risk Perception; Students; Gender; Education; Portugal.

**Abstract:** This study analyses the perception that students at the end of the 3rd cycle, in Portugal, have of a set of natural and environmental risks, considering their manifestation both nationally and in the area of residence. It also sets out to understand how students perceive the risks, taking into account the causes, the future trend, and support from public authorities, as well as the willingness to change attitudes regarding risk mitigation and reduction. The results suggest that students have a relatively low-moderate perception of risk. The risks of forest fires, heat waves, air and water pollution, and flooding are the ones they single out as most likely to occur, mainly as a consequence of climate change. Gender proved to be an important variable in perception, particularly in terms of manifestation and personal perception of risk. These results can influence the strategies and resources to be applied in the educational context, so that there is less reason to educate the youngest children about the need to prevent risk, and to reduce the impact of disasters and strengthen the resilience of the community in general.

## 1 INTRODUCTION


Understanding how the general public perceive natural and environmental risks is crucial for a better definition of communication and information strategies on risks. However, it can lead to more efficient risk management strategies, which will somehow contribute to societies that are better able to respond in crisis situations and that have greater social resilience.


Research on risk perception depends on various local/geographic and personal factors, including: the location of the individual (Bera & Danek, 2018); housing characteristics (Hung, 2009; Thistlethwaite et al, 2018); the consequences of the risk manifestation (Stojanov et al.; 2015); the impacts of the crisis (Thistlethwaite et al, 2018); the socio-economic and demographic profile (such as age, education, gender, income) (Balog-Way et al., 2020); direct experience (Terpstra, 2009; Bera & Danek, 2018); race (Macias, 2016); the historical-cultural context (Armas et al., 2015); and the political and

religious context (Bichard & Kazmierczak, 2012). Of the multiple variables that can influence risk perception, the gender difference has been described in several studies as a relevant factor, noting that women have higher levels of risk perception and show greater concern than men (Lindell & Hwang, 2008; Poortinga et al. 2011; Martins et al., 2019). However, other studies (Bradford et al., 2012) have not reported a robust correlation between risk perception and gender.

Education, particularly school, does seem to play a very important role in risk reduction, however. In general, individuals with a higher level of education tend to develop more accurate levels of risk perception, generally adopting more effective preventive behaviours towards risk (Striessnig et al., 2013; Muttarak & Lutz, 2014).

Based on the application of questionnaires to students living in several regions of Portugal, we set out to assess how students at the end of the 3rd cycle of basic education, perceive: (i) the probability of manifestation of natural and environmental risks, taking into account a number of natural and

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environmental hazards affecting the national territory and their area of residence; (ii) the triggering factors; (iii) the support of public authorities in the event of crisis; (iv) the future trends regarding their manifestation; (v) and the willingness to change their attitude regarding the mitigation and reduction of the respective impacts. The issue as to whether students of different gender have different perceptions on the previous questions is also examined.

## 2 MATERIALS AND METHODS

### 2.1 Background to the Study Area

Mainland Portugal is located in southwestern Europe, between latitude 36°57' N and 42°9' N, and longitude 6° 12' W and 9° 30' W. It occupies approximately 92,212 km<sup>2</sup> and has 10.3 million inhabitants. The insular part corresponds to the archipelagos of Madeira and Azores, located in the Atlantic Ocean.

Several risks affect the mainland territory. In the North and Centre regions of Portugal the risk of forest fires is dominant, less so in the south, with the exception of the Algarve mountains. In the south, drought and desertification are the most important risks, especially in eastern Alentejo. The risk of flooding is greater in the lower, estuarine, courses of the main Portuguese rivers, especially in the North and Centre regions, as is the case of the Douro, Vouga and Mondego rivers, and, further south, the Tagus.

### 2.2 Questionnaire and Statistical Analysis

In order to assess the perception that end-of-school students have regarding a set of natural and environmental risks, a survey questionnaire was applied to 376 students living in mainland Portugal. The average age of the respondents is 15 years old; about 47% were female and 53% male.

The questionnaire is structured in six parts. In the first part 'respondents are characterised' and in the second part students are asked to 'Rank the risks according to the probability of their occurrence', at national and municipal level. Fifteen natural and environmental risks were listed and a qualitative Likert scale was used to rank them, ranging from 1 - nil/minimum; 2 - low; 3 - moderate; 4 - high; 5 - maximum. The lowest value (nil or minimum) is therefore linked to a very low risk perception in relation to the probability of occurrence of the risk, as opposed to the highest value (maximum), correlated with a very high probability of manifestation.

