SCIENCE, SOCIETY, POLITICS, AND THE MEDIA – JOINING EFFORTS TO MANAGE THE RISK OF TERMITE INFESTATION IN THE AZORES

Ana Moura Arroz[1], Ana Cristina Palos[1], Isabel Estrela Rego[1] & Paulo Borges[2]

[1] Universidade dos Açores, Dep. Ciências da Educação, CITA-A, Terra-Chã, 9700-851 Angra do Heroísmo, Terceira, Açores, Portugal;. E-mail: ama@notes.angra.uac.pt
[2]Universidade dos Açores, Dep. Ciências Agrárias, CITA-A, Terra-Chã, 9700-851 Angra do Heroísmo, Terceira, Açores, Portugal;. E-mail: pborges@mail.angra.uac.pt

Main theme(s):
Working together – sharing expertise

Address and name of corresponding author:
Ana Moura Arroz
Universidade dos Açores
Campus de Angra do Heroísmo
9700-851 Angra do Heroísmo
Azores - Portugal

Telephone number
+ 351 295 402 200

Email:
ama@notes.angra.uac.pt

Abstract. Termites are well-established and serious pests of structural wood infestation in different parts of the world. Presently, in the Azores archipelago (Portugal), the drywood termite *Cryptotermes brevis* (Insecta, Isoptera) has been referred to four of the nine islands, and the damages to the buildings and other artefacts are severe and constitute a serious threat, especially in its main towns. In order to control the situation there has been a considerable scientific and political investment to survey and classify the infestation, and to develop mitigation strategies, over the last five years. Nevertheless, the infestation is far from being controlled and, also, most of the Azorean citizens are still unaware of the dangers and risks associated to this urban pest. If, however, effective educational and management practices are initiated soon, the losses from *C. brevis* can be greatly reduced.
Therefore, the major aims of this research project are: (i) to understand people's perspectives about the consequences of the termite infestation and their appraisal about the effectiveness of the proposed and existing management strategies; (ii) to understand the functions of the media in the making of public opinion; (iii) to develop simple ways of communicating complex technical information according to people's perception of who is accountable and trustworthy, in order to avoid misunderstandings between science, politics, managers and society; (iv) to develop and implement devices focused on the communication between the population and the main stakeholders, to promote the involvement of citizens and their commitment as essential partners of the termite control.
This paper aims to integrate data from the abovementioned stakeholders in order to identify communication problems, to create adequate strategies to solve conflicts, to facilitate dialogue and partnerships among stakeholders and to promote termite risk literacy. Data was gathered using several techniques, including interviews, descriptive-interpretative analysis of media, scientific discourses and existing operational programs. Data shows that the lack of integration among stakeholders is the most obvious barrier to be overcome by the communication devices to implement.

THE PROBLEM

Over six years ago, some homeowners of Angra do Heroísmo, the major town of Terceira Island in the Azores (Portugal), began observing pellets, elates, and wings of drywood termites in their furniture and picturesque and historic buildings. It was not until 2002 that *Cryptotermes brevis* was identified in Terceira and São Miguel islands (Borges *et al*. 2004, Myles 2004), being presently considered a well-established and serious pest of structural wood - detected in four of the nine archipelago's islands (Santa Maria, São Miguel, Terceira and Faial)- and the cause of severe damages to the buildings and other artifacts in major towns. This termites' capacity to attack different types of dry wood allows it to invade all types of fixed structures of a house (roof and ceiling, pavement, windows, doors, etc). Also, because it can eat soft and hard wood with a strong preference for sapwood over heartwood (Myles *et al*. 2007), it turns out to be the only termite easily found in furniture, what might both explain its introduction and dispersion in the Azores and increase the probability of its spreading to the rest of the islands (Borges *et al*. 2007).

Even though other termite species such as the *Kalotermes flavicollis* (an European dampwood termite) and the *Reticulitermes grassei* (an Mediterranean subterranean termite), have been recently identified in the Azores (Borges & Myles 2007), the extent and the impact caused by the infestation of the West Indian dry wood termite *Cryptotermes brevis*, are, by far, more worrying. Hundreds of residential, governmental, and commercial buildings in the islands of São Miguel, Terceira, and Faial are right know infested with *C. brevis* (Borges *et al.,* 2004, Borges & Myles 2007) With every passing year, additional structures will be colonized through seasonal dispersal flights emerging from untreated buildings (Guerreiro, Myles, Ferreira, Borges & Borges, 2007).

