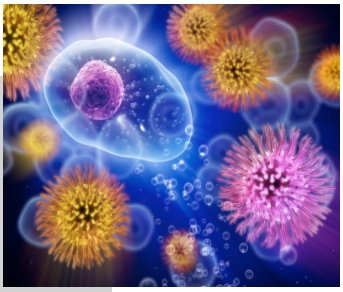
Utrecht University - Faculty of Geosciences

Risk Governance for Infectious Diseases

Analysing the applicability of the IRGC-framework



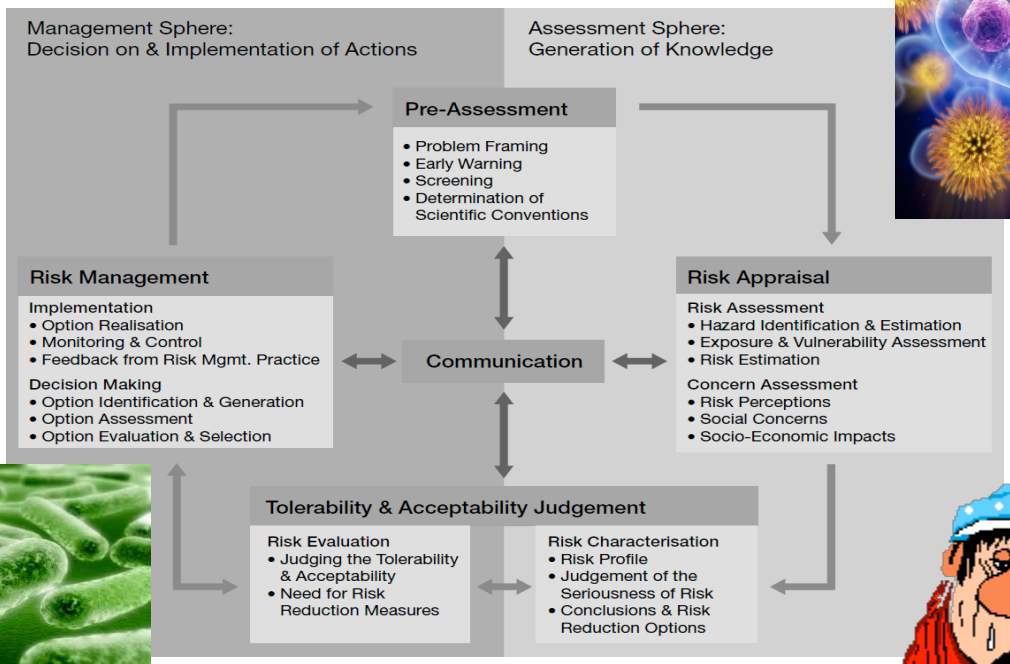


Figure 1: The IRGC-framework
Source: Renn 2005, p.13

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Abstract

The IRGC developed a framework in which it is argued that risks can be categorized according to simple, complex, uncertain and ambiguous risks in the assessment process (Renn 2005). Each risk category comes with a specific risk governance approach, including a differing level of stakeholder participation (thereby taking into account the societal context in which a risk occurs, and the principles of good governance). Although this proposed framework is not empirically tested yet, its aim is (among other things) fostering more effective, efficient and accepted risk governance.
Dutch infectious disease governance seemed to be a good field to test the IRGC-framework because of the increasing belief that risk governance should comprise more than standard risk calculations (RIVM 2003). Furthermore, recent national and international outbreaks (SARS, Influenza A, Q-fever, EHEC) have emphasized the fact that infectious diseases remain a serious risk. Complexity and uncertainty with regard to infectious diseases seem to have increased (due to climatological changes, intensified food production, globalization etc.) and ambiguity with regard to the size or severity of a risk can be a serious issue for infectious disease governance (e.g. Q-fever, Mexican flu, HPV). However, time pressure involved in infectious disease governance is an issue. Therefore, the main research question of this thesis is: *To what extent is the IRGC-framework useful for Dutch infectious disease control and if applied, what is the added value in terms of effectiveness, efficiency and acceptance?*
A qualitative case study analysis was chosen as a means to answer this question. Desk research to two recent infectious disease risks (Q-fever and Schmallenberg Virus) had to reveal absent IRGC-framework steps in the actual risk governance process and served as a means to get an indication of actual effectiveness, efficiency and acceptance. The results of desk research served as a basis for interviews with stakeholders (n=18), who were asked for the feasibility and added value if absent IRGC-steps would have been applied. This study revealed that both Q-fever and SBV showed partial resemblance with the suggested IRGC-approach; some (partly) missing IRGC-ideas could foster the success of Dutch infectious disease governance. The feasibility of appliance of IRGC-elements under time pressure was often questioned, which suggests that urgency adds an extra dimension to risk governance.

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List of general abbreviations

Abbreviation	Dutch	English
EHR	X	Environmental Health Risk
(Ministry of) EL&I	Ministerie van Economische zaken, Landbouw en Innovatie	Dutch Department of Economic Affairs, Agriculture and Innovation
GD	Gezondheids Dienst voor dieren	Animal Health Service
GGD	Gemeentelijke Gezondheidsdienst	Regional Public Health Office
(Ministry of) I&M (previously VROM)	Ministerie van Infrastructuur en Milieu (vroeger: Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer)	Ministry of Infrastructure and Environment (previously: the Dutch Department of Housing, Spatial planning and Environmental Management)
IRGC	X	International Risk Governance Council
LTO	Land- en Tuinbouw Organisatie Nederland	Dutch national agriculture organization
NVWA	Nederlandse Voedsel en Waren Autoriteit	Food and Consumer Safety Authority
PvdD	Partij voor de Dieren	Dutch political party for animal liberation
RIVM	Rijks Instituut voor Volksgezondheid en Milieu	National Institute for Public Health and the Environment
SBV	Schmallenberg Virus	Schmallenberg Virus
(Ministry of) VWS	Ministerie van Volksgezondheid, Welzijn en Sport	Dutch Department of Public Health, Welfare and Sports

List of abbreviations related to RIVM

Abbreviation	Dutch	English	Explanation
CIb	Centrum voor Infectieziektebestrijding	Center for Infectious Disease Control	RIVM CIb. CIb is one of the four sectors of RIVM
DB	Deskundigen Beraad	Expert Meeting	Meeting held at LCI in case of an infectious disease threat
LCI	Landelijke Coördinatie Infectieziektebestrijding	National Coordination Infectious disease control (part of RIVM)	RIVM-CIb-LCI. LCI is one of the six groups within RIVM-CIb
LZO	Laboratorium voor Zoonosen en Omgevingsmicrobiologie	Laboratory for Zoonotic diseases and microbiology	RIVM-CIb-LZO. LZO is one of the six groups within RIVM-CIb
OMT	X	Outbreak Management Team	Meeting held at LCI in case of an infectious disease outbreak
BAO	Bestuurlijk Afstemmings Overleg	X	Meeting held at VWS/EL&I in case of an infectious disease outbreak/threat. Follows an OMT or DB.

List of tables and figures

Glossary

* Deliberation: refers to the idea that indirect stakeholders should be included into the process of decision making (cf. Meadowcroft 2004).

* Discourse: the complex mix of cultural norms, disciplines and rituals– which govern discursive formations (cf. Hajer, 1995).