The third part of the questionnaire considers questions aimed at analysing the respondents' perception of risk, such as: (i) whether risks tend to increase in the future; (ii) whether they arouse fear; (iii) whether individual actions influence risk; (iv) whether they are concerned about the consequences of risks; (v) whether they are willing to change individual behaviour. The fourth part is aimed at analysing the understanding of causes. This part of the questionnaire considered: (i) whether risks result from anthropic action; (ii) whether they result from climate change; (iii) whether they result from poor planning and land use planning; (iv) whether they result from divine punishment; (v) whether they are unpredictable natural events. The fifth part, 'Channels of information on risk', was intended to examine the means of communication considered most effective in communicating and informing about risks, considering the role of education, the media and the Internet. Finally, the sixth part of the questionnaire looked at students' perceptions of state support in the event of a crisis.

To assess whether there are statistically significant differences between female and male students in the different components of risk perception, the independent t-test was used to compare the mean difference between genders.

## 3 RESULTS

In general, the perception of the risks considered according to their manifestation is low to moderate, mainly at the local scale (fig. 1).

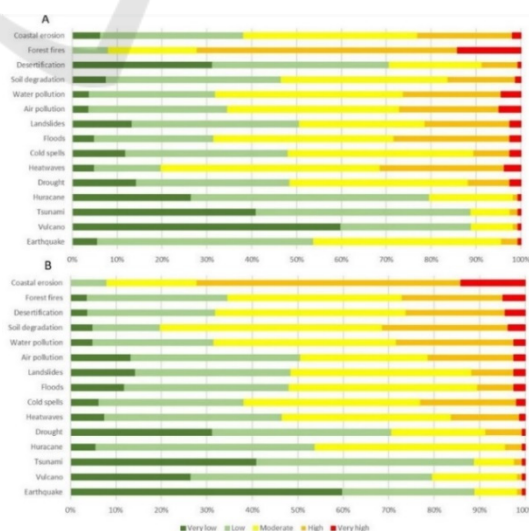


Figure 1: Distribution of the relative frequencies (%) by class, according to the occurrence of different risks at national level (A) and Madeira (B).

The risks with the highest perception values are forest fires (average 3.87) and heat waves (average 3.12). These are followed by water pollution (average 3.08), air pollution (average 3.06) and coastal erosion (average 2.72). The lowest values of risk perception were the geophysical risks, in particular the risk of volcanism (average 1.63) and tsunami (average 1.85), based on the national scale.

With regard to the area of residence, the risks with the highest perception are forest fires (average 2.77), water pollution (average 2.53), cold spells (average 2.46), and floods (average 2.41). With lower perception we find the volcanic risk (average 1.18), tsunamis (average 1.32), storms (average 1.46), and desertification (average 1.70).

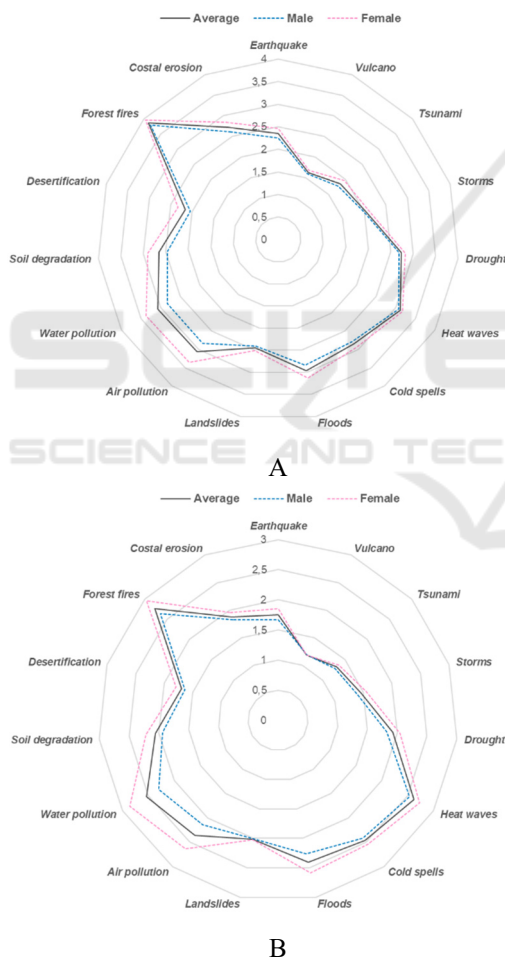


Figure 2: Overall risk rating (mean) for females and males (A National level, B Municipal) (Likert scale: 1 - nil/minimum; 2 - low; 3 - moderate; 4 - high; 5 - maximum).