Since the identification of this pest the University of the Azores, in partnership with other national and international institutions, has been hosting research devoted: (1) to identify termite species in the Azores and to characterize their biology; (2) to search for their patterns of distribution and abundance in the Terceira island, particularly in the Angra do Heroísmo district; (3) to analyse the circumstantial factors involved in the propagation of termites in Terceira island; (4) to test several techniques of mitigation and of propagation control, in the lab and *in situ,* in order to evaluate their efficacy in eliminating and repelling the infestation; (5) to study comparatively various chemical and physical methods to treat infested furniture (see Borges, Lopes, Simões, Rodrigues, Bettencourt & Myles, 2004; Myles, 2004; Borges & Myles, 2007).

To evaluate the incidence of the pest in the district of Angra do Heroísmo the research team carried out an exploratory study in ten randomly selected houses in each rural village of the district and in ten randomly selected houses in each street suspected to be infested by the pest in the only town of the district (Borges *et al*., 2004). Later, following a campaign to inform local residents, all the houses that until the end of May of 2004 reported to the local authorities of being affected by termites were also included in this sample. In the historical centre of Angra do Heroísmo about 43% of the inspected houses were reported as being affected, with half of them depicting severe infestation or a high degree of destruction of their foundation structures capable of endangering their occupants (Borges *et al*., 2004; Myles, 2004). This level of infestation is not observed in the whole island since there were no drywood termites detected in the rural areas of the interior. Such distribution pattern appears to indicate that the pest is much more harmful in less humid regions (see Figure 1).

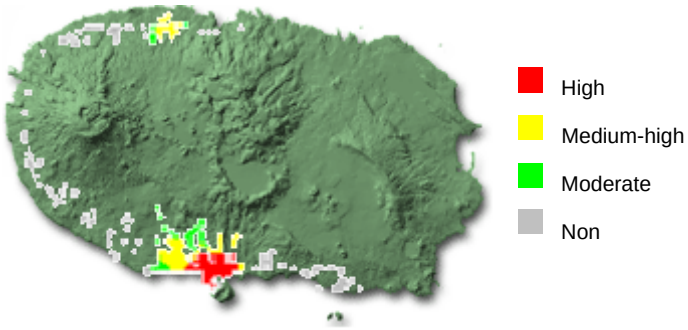

Figure 1- Distribution pattern of the drywood *Cryptotermes brevis* termite in Angra do Heroísmo district and in Biscoitos, in December 2004 (based in Borges *et al*., 2004).

Inspections conducted in 2006 revealed that presently the incidence of this pest is even more severe in S. Miguel Island, particularly in the historical centre of its major town, Ponta Delgada (Myles *et al*., 2007). Results from other studies (Ferreira, Myles, Borges, Guerreiro & Borges, 2007) confirm that the two more common types of wood typically used in building construction (*Cryptomeria japonica* and *Eucalyptus* spp.) are among the species more consumed by the *Cryptotermes brevis.* They are as well the two species with the higher level of termite survival and egg production (Guerreiro *et al*., 2007).

Knowing that the infestation has reached such a high level that it cannot be completely eradicated, these figures stress the vulnerability of the local socioeconomic system and the seriousness of the potential impact of the pest. Recovery and maintenance of damaged property and measures of pest propagation prevention and control required to ensure the habitability and security of buildings are costly to the homeowners and call for rapid intervention on the part of authorities. There is also the need of recovery; conservation and protection of a vast set of monuments of inestimable historical and cultural value (see also Borges *et al*., 2007).

THE *TERMIPAR PROJECT* – CITIZEN PARTICIPATION IN THE CONTROL OF TERMITE INFESTATION IN THE AZORES

Any systematic survey of the perception of the populations concerning the risk associated with this urban pest does not exist so far. The weak adhesion to initiatives of public information, the small number of inspections requested by citizens to the City, or the few occasion where the citizens have been heard by the media, seem to indicate the lack of awareness regarding both the gravity of the problem and the responsibilities that are tacitly imputed to them, and the procedures that should be put in motion and the requests that should be made to face a crisis. On the other hand, a feeling of helplessness has been growing among risk experts due to the weak impact of their recommendations and efforts on the target populations (see for instance Borges *et al*., 2007). Previous research (Borges *et al*., 2004) argues that there is a huge gap between what people actually know and what they need to know about termites, a fact that may cause a dysfunction in the communication between experts and common people.