* Governance: steering of society by not only the government, but also by civil society and businesses. See also paragraph 1.1.2.

* Good governance: it is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law (United Nations 2011). Good governance is an ideal; it is something to strive for while dealing with societal problems.

* Narrative: a story or account of events, experiences, or the like, whether true or fictitious.[1]

* Regime: "principles, norms, rules, and decisionmaking procedures around which actor expectations converge in a given issue-area" (Krasner 1982).

[1] Derived August 6th 2012, from: http://dictionary.reference.com/browse/narrative.
[2] Derived July 27th 2012, from: http://www.businessdictionary.com/definition/risk.html.

1 Introduction

Recent national and international outbreaks (SARS, Influenza A, Q-fever, EHEC) have emphasized the fact that infectious diseases remain a serious risk, despite all the advances in medicine. Also, some outbreaks led to strong (political) discussions about the chosen approach (e.g. Q-fever, et al 2010, Mexican Flu, Bults et al 2010), possibly due to the existence of multiple (differing) legitimate viewpoints concerning the perception and quantification of risk (Renn et al 2011). Both the dynamic character of risk as well as dissatisfaction about risk management gave rise to the increasing belief that risk assessment and management should comprise more than standard mathematical risk calculations (Renn 2005, RIVM 2003, Health Council of the Netherlands 2008, WRR 2008). The International Risk Governance Council (IRGC) has developed a theoretical risk management framework in which risks are categorized and the societal context is taken into account, thereby suggesting a specific approach for each specific risk type. The aim of the IRGC-framework is, among other things, enhancing effectiveness, efficiency and acceptance in risk governance.
This chapter covers background information, starting with an introduction on risk, governance, the IRGC-framework and the risks the IRGC framework covers in paragraph 1.1. Paragraph 1.2 describes an introduction to infectious disease risk governance including the Dutch organizational structure, inherent characteristics and challenges for risk management. Finally, the knowledge gap, aim and main question of this research can be found in paragraph 1.3.

1.1 The need for a more differentiated risk governance approach

1.1.1 An introduction to the concept of risk

Risks are mental constructions which are linked with reality through the experience of actual harm (the consequence of risk). There are many definitions on risk, e.g. “Risk is a state of uncertainty where some of the possibilities involve a loss, injury, catastrophe or other undesirable outcome” (Hubbard 2009, p.80) or “Risk is a probability or threat of a damage, injury, liability, loss, or other negative occurrence that is caused by external or internal vulnerabilities, and that may be neutralized through preemptive action.”[2] The latter definition acknowledges that “the invention of risk as a mental construct is contingent on the belief that human action can prevent harm in advance” (Renn 2005, p.23). The following definition is consistent with how (the concept of) risk is used in Renn (2005): “Risk is uncertainty about and severity of the consequences (or outcomes) of an activity with respect to something that humans value” (Aven and Renn 2009).
Renn et al (2011) have developed a classification of risks, broadly speaking distinguishing between simple and systemic risks. Simple risks imply known outcomes with known probabilities and a known cause of this potential negative outcome. Systemic risks on the other hand are embedded in a larger context of social processes, not confined to national borders or a single sector and not caused by a single factor but multi-causal. According to Renn (2005) systemic risks can be complex, uncertain, ambiguous or a combination of these typologies. Systemic complex risks are risks for which it is “difficult to identify and quantify causal links between a multitude of potential candidates and specific adverse effects” (cf. Renn et al 2011, p.324). Systemic uncertain risks refer to risks for which there is absence or limited knowledge on the probability of occurrence and/or impact (cf. Renn et al 2011). Finally, systemic ambiguous risks refer to the idea that there are different legitimate viewpoints concerning the perception and quantification of risk (ibid).

1.1.2 An introduction to the concept of governance

There is consensus in literature that besides governmental institutions, non-governmental institutions are gaining importance in the public policy field. Much has been written about recent changes and developments of governing styles, and a consequence of these changes is that boundaries between and within public and private sectors have become blurred (Jordan et al 2005). Governance thus refers to the steering of society by not only the government, but also by civil society and businesses.
The outputs of governance do not differ from the outputs of government and are aimed at “creating the conditions for ordered rule and collective action” (Stoker 1998, p.17). The means of governance and

[2] Derived July 27th 2012, from: http://www.businessdictionary.com/definition/risk.html.

government do differ though: "where government is characterized by its ability to make decisions and its capacity to enforce them" (ibid), governance "encompasses public debate, political decision making, policy formation and implementation and complex interactions among public authorities, private businesses and civil society" (Meadowcroft 2007, p.299). Governance is however found to be better suitable for nowadays problems than government (United Nations 2011[3]), because it would lead to societal self-steering (Meadowcroft 2007). Societal self-steering means that all parties (government, business, civil society) "take up the conscious efforts to bring about change" (ibid, p.301).

1.1.3 An introduction to risk governance and the IRGC-framework

Usually government agencies set standards concerning health risks in hierarchical ways and formal public participation was limited or absent, but the public and other stakeholders are increasingly involved in the formulation and implementation of environmental health risk (EHR) policies (Runhaar et al 2009).[4] The reason for the inclusion of participation into EHR policy is creating support and co-responsibility with regard to these risks (Runhaar et al 2009). The shift from government to governance (as described in paragraph 1.1.2) has occurred within the environmental health risk field, and thus one can also speak of infectious disease (risk) governance.[5] Risk governance is defined as "both the institutional structure and the policy process that guide and restrain collective activities of a group, society or international community to regulate, reduce or control risk problems" (Renn et al 2011, p.231) and involves "the 'translation' of the substance and core principles of governance to the context of risk and risk-related decision-making" (Renn 2005, p.22).

Since "good models offer ways to better assess and cope with risks" (Löfstedt and van Asselt 2008, p.77) they are a favoured subject of discussion in scientific literature. According to Löfstedt and van Asselt (2008) a good model is both easily understood as well as reflecting the state of art. This means that a model should simplify reality, but it should not be simplified to the extent that it does not reflect reality anymore. In risk governance literature, there is "no generally accepted model (or framework) for characterising and classifying risk governance regimes" (Runhaar et al 2009, p.332).[6] All frameworks are based on conventional (or classical) risk management including risk analysis, risk management and risk communication. An exception to this is the more normative approach of the IRGC; a framework in which (on top of the conventional elements) elements of *good governance*[7] are included and knowledge with regard to risks is categorized. Each risk category comes with a specific management strategy, risk reduction instruments and stakeholder participation methods. The intent of the IRGC-framework is, among other things, achieving more effective, efficient and acceptable risk governance (Renn 2005).

