



Stakeholder View of Efficient Risk Communication in Contaminated Sites

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Abstract

Environmental risk communication comprises an essential step in the management of contaminated sites. However, in Brazil there are no legal guidelines specifying how this communication should be performed. This research aims to identify the relevant aspects for risk communication in contaminated sites, from the perspective of stakeholders, such as responsible for contaminated sites that performed risk communication, environmental agencies, consultancies, and people affected by risks. The Q-technique was used, a methodology capable of identifying people's point of view and their subjectivities. The Q-set consisted of 67 statements that were judged and organized by 24 individuals in a value matrix, according to the opinion of each respondent, representing a group of actors involved. Five factors were identified representing the view of the research subjects: Factor 1 demonstrates concern about the health of those affected by the risk; factor 2 demonstrates the importance of safe communication, being responsible for the liability responsible for the process; factor 4 is strongly related to the legal issues that permeate the process; factor 5 exposes the concern to communicate aspects directly related to risk. All factors show concern with social factors and the rejection of forms of communication through social networks.

Keywords

Contaminated site • Risk • Q-technique • Environmental remediation • Environmental liability

1 Introduction

Land contamination is a problem in both developed and developing countries. In Brazil, the identification and characterization of contaminated sites are concentrated in the southeast region, in the states of Minas Gerais, Rio de Janeiro and São Paulo, pioneer state in this regard (Araujo 2014). It is noteworthy that there is one nationwide specific legislation for guidance or management of contaminated sites at the national level, the resolution National Council of the Environment No. 420/2009.

Contaminated sites management aims to reduce contamination to levels determined by law as acceptable. One of the activities involved in contaminated land management is risk communication, defined by Di Giulio (2010) as a dynamic process in which all stakeholders are informed about the risks and involved in the decision making. The requirement of risk communication highlights the importance of this activity for the management of contaminated areas. However, there are notable failures in conducting and developing risk communication (Di Giulio et al. 2012). In addition, although risk contamination is required, the national and state regulation do not specify how they should be conducted.

This study investigates what would be successful a risk communication in the perspective of different stakeholders: responsible for contaminated sites; affected or potentially affected by the contamination; consultants working with contaminated sites and regulators.

2 Methodology

The present study consists of qualitative and quantitative research using the literature review and the Q-technique, a specialized methodology for subjectivity analysis. In Q-technique, survey participants are invited to organize statements in a value matrix, according to their point of

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view. The generated data are analyzed through factor analysis. It is noteworthy that this factor analysis methodology seeks patterns in the study situations and not in people, that is, there is an inversion of conventional factor analysis (Couto et al. 2011; Webler et al. 2009).

Initially, a set of statements was defined, known as *concourse*, created from interviews with people related to the management of contaminated areas, as well as bibliographic research. The *concourse* subsidized the selection of statements to be analyzed by the interviewees, the *Q-set*. A *Q-set* should be balanced, appropriate for the study, simple and easy to understand, but comprehensive enough to reflect the full range of *concourse* views so that it is representative (Couto et al. 2011). *Q-set* statements aimed to answer the following question: “Given that risk communication is one of the basic principles of contaminated area management, what statements below represent an efficient risk communication from your point of view?”.

The *Q-set* underwent validation interviews with experts in contaminated sites and/or risk communication. A total of 67 statements were selected and categorized into five analysis groups: (1) communication strategies; (2) transparency of information; (3) economic aspects; (4) legal aspects; (5) environmental, social and human health aspects.

The *Q-set* was printed on 5 cm × 3 cm cards and then plasticized, ensuring greater durability. A matrix of values was made, a diagram with 67 statements divided into 11 columns, each column receiving a value between +5 (indicating greater agreement) and -5 (indicating lower agreement).

The interviews were scheduled by email and performed in person from August 2018 to July 2019. The data generated in the interviews were analysed using the PQMetod® application, following the methodology proposed by Brown (1982).

3 Results

3.1 Participant Profile

Twenty-eight individuals were interviewed between July 2018 and July 2019, three during the validation of the *Q-set* and 24 for data collection. An interview was excluded from the analysis for not following the proposed method. In the final analysis, data collected during the validation stage were excluded. Thus, the *P-set* analyzed was composed of 24 individuals, 12 males and 12 females.

The choice of the number of respondents followed the recommendations of the *Q* methodology, in which few participants are needed. What needs to be broad is the number of statements within the universe of possibilities for the subject addressed. The proportion of three statements for

each individual (3:1) is considered enough for the *Q* technique. This study achieved a proportion of 2.7 statements for each individual, a value within the expected for this technique (Webler et al. 2009).

Individuals comprised four analysis groups: affected or potentially affected by contamination (*G1*), contaminated site consultants (*G2*), responsible for contaminated site (*G3*) and regulators (*G4*). The number of respondents is not equal among the four analysis groups. *G2* was the group with the largest number of respondents—eight in total—followed by *G4* (six individuals), while the other groups had five individuals each. Despite presenting equal numbers of individuals for both sexes, it is noted that there is no uniform distribution by analysis group. The number of respondents per analysis group is shown in Table 1. The three participants in the instrument’s validation were excluded from the final analysis.