Since the nuclear crisis in the 60s that all these factors have gained importance in the course of understanding risks and have also originated, at an international level, a convergence between social sciences and natural and technological sciences. In the evolution of this confluence, however, it is possible to identify a paradigm shift in which the initial approaches, emphasizing the distance between layman's and experts' positions, gave place to a new orientation that aims at understanding the various rationalities involved in risk by uncovering cultural (Lupton, 1999, Lima & Castro, 2005), social (Lima 1998; Sjöberg, 2000), cognitive (Kraus & Slovic, 1988) and emotional (Lowenstein, Weber, Hsee & Welch, 2001; Slovic, Finucane, Peters & MacGregor, 2004) variables connected to risk perception. A shift was also present in the history of risk communication. While initial forms of communication were mainly informative, unidirectional, and devoted to persuade people to follow experts' prescriptions, the most recent approaches are dialogical, bidirectional (Fischhoff, 1995), and bring together public and risk management experts in a social learning process intended to create mutual trust by attending to the interests and concerns of both parts (Renn, 2005).

The organization and mediation of a risk communication process involves the combination of the populations', experts' and decision-maker's perceptions of risk, their beliefs regarding each part's expected role and actual responses in risk situations. The present research project - Citizen Participation in the Control of Termite Infestation in the Azores (TERMIPAR) - oriented towards the analysis and the intervention in the social dimensions of risk, was put forward both to promote the involvement and commitment as partners in the termite control of all interested groups and to develop devices focused on the communication between them. Considering risk communication a two-way communication process of social influence that is present in decision-making and conflict mediation, the opportunity to improve communication among the parts is expected to contribute for understanding and approaching those factors that have prevented an efficient management of this pest.

The objectives and phases of the study are described in the sections that follow. For each phase the research questions and methodological options are presented.

Objectives

The project's objectives are:

- To understand the perspectives of citizens, experts, decision-makers, and mass media about the consequences of the termite infestation and their appraisal about the effectiveness of the proposed and existing management strategies. That characterization will uncover potential conflicts between perceptions, concerns, causal attributions and estimates of risk consequences, as well as the assumptions underlying those perspectives;
- To understand the functions and the cultural frames underlying media discourse in the making of public opinion, in order to confront mass media with their social role in communicating the termite pest problem in the Azores;
- To identify factors underlying public trust and social participation in the communities being studied, as well as the communication contents more adjusted to the development of risk communication devices designed to reach each audience.
- To develop, implement and evaluate communicational devices focused on social interaction between the population and the main stakeholders, in order to increase social efficacy in termite control participated decisions;
- to develop simple ways of communicating complex technical information according to people's perception of who is accountable and trustworthy, in order to and to avoid misunderstandings between science, politics, managers and society;
- Contribute to create a plan to manage environmental risks more efficiently by making scientific and technical knowledge more easily available to decision-makers and populations.

Phases

Operationally, the project includes five tasks occurring in two phases:

Phase 1 - Characterization

- Social Response to Risk

Over the last six months the project has been focusing on the characterization of the management measures and procedures implemented by the government as well as on the analysis of the social dynamics among the various groups to manage the problem (Figure 2). The questions that oriented the study in this domain emerged after an exploratory phase in which the different groups were informally approached. There was an attempt to both find out the vulnerabilities of the communication among the social, technical, and institutional segments involved in this risk management and the identification of barriers to the implementation of recommended measures. Some of the questions orienting this search are: How do experts interpret risk? What position do such environmental problems occupy in the political agenda?