Figure 2 reflects the reasoning behind the IRGC framework: the preferred risk management (or governance) approach is dependent on the risk type. Also, the risk type determines the level of stakeholder/public participation in which Renn (2005) distinguishes between the following discourses with regard to the management of risk: the *instrumental discourse* is advised when dealing with simple risks. Since the expected results of the risk are considered obvious, most stakeholders would not seek to participate. Involved should be: agency staff, directly affected groups and enforcement personnel. The *epistemological discourse* is advised when complexity has the upper hand in a risk problem. Renn (2005, p.52) advises to let different science camps participate, as well as experts and knowledge carriers; the condition for legitimate participation is bringing new or additional knowledge into the process. Proposed methods are Delphi, Group Delphi and consensus workshops. If a problem is

[3] In particular, the United Nations (2011) plea for *good governance*. See glossary for a definition.
[4] Besides an *actor* shift (from government to government, civil society and business) other changes occurred in environmental health risk (EHR) governance: *objectives* became more differentiated, there is a slight change visible with regard to *knowledge sources* (i.e. a few efforts have been made to reconcile scientific and stakeholder risk perceptions) and risk assessment and management became more integrated (Runhaar et al 2009).
[5] The use of infectious disease *governance* throughout this thesis is thus a recognition of the fact that not only the government, but also other parties within our society (like citizens and business) are increasingly involved into policy making with regard to infectious disease problems.
[6] For a discussion on risk governance models/frameworks, see Löfstedt and van Asselt (2008), Runhaar et al (2009) and Steen and Aven (2009).
[7] For an explanation on *good governance*, see footnote 1.

mainly uncertainty induced, the *reflective discourse* is proposed. Risk managers are advised to include the representatives of main stakeholders and scientists in the evaluation process and ask them to find a consensus on the extra margin of safety in which they would be willing to invest in exchange for avoiding the consequences of a risk. Round tables, open space forums, negotiated rule-making exercises and advisory committees are the operationalization of this discourse. Finally, the *participative discourse* is advised in case of ambiguity induced risks. The process of risk evaluation should be open to public input and new forms of deliberation. Citizen panels, juries, consensus conferences, advisory commissions are among the tools for this discourse (Renn 2005).

Knowledge Characterisation	Management Strategy	Appropriate Instruments	Stakeholder Participation
1 'Simple' risk problems	*Routine-based:* (risk evaluation) (risk reduction)	→ Applying 'traditional' decision-making - Risk-benefit analysis - Risk-risk trade-offs - Trial and error - Technical standards - Economic incentives - Education, labelling, information - Voluntary agreements	Instrumental discoouse
2 Complexity-induced risk problems	*Risk-informed:* (risk agent and causal chain)	→ Setting the 'facts' straight - Expert consensus seeking tools: - Delphi or consensus conferencing - meta analysis - scenario construction, etc. - Results fed into routine operation	Epistemological discourse
	Robustness-focussed: (risk absorbing system)	→ Improving buffer capacity of risk target through: - Additional safety factors - redundancy and diversity in designing safety devices - improving coping capacity - establishing high reliability organisations	
3 Uncertainty-induced risk problems	*Precaution-based:* (risk agent)	→ Using hazard characteristics such as persistence, ubiquity etc. as proxies for risk estimates Tools include: - Containment - ALARA (as low as reasonably achievable) - BACT (best available control technology), etc.	Reflective discourse
	Resilience-focussed: (risk absorbing system)	→ Improving capability to cope with surprises - Diversity of means to accomplish desired benefits - Avoiding high vulnerability - Allowing for flexible responses - Preparedness for adaptation	
4 Ambiguity-induced risk problems	*Discourse-based:*	→ Application of conflict resolution methods for reaching consensus or tolerance for risk evaluation results and management option selection - Integration of stakeholder involvement in reaching closure - Emphasis on communication and social discourse	Participative discourse

Figure 2: Suggested approach for characterising and managing risks by the IRGC
Source: Renn (2005, p.16)

1.1.4 Risks covered by the IRGC framework

According to Renn (2005, p.19) the IRGC-framework "is not covering all risk areas but confines its efforts to (predominantly negatively evaluated) risks that lead to physical consequences in terms of human life, health, and the natural and built environment" (in short: Environmental Health Risks, EHR).

The IRGC-framework places "most attention on risk areas of global relevance which additionally include large-scale effects (including low-probability, high-consequence outcomes), require multiple stakeholder involvement, lack a superior decision-making authority and involve the potential to cause wide-ranging concerns and outrage" (Renn 2005, p.19). Many risks could fit this description but the overview of the sources of risks that potentially fall within the scope of the IRGC-framework are all

associated with exposure to environmental factors. Therefore, one could call these risks Environmental Health Risks (EHR) (cf. Runhaar et al 2009).
EHR are categorized into four categories: physical agents, biological agents, chemical agents and natural forces. For this research a demarcation is made to biological agents causing EHR. Biological agents are "fungi and algae, bacteria, viruses, genetically modified organisms and other pathogens" (Renn 2005, p.20); i.e. living organisms. These biological agents can cause infectious disease risk. For this thesis, a distinction is made between two types of infectious disease risks: *crises and threats*. Although this distinction is arbitrary, crises are recognized by time pressure (an outbreak is occurring), whereas threats are not or to a lesser extent (there are signals for a possible outbreak). Leach et al (2010, p.370) make a similar distinction, arguing that "some disease drivers and effects involve short-term shocks – as in an ecosystem 'switch' that triggers a sudden epidemic outbreak – while others involve longer term trends and stresses."

1.2 The need for a more differentiated approach for infectious disease risk governance

1.2.1 Organizational structure of Dutch infectious disease control

The focus of this research is on Dutch infectious disease control, in which institutions on the regional, national and transnational level are involved (both private and public). Local infectious disease risks are assessed and managed by regional public health offices (GGDs) and RIVM will be involved as or if: 1) soon as the infectious disease risk becomes national, 2) coordination of efforts among stakeholders in different regions or different administrative scales is required or 3) GGDs need support in performing research with regard to source and contact detection of the infectious disease risk.
RIVM organizes and facilitates Outbreak Management Teams (OMT) and Expert Meetings[8] (DB) in case of national infectious disease risks. An OMT can be organized in case of a *crisis* and a DB could be organized in case of a *threat* as defined for this thesis (see paragraph 1.1.4). This distinction however does not necessarily hold true since there is no formal distinction between an OMT or DB. OMT and DB provide the government with scientific advice on the infectious disease (often on biomedical grounds). The advice of the OMT is in turn weighed in a BAO[9] with regard to the managerial feasibility (including economic, political and juridical feasibility). Finally, the BAO advises the minister of VWS. The minister of VWS has decision power at national level or can enforce local action in very specific circumstances. In case of zoonotic infectious diseases, the minister of VWS and the minister of EL&I are both advised by the BAO and need to cooperate and make decisions together.