3.2 Factors Analysis

Statistical analysis revealed eight factors; however, following significance criteria, five factors were selected for further analysis. Each factor represents a common or very close point of view of a group of individuals, distinct from the others. Thus, from the interpretation of the factors, it is possible to establish the vision of the different groups involved.

Seven individuals did not fit into any of the factors or fell into two or more factors. Interestingly, four individuals in the environmental agency (*G4*) did not fit into any of the factors.

The five selected factors were named as follows: factor 1—understand contamination; factor 2—communicate safely; factor 3—focus on compliance with legislation; factor 4—transparent communication and; factor 5—risk and health. Factors and their respondent information are listed in Table 2.

4 Discussion

Factor 1 is common to four individuals. Only two stakeholder groups identified with this factor: *G2* with one individual and *G3* with three. The individuals who compose this factor considered the amount of resources spent on risk communication as irrelevant, as well as the beginning of communication parallel with the site investigation. They also rejected the availability of printed material as a strategy of communication. However, maintaining a trust relationship between stakeholders, the interest in solving the problems presented, and communicating and minimizing the exposure to contaminants were considered important.

Table 1 Number of participants in this research per analysis group

Analysis group	Number of individuals	Female	Male
Affected or potentially affected by risk (<i>G1</i>)	5	4	1
Contaminated area consultants (<i>G2</i>)	8	2	6
Responsible for contaminated area (<i>G3</i>)	5	4	1
Environmental agency (<i>G4</i>)	6	2	4
Total	24	12	12

Table 2 Individuals' distribution per factor

Factor	Total of individuals	Total of individuals per group			
		<i>G1</i>	<i>G2</i>	<i>G3</i>	<i>G4</i>
1	4	0	1	3	0
2	3	1	1	1	0
3	3	0	2	0	1
4	2	1	1	0	0
5	5	2	2	0	1

Note *G1*—risk-affected group; *G2*—consultants in contaminated areas; *G3*—group of managers and responsible for environmental liabilities; and *G4*—representatives of the environmental agency

Factor 2 represents a common view among three respondents from three distinct analysis groups: *G1*, *G2* and *G3*. Communication with security was considered very important, so mechanisms should be sought to avoid causing panic in those affected. These individuals do not discern the best way to communicate risk, but give preference to face-to-face communication, supported by representatives of stakeholders. The aspects related to the health of those involved were considered unimportant or irrelevant. There is also a relevant concern with the image of the institution that owns the contaminated area.

Factor 3 is composed of three individuals; two individuals distributed in *G2* and one in *G4*. Participants in this factor are very concerned about complying with the current legislation. For this to happen, expert remediation advice, where possible supported by communication specialist, is important. They also consider that the institution holding the liability is responsible for the communication.

There is appreciation of present communication so that a relationship of trust is established between the parties involved. Although they value the relationship of trust between stakeholders, they are not open to dialogue.

Factor 4 is composed of only two individuals from *G4*. Noteworthy in this regard is the concern with transparency of information and the rejection of the adoption of specific rules that guide how communication should occur. Individual communication and the opportunity to express their views on the issue were considered irrelevant. Individuals are interested in analysing risk perception of those affected and pathways of exposure to the contaminant and ways to minimize health risks.

Factor 5 is composed of five respondents from three different analysis groups: *G1* and *G2*, with two individuals, and *G4*, with one individual. The set of individuals that makes up this factor considers it important to communicate aspects directly linked to risk, understanding the current state of risk and which contaminants are present in the area. Also considered important is knowing the time required to reduce the risk to levels considered acceptable, as well as the aspects related to the health of those affected.

The individuals presented different points of view. However, they also shared similarities in some respects. The research subjects did not consider it important to make information available through e-mail and through the institution's website, as well as to provide information to different mass media, such as radio, TV, print and electronic newspapers, and reject communication by social media. However, the adequacy of language to different audiences is of considerable importance, fact that enables the understanding information to individuals who do not specialized in contaminated area.

5 Concluding Remarks

The four stakeholder groups involved in the risk communication process, as already described, have different perspectives about efficient risk communication. This also occurs within the same stakeholder group: The *G1* shares the view on three different factors (factors 2, 3 and 5). However, there is a predominance of factor 5, which shows this group prioritizes health-related aspects related to exposition to risks

from the contaminated area. The *G2* individuals are distributed in all factors, so there is no predominant view for this group of participants. The *G3* comprises two factors (one and two), but there is a predominance with a view represented by factor 1. *G4* is distributed in two factors. However, it is noteworthy that most individuals in *G4* did not fit in a single factor.

Individuals who are more concerned with understanding the risk, that is, how the exposition to risk occur and how to minimize exposure to these risks have greater affinity with factor 1. Factor 2 is composed of individuals who value the safety of risk communication and are concerned about the image of the institution responsible for the contaminated site. The concern with the legal aspects, appreciation presentational communication and the maintenance of trust are characteristics of the individuals that compose factor three. The individuals that compose factor 4 show greater concern with communication transparency and with analysis of the risk perception of those affected. The concern with the health of those involved and aspects directly linked to risk, such as information about contaminants in the site, is a view that represents factor 5. In summary, the views are very different

and not directly related to which group the individual belongs to.

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