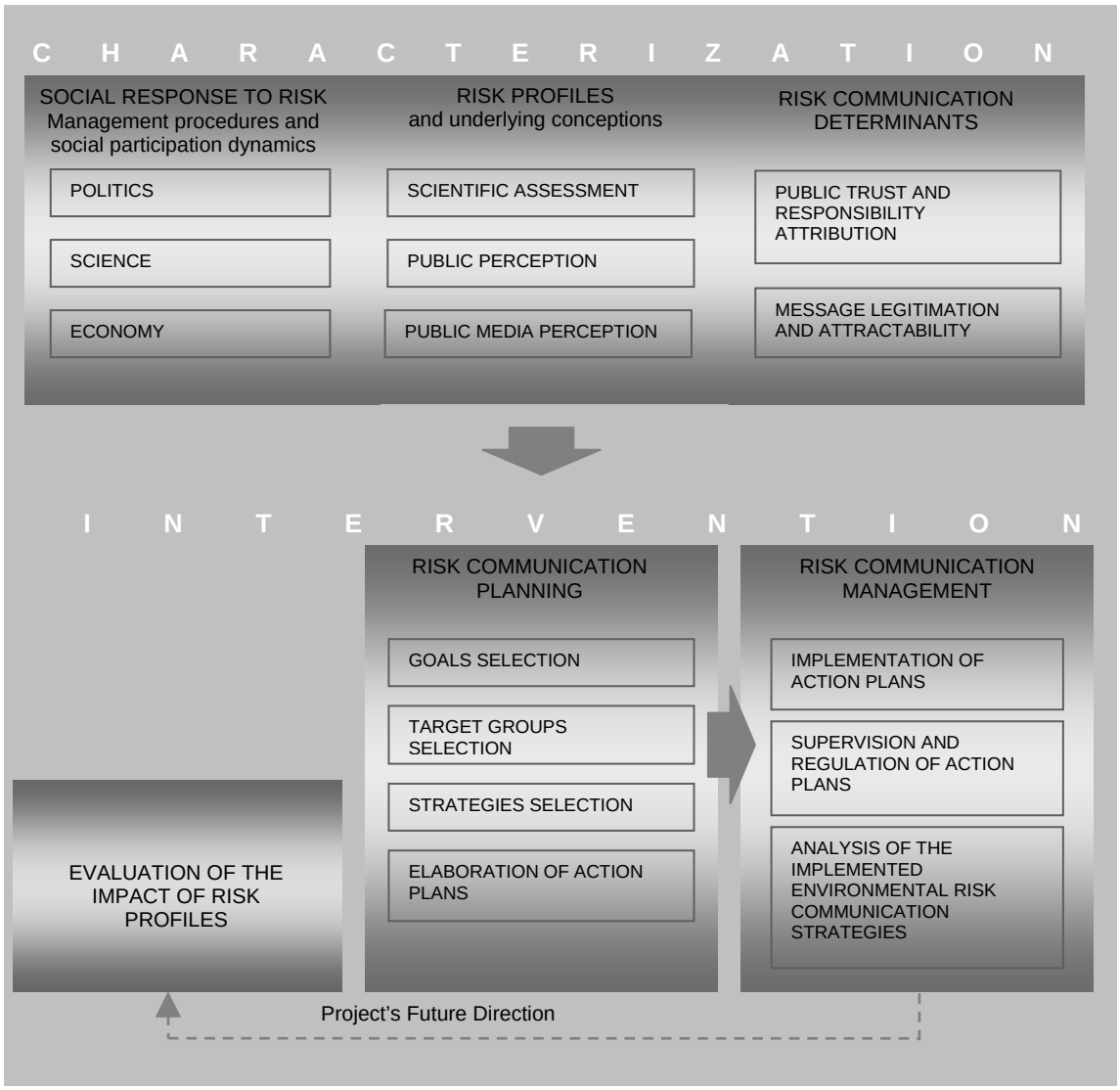

Figure 2- Phases of the TERMIPAR Project.

What policies are officially undertaken? What institutional means exist for monitoring environmental risk prevention and mitigation? What sort of mechanisms do responsible institutions put forward in order to reach different groups in society?

In the characterization of social response to risk, the research team sought to reach an integrated view of the facts based on a combination of an external, evaluative logic, focusing on the description of phenomena as they appeared to the team, and an interpretative logic, focusing on the public, scientific and institutional modes of interpreting the termite risk.

- Risk Profiles

Only when one understands the beliefs and values shared by individuals in a given society can he/she understand which situations are considered threatening and how that leads to different risk estimates' (Bernardo, 1998, p.3).

Since the identification of commonalties and divergences in the risk judgements of each interpretative community and of information deficits on risks and forms of dealing with them are very relevant to design the risk communication devices, the characterization has been focusing on question such as: How is a given risk understood by the different parts involved in the situation? What kind of information do they have about the situation and ways of dealing with it? How do they estimate the probability of risk exposure, the degree of severity of consequences, and the possibility of eradicating and controlling its spreading to other islands? Does the association of a small investment to alter the common agriculture practices and the wood transformation industry with the

minimization of the risks, understood by people, verifies? If yes, which risk profile dimensions will contribute for this minimization or problem unawareness? Is it a question related to the presumed controllability, with the information available about the extension, seriousness of consequences or the vulnerability of the patrimony built or is it related to a great trust upon the government and/or the experts in risk management? Or could the typically Portuguese cultural believes that "*everything will be settled with the help of God"* conditioning populations less active attitudes? Who is responsible for what regarding risk prevention and mitigation? Answers to these questions may help to understand how risk perception and responsibility attribution can contribute to the definition of risk management strategies. Therefore, this task aims at capturing how different groups perceive termite risks and interpret their own responses to this situation. Interviews and questionnaires will be used for that purpose.