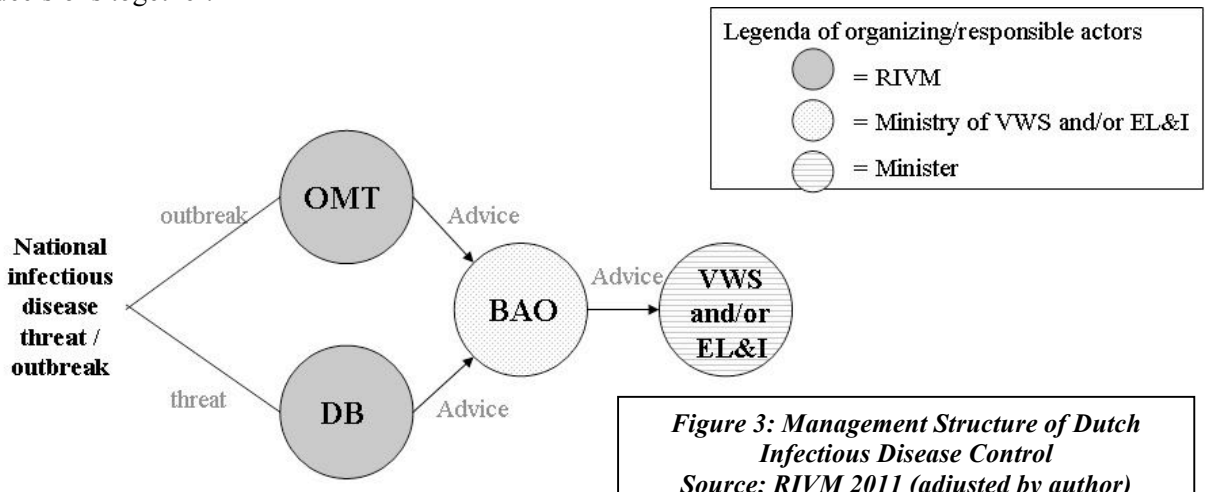

Figure 3: Management Structure of Dutch Infectious Disease Control
Source: RIVM 2011 (adjusted by author)

[8] This is a free translation from the in Dutch so called *Deskundigenberaad*.
[9] BAO stands for *Bestuurlijk Afstemmings Overleg*. The researcher did not find a resembling translation in English and therefore chose to explain the concept in the text. A BAO consists of members carrying formal responsibility for the political and policy consequences of risk management decisions (e.g. the involved mayor(s), the Minister of Health according to the Public Health Act, the health care inspectorate, the food safety authority).

1.2.2 Challenges for infectious disease governance

According to Renn (2005, p.29) complexity, uncertainty and ambiguity are key challenges for risk governance. Complexity, uncertainty and ambiguity refer to the state and quality of knowledge available about risks. There is no commonly used risk classification scheme in scientific literature (yet), but since "the three major challenges (for risk governance, *added*) can best be described using the terms complexity, uncertainty and ambiguity" (Renn 2005, p.29) this classification is also used in this thesis.

Complexity

Emerging infectious diseases can be defined as: "either a new infection that has never appeared before or a known infection that has a recent increase in prevalence" (Hui 2006, p.905). "For an infectious disease to emerge in the human population, something has to change in the ecological balance" (Fineberg and Wilson 2010, p.3). Causes for changes in the ecological balance are: climatologic changes and environmental alterations (Braks and de Roda Husman 2011, Lashley and Durham 2007, King et al 2006), intensified food production (Cavirani 2008; Graham et al 2008, Fineberg and Wilson 2010), changes in the handling and treatment of foodstuffs (Lashley and Durham 2007, King et al 2006). Also mentioned as causes for changes in our ecosystem are globalisation related processes like trade, transport and migration (Van der Giessen et al 2010, Fineberg and Wilson 2010), other social and behavioural changes (King et al 2006 e.g. poverty, hunger, sexual behaviour), advances in (health care technology) (Fineberg and Wilson 2010), demographic factors, microbial evolution, war and/or natural disasters and deliberate release of micro-organisms (Lashley and Durham 2007). Finally, poor governance (King et al 2006) or management of infectious diseases (Chauvenet et al 2011, Pysek and Richardson 2010) can also be a cause for changes in our ecosystem. Thus: human, animal and environmental factors can all contribute to a change in ecological balance, but "particularly relevant are drivers that occur at the intersections of humans, animals and the environment" (Fineberg and Wilson 2010, p.4. See also figure 4).

Besides the fact that the *occurrence* of infectious diseases can be found in multiple causes, the *effects* of (the management of) infectious diseases can also be found in multiple domains: biodiversity (Keesing et al 2010, Mack et al 2000, Stohlgren and Schnase 2006, Pysek and Richardson 2010, Chauvenet et al 2011), economics (Van Dijk et al 2010), social (health). This means that for the governance of infectious disease risk, a balance has to be found between environmental, economic and social interests.

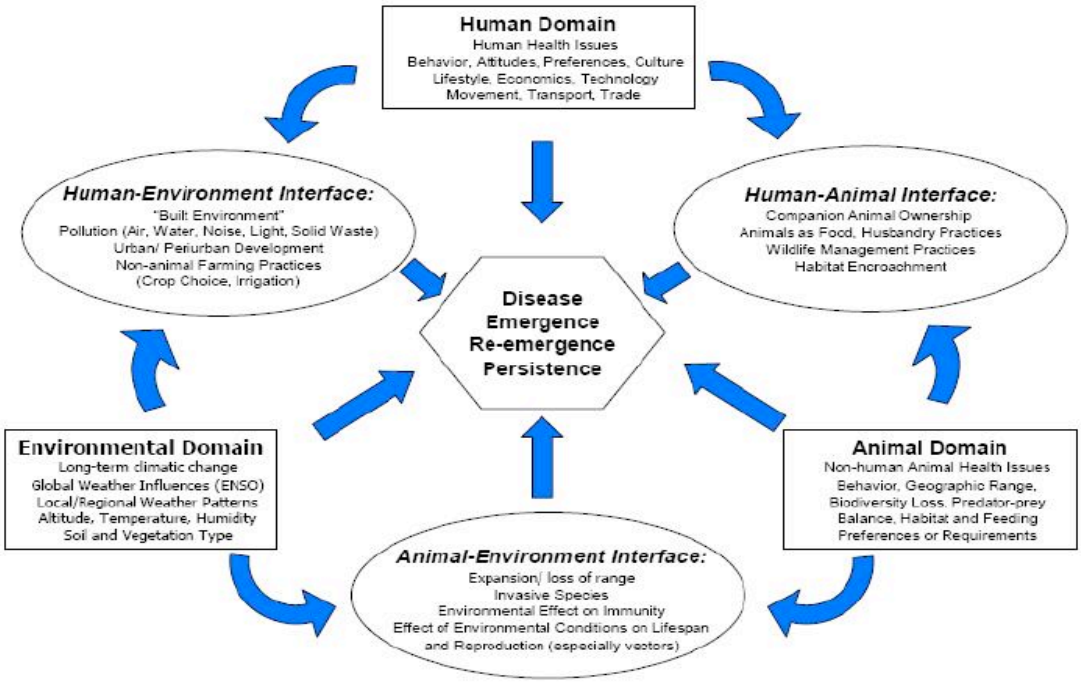

Figure 4: Factors contributing to infectious disease emergence
Source: Fineberg and Wilson (2010, p.4)

Uncertainty

Scientific uncertainties are another challenge for infectious disease governance (Fineberg and Wilson 2010). There is never full knowledge on the source, transmission or infected individuals (not all symptoms of infectious diseases are recognized/notified, see figure 5) and there is never full certainty on the outcome of token measures. However, "scientific knowledge about micro organisms, vectors, and disease is an extremely strong contributor to averting and reducing the effects of emerging infections" (Fineberg and Wilson 2010, p.7). This is acknowledged by RIVM-CIb. Therefore, infectious disease risks are systematically approached by using the transmission flowchart (figure 6), in order to gain knowledge on an infectious disease.