The results indicate statistically significant differences (Levene's test for equality of variances/ t-test for equality of means) in the perception of risks,

taking gender into account. This fact is seen more clearly at the local scale, and for the risks of flooding (sig. 0.005), water (sig. 0.000) and air pollution (sig. 0.000), desertification (sig. 0.009), and soil degradation (sig. 0.009). Female students have a higher perception of risks than male students, particularly when it comes to the risk of air and water pollution, floods, forest fires and coastal erosion. (Fig. 2).

Most students understand that the considered risks, especially forest fires, tsunamis, storms and earthquakes, can cause material and human losses. Similarly, they consider that the occurrence of the risks will tend to increase in the future, especially the risks of air and water pollution, forest fires, and heat waves.

The results also very clearly suggest the importance of anthropic action as a risk amplifying factor, especially regarding the risk of water (mean 4.16; n=162) and air pollution (mean 4.18), and the risk of forest fire (mean 4.04) (fig. 3).

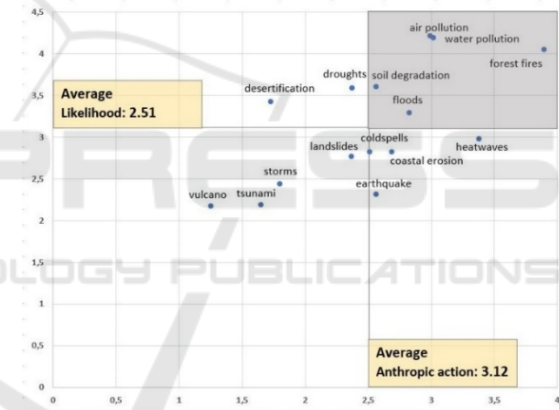


Figure 3: Comparing perceptions on likelihood and anthropic action as a risk-increasing factor.

Climate change is seen as a cause of increased risk of heat waves (mean 4.09), droughts (mean 4.02), cold spells (mean 3.83) and forest fires (mean 3.76). Once again, gender establishes statistically significant correlations with the fear of risks (sig. 0.000), with individual actions as a risk-influencing factor (sig. 0.004), with the concern about risks (sig. 0.000), and with behavioural change (0.003) towards risk mitigation (Table 1). It is the female students who are more concerned about the consequences of the manifestation of risks; they are more afraid and believe that individual action contributes significantly to risk reduction. They also tend to ascribe the causes of an increase in the occurrence of disasters to poor land use planning policies and are

more willing to change their behaviour in order to moderate the impacts of risk manifestation.

Table 1: Levene's and t-test for risk perception.

	Levene's test for equality of variances	t-test for equality of means
	Sig.	Sig. (2extremities)
I'm worried about the risks*	0.130	0.000
Willing to change*	0.667	0.000
Divine punishment	0.103	0.186
Nature's revenge	0.104	0.178
Planning Policies	0.868	0.177
My actions can lessen the risk*	0.465	0.006

Note: Asterisk, significant relationships between groups (p-value < 0.05); n= 376.

Regarding channels of communication and information on risks, the students surveyed believe that the Internet and school are effective channels of communication. Most students assigned a very important role to education and the media as vectors of communication (mean 4.19) and information (mean 4.07) about risks. However, the Internet is the most effective vehicle in the process of communication and information about risks (average 4.07).

In crisis situations, students feel supported by government bodies.