Considering the influence of mass media in the shaping of Portuguese public opinion and on the states' political agenda, an analysis of the way risk situations are addressed by local media is also pointed out. Several survey studies (Almeida, Lima, Nave, Casanova, Schmidt, 1997; Almeida, 2004; Gonçalves, Domingues, Delicado & Raposo, 2004) focusing on the impact of the media coverage of environmental problems in the Portuguese public opinion have shown that between 1997 and 2004, even though there was a substantial decrease in the confidence on information propagated by the media, people kept on attributing to the mass media the role of primary transmitters of information pertaining to environmental risks. To uncover the role of media in the spreading of information about termite pests among the population appears to be critical to understanding the kind of resistance that prevents a more active social participation in the control of this problem.

Some of the questions in the media analysis agendas are: Which devices opinion makers use to persuade citizens regarding their interpretations of the problem and the strategies to manage it? To which pressure groups is given voice? Which inferences can be drawn from the cultural frames informing public communication? To what extent can these cultural frames promote or prevent the engagement of citizens in this problem management? To answer these questions the team is content analyzing newspapers, radio, and TV pieces regarding their form and content.

- Risk Communication Factors

Closely related to that integration of perspectives are the efficiency of communication between all the parts involved in the process of understanding and dealing with risk, the participation of citizens and stakeholders in decisions and their willingness to undergo behavioural changes – a condition required for public responsibility – and the strengthening of confidence in the institutions responsible for risk governance as a mechanism of social credibility.

Considering risk communication a two-way communication process of social influence that is present in decision-making and conflict mediation, it plays a central role along the whole course of risk governance. It is also relevant to get a deeper knowledge on other issues closely related with the communication process since uncertainty associated to risk affects trust in decision-making (Eiser & White, 2006, Renn, 2005, Taylor-Gooby, 2004). To identify which interlocutors are not trusted, to understand what factors contribute for that lack of confidence, to know what kind of communication appears to be more attractive and legitimate to address different risks with particular groups are some of the questions to be tackled in this task. Answers will provide procedural knowledge on what type of communicational strategies should be put forward in intervention plans to implement later, and will permit to design communication devices more adjusted to the specific needs, socio-cultural characteristics, social participation, and specific problems trust patterns of targeted groups implicated in a particular risk governance situation.

The characterization was based on the analysis of all legislation and political public debate produced around this problem, the measures implemented by the government and local power, the reports from the inspection visits requested by the citizens, and all the media material produced since the pest started in 2002 until the present, in local newspapers, radios and TV news. The analysis consisted of interpretative content analysis of the oral and written discourse, using the methodological approaches and instruments considered most suited for the task.

In an effort to consider the interplay of a high number of variables, the methodological approach used in the risk perception and communication diagnostics focuses on individual experiences occurring in specific settings and interviews - to termite research specialists, decision-makers, pest management specialists from private companies, mayor managers and target groups from the population identified by the risk evaluation group in the exploratory phase, based on risk

structure and system vulnerability – based on which a questionnaire with be produced to better evaluate the different perspectives.

Phase 2 – Intervention

The second phase of this project pertains to the implementation of communication devices previously constructed. Although risk perception and communication factors plays a central role in this project, its major purpose is to serve risk management activities: 1. provide information about termites risk and ways of handling them; 2. assist people in learning forms of action appropriate to cope with this infestation; 3. contribute for people's recognition of competence and fairness in institutions; and 4. promote the participation of all parts in conflict resolution and decision making processes related to risk.

Since the aspects to be acted upon are defined by both the needs assessed in a previous phase of the project, and the obstacles and resistances encountered along the decision-making process, any plan of action elaborated at the present moment necessarily has a provisory character. Nevertheless, it is possible to anticipate, though in a quite generic form, some methodological and procedural aspects, and the kind of functions the communication supports. The role of communication in risk management is to intervene, in different ways and with distinct but compatible purposes, in decision making. In that context some functions of communication are: to provide information; to promote behavioural change; to offer experts, decision-makers and stakeholders the possibility to share their perspectives; to implement and regulate risk management processes in accordance with the institutional compromises previously attained. Interventions directed towards any of these functions comprise a common sequence of operations specially selected for that particular case. How to negotiate in order to insure that all parts get actually involved in the decision-making process? How to promote the parts' adherence to the ultimate purposes of decision-making in order to have them participating in intervention planning? How to mobilize the NGO's experience and knowledge of environmental issues in the mediation of individuals and groups involved in decision-making processes? What regulation mechanisms should be put forward to monitor the implemented processes and their impact on the groups and systems, as well as on risk mitigation?