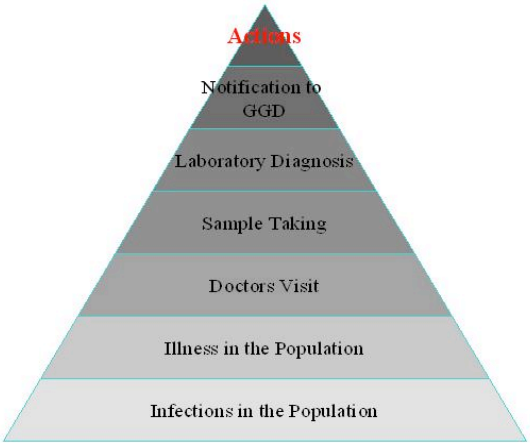

Figure 5 (left): The Infection Pyramid
Source: RIVM

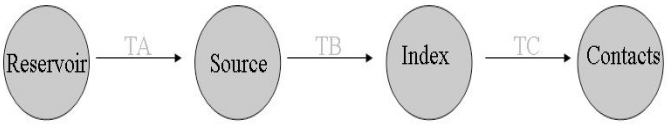

Figure 6 (right): Transmission Flowchart
Source: RIVM

Infectious disease outbreaks always first appear on an individual or local level, and appear either in persons or in animals. The risk assessment and –management process evolves after a first patient or small cluster of patients is recognized, and is a dynamic collaboration of private and public individuals and organizations each having their role and responsibility (sometimes overlapping). Complexity and uncertainty thus seem inherent challenges for infectious disease governance. This is acknowledged by Leach et al (2010, p.370), who argue that: "epidemics implicate a diversity of spatial and temporal scales, because they range from the individual diseased body to the globe and short-term outbreaks interact with longer term predisposing conditions, stresses and drivers."

Ambiguity

As mentioned in paragraph 1.1.1, ambiguity refers to the idea that there are different legitimate viewpoints concerning the perception (normative ambiguity) and quantification (interpretative ambiguity) of risk.[10] Others (Breakwell et al 2001, p.6, Kasperson et al 1988) acknowledge ambiguity being a challenge for risk governance, though frame it in a different way: there is a discrepancy in risk perception between experts and lay man about the magnitude, severity or impacts of the risk.

Interpretative ambiguity can be the result of quantification of risk not always being possible. Assumptions are used as a means to overcome uncertainty, but assumptions introduce subjectivity into risk estimations (RIVM 2003). This in turn can result in differences of opinion about the size or severity of the risk among experts. Needleman (1997, p.265ff) describes five areas of assumption related scientific controversy in environmental epidemiology. First mentioned is the "nature of valid causal inference in science," rooted in the tradition of positivism. It includes linear relations and excludes cumulative environmental exposures. Second, in epidemiology one often works with "average responses to exposure" while certain sub-groups[11] are disproportionally affected by some environmental health risks. This leads to differential susceptibility within exposed populations.[12]

[10] Examples of normative and interpretative ambiguity can be found in Table 1 in paragraph 2.1.
[11] Mentioned are: children, poor people, malnourished adults, people with affected immune systems etc.
[12] The varying susceptibility to risk is also mentioned as a challenge for infectious disease governance in Fineberg and Wilson (2010), although it is framed as a driver of emerging infectious diseases.

Third, epidemiologic data are being collected on individuals as if they were essentially interchangeable units within the study population, without regard to the social structure; i.e. the social context of exposure, disease and health[13] is not taken into account. Fourth, many simplifying assumptions are used which makes it is difficult to capture more subtle (long-term) health effects. Leach et al (2010) frame this in a different way and argue that the focus of infectious disease governance is on achieving stability; i.e. control of short-term shocks.[14] And fifth, in epidemiology there is an emphasis on precise quantitative risk assessments. Needleman (cf. 1997, p.271) argues that the "deeper significance of these controversies should be appreciated and underlying non-empirical assumptions should be made transparent in research."
Normative ambiguity refers to differences in opinion about what can be regarded as tolerable, intolerable or acceptable (cf. Renn 2005) because of ideological or cultural reasons. Fineberg and Wilson (2010) acknowledge conflicts about interests and values as being a challenge for infectious disease governance, because they can influence the response to an infectious disease.

1.2.3 Challenges may lead to risk governance deficits

According to the IRGC, complexity, uncertainty and ambiguity are key challenges that underlie all of the deficits occurring in risk governance. Risk governance deficits are "shortcomings or failures in the identification, assessment, management or communication of risks, which constrain the overall effectiveness of the risk governance process" (IRGC 2009, p.9). A broad distinction is made between governance deficits likely to occur in the risk assessment phase and deficits likely to occur in the management phase. An implicit assumption behind the risk governance deficits is that all IRGC-steps are needed in risk governance. An overview of all risk governance deficits can be found in Appendix 1. In line with Todd (2011), the governance deficits are linked to the five IRGC-steps (See Appendix 2, the main risk governance deficits can also be found in paragraph 2.4).

1.2.4 Consequences of risk governance deficits and challenges

The consequences of the equal treatment of all risks (instead of risk categorization), absence of actor participation and arise of governance deficits are lower efficiency (because of expensive rebound measures), lower effectiveness (irresponsible attenuation of the risk, deadlocks, lock-ins) and acceptancy problems (trade and border conflicts, social amplification of risk, sustained controversy, unintelligible decision making) (cf. Renn et al 2011).
Kasperson et al (1988) in particular describe the consequences of ambiguity challenges: discrepancy in risk perception between experts and lay man about the magnitude, severity or impacts of the risk results in secondary impacts like (among others) enduring mental perceptions, images and attitudes (e.g. stigmatization of an environment or risk manager), local impacts on economic activity, political and social pressure, social disorder and repercussions on social institutions.
The relation between the challenges of infectious disease governance, governance deficits and their direct consequences is not described in many scientific articles. This can be the result of inherent complexity and uncertainty, making it difficult to define direct causal relations. Nevertheless, consequences are recognized (and are likely to relate to the challenges in infectious disease governance). RIVM (2003) for example refer to the erosion of public trust, decreasing risk acceptance and a higher question of guilt of the public to the government. Van Der Weerd et al (2010) measured a decline in public trust in the government during the outbreak of the Influenza A pandemic.

[13] Examples of local context are: local history, cultural values, norms of health behaviour, economic and power relations, availability of health care, social networks etc.
[14] Leach et al (2010) argue that in infectious disease control (in particular with regard to epidemics), a balance is needed in stability, robustness, resilience and durability in order to achieve a sustainable infectious disease control. The focus is on stability at the moment because: 1) eradicating a disease or controlling an epidemic is a powerful way of asserting political authority, 2) routine responses are associated with the property of stability, 3) the dominant disciplines involved in infectious disease governance are mainly short-term focused (biomedicine and epidemiology) and 4) the media support and amplify outbreak narratives.