## 4 DISCUSSION

School education is very important in risk perception, serving not only to increase knowledge of the different potentially dangerous physical processes, but also to raise awareness of practices aimed at improving safety. In this study, the students' perception of the risks considered is low to moderate, both at national level and, more especially, in the municipalities where respondents live. These results corroborate some works that suggest a lower perception of risk in the municipalities of residence than at the national scale (Martins et al., 2019; Nunes & Martins, 2019). This perception seems to be related to direct experience with crisis situations (Wachinger et al., 2013) or even to result from the influence of the media. In fact, the media have proven to be an important vehicle of information by influencing the perception very strongly (Biernacki et al., 2009). News of disasters elsewhere thus seems to influence perceptions, suggesting that risk events tend to occur outside the area of residence. However, the greater attention given to a certain risk is responsible for

creating an indirect experience that influences perception and that can, in some way, explain the valuation of a certain risk (in the Portuguese instance, forest fires) compared to other risks (Siegrist & Gutscher, 2005).

In general, risks are perceived as potentially dangerous because they can lead to loss of life and damage to property. Forest fires and tsunamis are prominent in this group. Disasters are also seen as phenomena that will tend to increase in the future, especially those related to water and air pollution, and meteorological risks, such as heat waves and cold spells. In fact, there are several works that point to atmospheric risks as having the highest perceived tendency to increase in the future (Garschagen et al. 2020), especially in relation to climate change and extreme hydrometeorological phenomena (Eck et al., 2020), and pollution (Altunoğlu et al., 2017).

The results suggest statistically significant differences with respect to gender. Female students showed a higher perception than male students, especially regarding the risk of air and water pollution, soil degradation and coastal erosion risks, both at national level and in the municipality where they lived. These results are in line with some works that identify gender as a factor in risk perception (Lindell & Hwang, 2008; Poortinga et al. 2011). Female students tend to value the consequences of disasters, too, raising more fear in them. This result is similar to other studies that suggest that women feel more fear and concern about the consequences of risk manifestation than men (Lujala et al., 2015). They also tend to give greater consideration to their actions in influencing risk, and are more willing to change their behaviours to lessen the likelihood that catastrophic events might occur.

Regarding causes, climate change stands out as the most important factor in increasing risk. The strong media coverage of the topic and its relationship with some risks, particularly those associated with hydroclimatic extremes, could justify this perception, in line with several studies that indicate identical results (Wamsler et al., 2012; Muttarak & Lutz, 2014).

Although education, especially the role of school, is seen as an important means of information and communication vis-à-vis knowledge of the physical phenomena associated with the different risks, social communication is also emphasized, thus validating some works that reach the same conclusions (Biernacki et al., 2009). However, the internet is the most effective form of knowledge (Roth & Brönnimann, 2013). Nevertheless, although the internet contributes very effectively to a wider



dissemination of information, this does not mean that it contributes to greater technical knowledge (Krimsky, 2007).

The results also suggest that the causes of occurrence, and the severity of the risks are related to poor land use planning policies. They also suggest that individual actions influence the risk, often aggravating it, and claim that female students are especially willing to change behaviours so as to mitigate risks. Several studies (Zaalberg et al., 2009; Terpstra, 2011) have similarly demonstrated a positive relationship between emotional elements such as fear or worry and willingness to implement measures aimed at mitigating the impacts of risk occurrence.

## 5 CONCLUSIONS

Risk perception is inherently personal and subjective, and results from a combination of knowledge and judgment associated with social, psychological, cultural and political factors. Given this multiplicity of factors, the analysis in this study is somewhat limited and focuses mainly on gender and the socio-cultural background of the students surveyed. Gender, indeed, proved to be a variable with significant influence on perception, particularly in terms of personal risk perception. Female students were more concerned about risks, as they are more afraid because they think that risks will be more frequent in the future and have increasingly significant impacts. Female students also have a higher perception of risk depending on its manifestation. However, further work is needed in order to consolidate this conclusion by including more variables.

In fact, in Portugal the subject 'Risks and Disasters' has only recently been introduced in the school curriculum. Therefore, there are still no studies on the contribution of this content to the perception of risk by students. Thus, it is essential to carry out studies, with a larger sample and over a longer period of time, aiming at acquiring sounder knowledge about how education, and school in particular, influences students' risk perception. It will then be possible to benefit equally from a more correct approach to teaching methods and from the quality of educational materials and resources used in the teaching-learning process, thereby deepening knowledge and raising students' awareness.

## ACKNOWLEDGEMENTS

This research received support from the Centre of Studies in Geography and Spatial Planning (CEGOT), funded by national funds through the Foundation for Science and Technology (FCT) under the reference UIDB/04084/2020.

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