To evaluate the impact produced by the interventions implemented appears to be an important condition to assess how efficacious and feasible these approaches are to deal with both risk mitigation and risk social effects. However, the amount of time required by this evaluation goes beyond the scope of this project and represents a goal to be pursued later. The impossibility of eradicating termites in the Azores calls for the development of regulation mechanisms that ensure the continuity of the communicational process started in the present project.

WHERE DO WE STAND NOW?

With the characterization phase still in progress, the collected data has enable the uncovering of some factors associated to the inefficient and reduced impact of the available scientific knowledge and legislation in people's behaviours addressed to mitigate and deal with this pest. This data leaded to a profound problem redefinition, from an exclusive focuses on the supposed precarious involvement of the citizens in its control, to an analysis of all the current social response system of governance. This redefinition was vital to the delimitation of its posterior operational actions.

This final section focuses on several social aspects and dimensions of the termites' pest governance that was found to be more relevant up to now.

Institutional measures and control

The great economic and patrimonial impacts of this pest have triggered considerable investments from the scientific community in the last 6 years. However, knowledge produced on the assessment of the risk source and on the efficacy of mitigation strategies have not had the desired social impact, probably due to the fact of not being followed by the implementation of mitigation, control, prevention, and dissemination measures at a regional level. For that purpose a mission team, composed by representatives of different departments of the government, was officially created and put in charge of developing a Program of pest management. In the scope of that program a set of integrated recommendations were made to the various stakeholders involved, concerning (1)

information about the sources of risk and the strategies to manage it, (2) support and technical advise to the population under risk, (3) strategies to mitigate and control the source of risk, and (4) scrutiny of the fulfilment of law measures of prevention, disinfestations and residues discarding (see Borges 2007).

Despite the diversity of recommendations, the political intervention restricted only to the financial support of related scientific studies (see Borges & Myles, 2007), the realisation of a short duration technical course to train inspection workers, and to the production of legislation regarding the attribution of financial support for building rehabilitation work. It is also assured buildings' inspection but only when required by citizens.

The inefficacy of the government financial support for building rehabilitation work is a consequence of tight regulations imposed to people, namely the salary of the families: only the families with a gross salary of 413 euros per person (minimum national salary) have access to deep lost loans or interest with the highest bonification tax. These financial aids cease when at least two members of the family have a gross salary superior to two minimum national salaries.

The difficulty in currently identifying a management structure for operational coordination of this problem indicates the absence of a political determination in assuming the control of this environmental risk, notwithstanding its social priority. Consequently, the absence of guidelines we come across with makes it harder for experts to assume responsibilities in their area of expertise, and for citizens to comprehend the actions to undertake and to whom they should appeal.

Challenging the essential recommendations of the Group of Mission, that emphasized the responsibility of the State and of the mayors, the current situation is characterized merely as a management of occurrences, i.e., punctual measures of education for the problem promoted by the mediators, unconvinced measures of remediation of the consequences of the infestation, and the ruling of financial supports to the recovery of properties. If we add to this the fact that these measures are oriented for a restricted group of people, particularly underprivileged ones, and that the main political speech is centred in citizens and private companies responsibility for the detection, treatment, recovery and residues management, we move towards a logic of risk privatization, that greatly increases the vulnerability of the systems. In this context and in the absence of control in the wood inter-island transportation, the most probable consequence will be the dispersal of the pest to other islands in the archipelago.

Although termites eradication from the Azores is impracticable, much of the produced information affirms that the losses from *C. brevis* can be greatly reduced if effective mitigation practices and more stringent inspection of imported goods are initiated soon.

Public Information

In spite of the media speech analysis being far from concluded, its contribution for risk management presents a differentiated investment. Local periodicals and television have presented extensive covering of the phenomenon, while on the other hand radio (based on the parts available until this moment) has only occasionally narrated ongoing initiatives. These media could also be distinguished by the stakeholders to which they have given stronger voice to: both television and periodicals put in evidence the diverse points of view of the different intervenient (homeowners, scientists, pest managers, private companies, politicians), whereas the radio gives some emphasis to the scientists and the produced scientific knowledge.