1.3 Aim of research

1.3.1 Knowledge gap

In 2005 the IRGC-framework was developed (Renn 2005), after which several authors applied it to existing policy problems. Purposes of these researches were to see whether the framework could be improved, to see whether deficits in existing policies could be discovered while using the IRGC-framework (a lessons learned perspective, Tait 2006; Kuenzi and McNeely 2006; Bonneck 2006; Warner North 2006; Knight et al 2008; Okada, Tatano and Takagi 2006) or to see how a further application and development of the IRGC-framework was possible for a particular problem (a prospective and proactive perspective, Roco and Renn 2006). These researches led to recommendations for further testing of the IRGC-framework (Okada, Tatano and Takagi 2006), questions on the intent of the IRGC-framework[15] (Knight et al 2008) and (slight) "modifications of the IRGC-framework"[16] (Renn et al 2011, p.244). The modified framework is applied to non-prescription drugs in Brass et al (2011).[17]

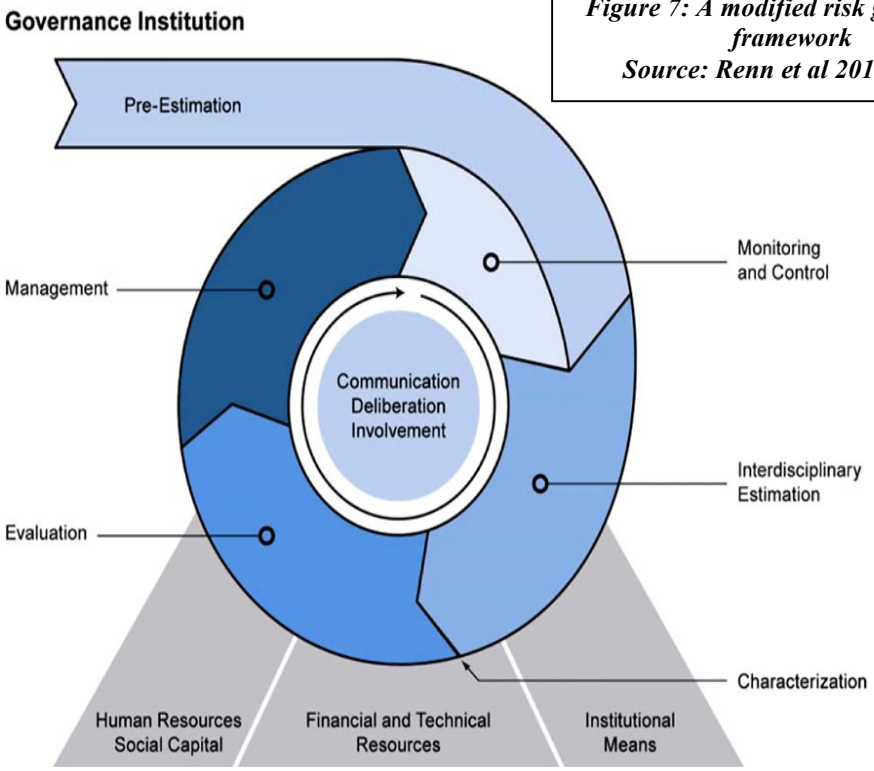

Figure 7: A modified risk governance framework
Source: Renn et al 2011, p.238

Recently, the IRGC has developed a report on governance deficits (IRGC 2009) illustrating the most common deficits in risk governance and it is developing a handbook on how to manage these deficits. Cleeland (2009) did research on the governance deficits arising from the BSE epidemic in the UK and Germany. Aven (2011b) summarized and commented on the main governance deficits and Todd (2011) linked the governance deficits to the IRGC-steps.

Research on risk governance with regard to infectious diseases ranges from a report on the recognition for multiple risk types and practical management (RIVM 2003), to the development of models for outbreak management (Timen 2010), to the development of early warning systems, signaling systems

[15] The authors question whether the purpose of the IRGC-framework is: "1) to develop a risk communication strategy 2) to recommend policy 3) to be a guideline during the policy formation process and/or 4) to develop criteria from which to evaluate policy" (Knight et al 2007, p.32).

[16] Examples of modifications to the IRGC-framework are: the (explicit) emphasis on resource effectiveness, deliberation and involvement. The original IRGC-framework is visible on the front page of this thesis.

[17] This publication was not available at the time of desk research for this thesis.

and guidelines for threats of relevance to both human and veterinary health (Van der Giessen et al 2010, Krommendijk 2011). The only publication within the infectious disease field in which the IRGC-framework is applied, is Todd (2011) who researched Listeria monocytogenes in soft cheese made from unpasteurised milk. Todd (2011) is an elaboration on Knight et al (2008) and concludes that the IRGC-framework is particularly useful for conceptualizing the range of stakeholders throughout the commodity system and their positions towards the risk.[18] Todd (2011) however researched Listeria monocytogenes in retrospective, meaning that it stays questionable whether the IRGC-framework is useful during an outbreak or threat in which time can be scarce. Time scarcity and deliberation (being a time consuming effort) conflict with each other. It is therefore interesting to explore whether the IRGC-framework can be of use for Dutch infectious disease control. Exploratory research revealed no further publications[19] focusing on the operationalization of the IRGC-framework in daily practice of infectious disease control.

1.3.2 Research objective

Resulting from the above, the purpose of this research is to explore whether the IRGC-framework could enhance effective, efficient and accepted risk governance for infectious diseases in the Netherlands. This research thus aims to generate a) descriptive, b) evaluative and c,d) prescriptive knowledge by:

a) describing two infectious disease risks (actual situation) over time in terms of effectiveness, efficiency and acceptance, discover absent IRGC-steps and categorize these risks according to the ideas of the IRGC (simple, complex, uncertain, ambiguous)
b) comparing the actual situation with an hypothetical situation in which the absent IRGC-steps would have been applied (hypothetical situation) and evaluating the outcome on the basis of success criteria (efficiency, effectiveness and acceptance)
c) giving recommendations to RIVM-CIb about the usefulness of the IRGC-framework (steps) for Dutch infectious disease control
d) generalizing the results of this study for further research into risk governance

1.3.3 Research question

To what extent is the IRGC-framework useful for Dutch infectious disease control and if applied, what is the added value in terms of effectiveness, efficiency and acceptance?

In order to be able to answer this research question, several sub-questions were formed:

- 1) How can effectiveness, efficiency and acceptance be defined with regard to infectious disease governance? (paragraph 2.3)
- 2) Why would appliance of the IRGC-framework in theory lead to more effective, efficient and accepted risk governance (for infectious diseases)? (paragraph 2.4)
- 3) What can be said about the effectiveness, efficiency and acceptance of risk governance during two infectious disease risks? (paragraph 4.2 & 5.2)
- 4) How can these two infectious disease risks be categorized (simple, uncertain, complex, ambiguous)? (paragraph 4.3 & 5.3)

[18] Todd (2010, p.1523) elaborates on other advantages of the IRGC-framework: "it makes risk governance more transparent (…) and it incorporatessocial science and public perception approaches (..) in a formal way, identifies inconsistencies across regulations and risk management procedures, probes uncertainty in risk assessment and risk perception data, and offers a broader range of risk management options not currently employed" (Todd 2010, p.1523).

[19] Not (yet) published research was found though: Strachan et al (n.d.) applied the IRGC-framework to E.coli 0157. Telephone contacts with the author made clear that several researches were done (e.g. telephone questionnaires N=1000 and written questionnaires N=1000), after which they were placed into the IRGC-framework. A note of this research can be found on http://www.relu.ac.uk/news/policyandpracticenotes.htm.