The inexistence of censuses which would allow us to evaluate the audibility of each one of these sources in the Azores and the fact that we are still analysing in detail the validation of the information and the trustworthiness on the part of the citizens, hinders a comprehensive reading of its role in public opinion construction.

Nevertheless, more than the media or any another legal structure the investigators have constituted the main source of information for the homeowners (see e.g. Borges *et al*. 2007; Borges & Myles, 2007). Through the organization of events to divulgate the results in the three most affected islands and the publication of a user-friendly book with practical ways of managing termite infestation in the Azorean buildings (see Borges & Myles 2007), the risk evaluation group is trying to be closer to the populations. , Even though the implications of the produced knowledge for the common citizen are clear, both the adopted communication strategies, as well as the code of the message used approaches the classic modalities of scientific spreading. The choice for the organization of workshops – a communication strategy based on a bottom up curricula construction with great flexibility in contents which facilitate a greater interaction between the public and the scientists – resulted in practice in the organization of mini-symposia where the logic of the user did not dominate.

This situation can have contributed to harden effective communication with the diverse public that in each island composed the audience. On the other hand, this public diversity, that opposed the predominance of alive forces of the local economy in one of the islands, the affected citizens in the others, seems to indicate deep cultural differences that must be taken into account in future communicational devices preparation .

Finally, these events also brought the opportunity for the represented governmental departments and stakeholders to discuss and debate their role in solving the issue and to be confronted with situations of institutional emptiness.

Economic Sectors and Private Initiative

Until this moment there is no adequate information available concerning the economical transformations conceivably introduced in the system since the social recognition of this infestation.

Based on the accessible knowledge, both the agriculture and the wood transformation industry should suffer major changes, in order to substitute the dominant trees in home construction (*Cryptomeria japonica* and *Eucalyptus* spp.) for other less vulnerable to termite pest. Even though these changes have been belong to a set of recommendation in the *Programme of Combat to the Termites* (Anonymous 2004), the inexistence of financial incentives and educational programmes specifically directed for these sectors of activity, such as for the area of the civil construction, is related to the lack of visible alterations in these areas.. Based on the participation in the previously mentioned workshops, it can only be suspected that some carpentries with more aggressive positions in the market are becoming interested in the subject. However this behaviour was only observed in one of the three most infested islands.

Analogous situation can be perceived by the pest control companies, since as far as we know only two local companies are carrying out termite control using non-specialized termiticides. Since there are already available in the international market more specific products and other solutions more environmentally friendly (see also Borges & Myles 2007), it is clear that the local pest-control companies will need additional training in other technologies. Moreover, there is no record of similar initiatives in the remaining islands.

This unawareness scenario regarding this problem remains unchanged in the sector of the load transport companies, since there is no control or specifications in the exit and entrance of goods and products.

FINAL CONSIDERATIONS

The global transference and the privatization of this public risk seem to characterize, in the generality, the way the society has dismissed itself to face and to control this urban insect pest. Consequently, this natural risk needs an increased social participation in order to set up adequate strategies to solve conflicts, to facilitate dialogue and partnerships among stakeholders and to promote termite risk literacy.

Data shows that the lack of integration among stakeholders is the most obvious barrier to be overcome by the communication devices to implement. Therefore, this project aims to contribute to strengthen social participation in order to increase social efficacy in this pest governance.

REFERENCES

Almeida, J.F. (Ed.). 2004. Os Portugueses e o Ambiente – Resultados do II Inquérito Nacional. Oeiras: Celta Editora.

Almeida, J.F. (Ed.), Lima, AV, Nave, JG, Casanova, JL, Schmidt, L. 1997. *I Inquérito nacional - Os portugueses e o ambiente*. Resumo 2001. Lisboa: OBSERVA - Ambiente, Sociedade e Opinião Pública.

Anonymous 2004. Grupo de Missão para Estabelecer um Programa de Combate às Térmitas nos Açores - *Programa de Combate às Térmitas nos Açores*. Unpublished Report.

Bernardo, F. 1998. Percepção pública de riscos e planos de intervenção. In M. A. Santos & D. S. Silva (eds.), *Risco e gestão de crises em vales a juzante de barragens*. Procedings of a

workshop on risk and emergency, management at downstream valleys of dams held in Lisbon, (pp. 55-75). Lisboa: Nato e LNEC.

Borges, P.A.V., 2007. Introdução. In: P.A.V. Borges & T. Myles (Eds.), *Térmitas dos Açores.*. Lisboa: Princípia, pp. 11-14.

Borges, P.A.V., Lopes, D.H., Simões, AM.A., Rodrigues, A.C., Bettencourt, S.C.X. & Myles, T. 2004. *Relatório do Projecto – Determinação da Distribuição e Abundância de Térmitas (Isoptera) nas Habitações do Concelho de Angra do Heroísmo*. Universidade dos Açores, Dep. de Ciências Agrárias.

Borges, P.A.V. & Myles, T.G. 2007. *Térmitas dos Açores.* Princípia, Lisboa, 128 pp.

Borges, P.A.V., Myles, T.G., Lopes, D.H., Ferreira, M., Borges, A., Guerreiro, O. & Simões, A. 2007. Estratégias para combate e gestão das térmitas nos Açores, (pp. 112-122). In: P.A.V. Borges & T. Myles (eds.), *Térmitas dos Açores.*, Lisboa: Principia.

Eiser, J. R. & White, M. P. 2006. *A Psychological approach to understanding how trust is built and lost in the context of risk.* In Social Contexts and Responses to Risk Network (SCARR), Working Paper, n.º 12. Disponível em: http://www.kent.ac.uk/scarr/, consultado em 22/5/07.

Ferreira, M., Myles, T.G., Borges, A. Guerreiro, O.& Borges, P.A.V. 2007. Consumo de madeiras e produção de partículas fecais pelas espécies de térmitas açorianas da família *Kalotermitidae*: *Kalotermes flavicollis* e *Cryptotermes brevis*. In: P.A.V. Borges & T. Myles (Eds.), *Térmitas dos Açores,* (pp. 47-61)., Lisboa: Principia..

Fischhoff, B. 1995. Risk perception and communication unplugged: Twenty years of process. *Risk Analysis* **15** (2) 137-145.

Gonçalves, M. E., Delicado, A., Domingues, M. & Raposo, H. 2004. *Novos riscos, tecnologia e ambiente.* Relatório Final, OBSERVA, ISCTE.

Guerreiro, O., Myles, T.G.**,** Ferreira, M., Borges, A. & Borges, P.A.V. 2007. Voo e fundação de colónias nas térmites dos Açores, com ênfase na *Cryptotermes brevis*, (pp. 29-46). In P.A.V. Borges & T. Myles (Eds.), *Térmitas dos Açores.* Princípia, Lisboa.

Kraus, N. N. & Slovic, P. 1988. Taxonomic analysis of perceived risk: modelling individual and group perceptions within homogeneous hazard domains. *Risk Analysis*, **8** (3), 435-455.

Lima, M. L. & Castro, P. 2005. Cultural theory meets the community: Worldviews and local issues. *Journal of Environmental Psychology*, **25**, 23-35.

Lima, M. L. 1998. Factores sociais na percepção de riscos. *Psicologia*,**12**, (1), 11-28.

Lowenstein, G. F., Weber, E. U., Hsee, C. K. & Welch, E. 2001. Risk as feelings. *Psychological Bulletin*, **127** (2), 267-286.

Lupton, D. 1999. *Risk*. New York: Routledge.

Myles, T.G. 2004. *Report on termites in the Azores with emphasis on Cryptotermes brevis and its control*. Unpublished report. July.

Myles, T.G.**,** Borges, P.A.V.**,** Ferreira, M., Guerreiro, O., Borges, A. & Rodrigues, C. (2007). Filogenia, Biogeografia e Ecologia das Térmitas dos Açores, (pp. 15-28).. *In* P.A.V. Borges & T. Myles (Eds.), *Térmitas dos Açores*, Lisboa: Principia.

Renn, O. 2005. *Risk Governance. Towards an integrative approach*, White Paper, n.º 1. Geneve: International Risk Governance Council.

Sjöberg, L. 2000. *Factors in risk perception*. *Risk Analysis*, **20** (1), 1-11.

Slovic, P., Finucane, M., Peters, E. & MacGregor, G. 2004. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Analysis*, **24** (2), 1-12.

Taylor-Gooby, P. 2004. *Psychology, Social Psychology and Risk*. In Social Contexts and Responses to Risk Network (SCARR), Working Paper, n.º 3. Disponível em: http://www.kent.ac.uk/scarr/, consultado em 22/2/07.