- 5) Did actual risk governance match with the IRGC-approach in line with the risk categorization? i.e. Which, if any, suggested IRGC-steps were absent during the two infectious disease risks? (paragraph 4.4 & 5.4)
- 6) When would the absent IRGC-steps hypothetically have been applied? (i.e. what would the hypothetical situation have looked like?) (paragraph 4.5 & 5.5)
- 7) Would appliance of the absent IRGC-steps have been feasible (considering time pressure) and would it have led to higher effectiveness, efficiency and acceptance? (paragraph 4.6, 4.7 & 5.6, 5.7)

In short: this chapter aimed at providing a basic understanding of the concept of risk, governance and the present state of infectious disease governance in the Netherlands. Where scientific literature places the emphasis on a differentiated approach to risk governance based on the various types of risk, in practice often the classical risk approach is used in which there is only one type of risk and participation is limited. According to Renn (2005) the challenges in risk governance can best be categorized using the terms complexity, uncertainty and ambiguity, each accompanied by a specific risk governance strategy (the IRGC-framework). If the recognition of the existence of multiple risk types is absent, risk governance deficits may occur (IRGC 2009). Risk governance deficits result in lower effectiveness, efficiency and acceptance of risk governance. The differentiated IRGC approach is not empirically tested yet: this research therefore aims at exploring whether a fully, more deliberate use of all IRGC-steps could foster the success of infectious disease governance.

2 Theoretical Framework

According to Renn (2005) complexity, uncertainty and ambiguity are key challenges that underlie all of the deficits occurring in risk governance. Paragraph 2.1 elaborates on this by pointing out the differences between the classical versus the differentiated (or IRGC) approach to risk governance. The IRGC-framework is argued to be a means to prevent for risk governance deficits, because it categorizes risk related knowledge (thereby allowing for a more structured, inclusive, precautionary risk estimation and thus enhances effectiveness and efficiency in risk governance) and takes into account the social context by deliberation (thereby taking into account multiple legitimate viewpoints concerning the quantification and perception of a risk, and thus enhances acceptance of risk governance); paragraph 2.2 elaborates on this. In paragraph 2.3 is explained how effectiveness, efficiency and acceptance can be defined with regard to infectious disease governance. Hereby the first sub-question of this research is answered. At the same time, effectiveness, efficiency and acceptance serve as evaluation criteria in order to be able to test the IRGC-framework. In paragraph 2.4 all IRGC-steps are discussed one by one, thereby aiming to theoretically substantiate why all IRGC-steps are essential elements in order to achieve effective, efficient and accepted risk governance. Hereby the second sub-question of this research is answered. Paragraph 2.5 contains the theoretical framework used for this research. This paragraph can be seen as a summary of the former paragraph.

2.1 Reason for the occurrence of risk governance deficits

Aven (cf. 2011a, p.1080) argues that "most of the risk definitions include the following components: A) what can go wrong; also called the initiating events, C) the consequences of these events if they would occur and P) the probabilities of A and C." In short, Risk = (A, C, P). This is referred to as the classical risk approach. The classical risk approach in the Netherlands is recognized by its focus on physical science and quantitative measurements (The Dutch Health Council, in Cramer 2009, p.4).

In the formula above, probability P can be interpreted as a relative frequency, i.e. the relative fraction of times the event occurs if the situation analyzed were hypothetically ''repeated'' an infinite number of times. It is a subjective measure of uncertainty, conditional on the background knowledge (the Bayesian perspective). "Since probability is not considered the only suitable approach for expressing uncertainties," Aven (2011a, p.1081) argues that the above short definition of risk is not inclusive enough. Therefore, the P should be replaced with an U (Uncertainty) in line with the ideas of Aven and Renn (2009).

According to Renn (2005) simple risks can still be determined by (A,C,P), because the three components are known. In other words: "the number of predicted events is frequent and the causal chain is obvious, meaning that validation is simple and straightforward" (Renn 2005, p.29).[20] For many risks, the number of predicted events or the causal chain are not obvious; therefore it is argued that a categorization is needed in order to clarify which knowledge is missing (and thus still needed). Since "a growing number[21] of scientists argue that the field's traditional epistemological assumptions provide a conceptual framework too limited for detecting, analyzing and controlling environmental

[20] An example of simple risks are car accidents.

[21] Needleman refers to the following nine authors: 1) Susser M. Choosing a future for epidemiology. II. From black box to Chinese boxes and eco-epidemiology. Am J Public Health 1996;86:674-7. 2) Silbergeld EK. Evaluating the success of environmental health programs in protecting the public's health. In: Andrews JS, Frumkin H, Johnson BL, Mehlman MA, Xintaras C, Bucsela JA, editors. Hazardous waste and public health: international congress on the health effects of hazardous waste. Princeton (NJ): Princeton Scientific; 1994:43-4. 3) Davis D, Miller Poore L. Policy issues in environmental epidemiology: making the connection between exposure and human disease. In: Andrews JS, Frumkin H, Johnson BL, Mehlman MA, Xintaras C, Bucsela JA, editors. Hazardous waste and public health: international congress on the health effects of hazardous waste. Princeton (NJ): Princeton Scientific; 1994:33-42. 4) Pearce N. Traditional epidemiology, modern epidemiology, and public health. Am J Public Health 1996;86:678-83. 5) Schwartz S. The fallacy of the ecological fallacy: the potential misuse of a concept and the consequences. Am J Public Health 1994;84:819-24. 6) Oppenheimer GM. Comment: epidemiology and the liberal arts--toward a new paradigm? Am J Public Health 1995;85:918-20. 7) Wing S. Limits of epidemiology. Physicians Soc Respons Q 1994;1:74-86. 8) Finkel AM, Golding D. Alternative paradigms: comparative risk is not the only model. EPA J 1993;1:50-2. 9) Locke R And ne'er the twain shall meet? Public health and ecology in the evolution of environmental programs. American Public Health Association Annual Meeting; 1996 Nov 17-21; New York.

causes of disease" (Needleman, 1997, p.262), the categorization of risk might also be needed for infectious disease governance.

Table 1: Categorization of risk related knowledge
Source: Renn 2005, p.29-31

(Knowledge) challenges in risk governance categorized	**Description**	**How to recognize?**	**Examples**
Complexity	Risks for which it is difficult to quantify causal links between a multitude of potential causal agents and specific observed effects	- long delay periods - interactive effects among agents - intervening variables	Risks of critical loads to sensitive ecosystems
Uncertainty	Results from an incomplete or inadequate reduction of complexity in modelling cause-effect chains	- target variability - systematic/random error in modelling - indeterminacy or genuine stochastic effects - system boundaries - ignorance or non-knowledge	Earthquakes, long term effects of the introduction of genetically modified organisms
Ambiguity	Result of divergent or contested perspectives on the justification, severity or wider meanings associated with a given threat (Stirling 2003 in Renn 2005)	- interpretative ambiguity (different interpretation of an identical assessment) - normative ambiguity (different concepts of what can be regarded as tolerable, like ethics, quality of life etc.)	Interpretative: food supplements, hormone treatment of cattle. Normative: passive smoking, nuclear power.

2.2 IRGC as a means to prevent for risk governance deficits

The classical risk management approach involves three components: risk assessment, management and communication (Renn et al 2011). This in contrast to the IRGC-approach, which comprises three additional components: risk pre-assessment, risk perception and risk characterization/evaluation. Furthermore, the IRGC extends risk communication by advocating stakeholder participation; risk communication should be two-way. The intent of the additional components is a stimulation of effectiveness (because of more inclusive risk estimations), efficiency (because of effective use of resources) and acceptance (because of inclusion of stakeholders). The main hypothesis of this research thus is: ***The explicit appliance of the IRGC-framework will result in more effective, efficient and accepted risk governance.***

According to Renn (2005, p.12), the IRGC-framework offers "two major innovations to the risk field: 1) the inclusion of the societal context and 2) a new categorization of risk-related knowledge." The first innovation refers to the fact that the IRGC-framework includes the structure and interplay of different actors dealing with risks, stakeholders' differing perception of risks and likely consequences of these risks. Furthermore, the IRGC-framework takes into account the socio-political impacts prevalent within the organizations involved in the risk governance process, the regulatory style, the organizational imperatives and the capacity needed for effective risk governance. The second innovation refers to the fact that within the IRGC-framework, a categorization of risk is made within four categories: risks can be simple, complex, ambiguous, or uncertain. For each category, a strategy for appropriate risk assessment, risk management and the level and form of stakeholder involvement is suggested. The two innovations of the IRGC-framework are based on the following assumptions (Renn 2005, p.12):

1) Both factual and socio-cultural knowledge are needed in order to produce adequate decisions and results

2) Inclusiveness (early/meaningful participation of stakeholders) is needed to ensure the tackling of risks in a sustainable and acceptable manner
3) The principles of good governance should be included in risk governance

2.3 How can the IRGC-framework be tested?

"Success criteria are essential for evaluative research" (Verschuren and Doorewaard 1999, p.78), because one can only assign value or judge a public health program if one knows what is considered successful (CDC 1999). The success criteria used for the evaluative part of this research are: effectiveness, efficiency and acceptance. The choice for these success (outcome) criteria is arbitrary,[22] but based on scientific literature (Stirling and Scoones 2009, Leach et al 2010, Thacker et al 1988[23] and CDC 1999). Because of the low number of scientific articles on success criteria within infectious disease governance, small interviews with experts are used as an additional source.[24]

* ***Effectiveness*** refers to "the degree to which objectives are achieved and the extent to which targeted problems are solved."[25] On the short term, this variable refers to reducing the number of (human) infections as a result from zoonotic diseases and on the long term, this variable refers to reducing the scientific risk for zoonotic diseases (resulting in a lower number of sick persons, cf. RIVM 2011). This criteria resembles the usefulness criteria of Thacker et al (1988): a surveillance system is useful if it generates a public health response leading to the control and prevention of adverse health events or to a better understanding of the process leading to an adverse outcome. Effectiveness on the short term (control) as well as on the long term (prevention) relates to sustainability because the short term (reducing the number of sick persons) as well ass the long term (reducing the risk for a zoonotic disease) are taken into account. Leach et al (2010, p.371) acknowledge this: "In the case of epidemics, sustainability may be defined in terms of sustaining the health of global populations in the face of disease outbreaks." Infectious disease control is aimed at response measures: these are interventions to prevent from transmission (see TA, TB or TC in figure 6). In other words: in order to arrive at an effective outcome (as defined above), response (or intervention) measures may be needed.

* ***Efficiency*** refers to the optimal use of resources. Not only efficiency refers to cost (both direct and indirect, Thacker et al 1988) or cost-effectiveness (CDC 1999), it also refers to time. Efficiency is related to effectiveness in the sense that if timely, all possible intervention options are pointed out, there might be a higher chance on effective prevention or control of an infectious disease.

* ***Acceptability*** refers to the satisfaction about to response measures decided upon by risk managers. Stakeholders have faith in risk managers and support their decisions.

2.4 Why all IRGC-steps are needed for a more effective, efficient and accepted outcome

The assumptions behind the IRGC-framework (as mentioned at the end of section 2.2) are integrated into the five steps of the IRGC-framework. Each IRGC-step is separately elaborated on in this

[22] "There remain important differences of opinion as to what should be taken into account in an assessment, how various parameters ought to be measured and what weight should be attached to particular aspects of the evaluation" (Sewel et al 1979, p.346).
[23] Thacker et al (1988) write about systems of epidemiological surveillance. This means that the article is more specific than the other articles and the criteria have a limited relevance for this study. Because of the low number of articles on the topic, it is however taken into account.
[24] Five risk assessors and eight risk managers were asked 1) what they considered a successful advice (of risk assessors to risk managers) and 2) what they considered a successful policy outcome. Only the answers to the second question are used for determination of the success criteria for this research since both risk assessment and risk management are part of the IRGC-framework. The researcher acknowledges that for a proper overview of what is considered a successful infectious disease policy, more (and more diverse) stakeholders should be asked for their opinion. Time limitations and the intent of this small exploration (the 30 minute interviews were meant to give an *indication* of what was considered a successful policy outcome) refrained the researcher from doing this. An overview of all success criteria from the 30-minute interviews can be found in Appendix 3.
[25] http://www.encyclo.nl/ and http://www.businessdictionary.com

paragraph, since the theory behind the framework is extended. One should keep in mind though that the five IRGC-steps should not be seen as sequential steps but rather as closely interlinked elements (cf. Renn 2005, p.26).
For each IRGC-step, first a list is made of all components (or sub-steps) this IRGC-step contains. Second is explained what the IRGC-step serves for. An elaboration on what the sub-steps mean follows, and possibly an adjustment to infectious disease governance is made. Direct causal relations between an IRGC-step and one of the outcome variables (effectiveness, efficiency and acceptance) do not necessarily exist (which can be due to the fact that risk governance is an iterative process). Nevertheless, an attempt is done to link all IRGC-steps (and sub-steps) to the outcome variables effectiveness, efficiency and acceptance. Finally, for each IRGC-step the governance deficits linked to this particular step are mentioned.[26]
It seems that for all systemic risks (complex, uncertain, ambiguous) all IRGC-steps should be completed, though with a differing level of intensity (i.e. stakeholder participation). The level of stakeholder participation (or deliberation) within the process, is dependent on the categorization of the risk (see figure 8).

Figure 8: The Risk Escalator and Stakeholder involvement
Source: Renn 2005, p.53

		Risk Balancing Necessary + Probabilistic Risk Modelling	*Risk Trade-off Analysis & Deliberation necessary* + Risk Balancing + Probabilistic Risk Modelling
	Probabilistic Risk Modelling	Remedy	Remedy
	Remedy	• Cognitive • Evaluative	• Cognitive • Evaluative • Normative
Statistical Risk Analysis	Cognitive	Type of Conflict	Type of Conflict

Remedy	Type of Conflict	• Agency Staff
		• External Experts
		• Stakeholders
		  • Industry
		  • Directly affected groups
			• Agency Staff
			• External Experts
			• Stakeholders
			  • Industry
			  • Directly affected groups
			  • General public

Agency Staff	• Agency Staff • External Experts	Actors	Actors
Actors	Actors	Reflective	Participative
Instrumental	Epistemological	Type of Discourse	Type of Discourse
Type of Discourse	Type of Discourse	Uncertainty induced	Ambiguity induced
Simple	Complexity induced	Risk Problem	Risk Problem
Risk Problem	Risk Problem		
Function:	Allocation of risks to one or several of the four routes		
Type of Discourse:	Design discourse		
Participants:	A team of risk and concern assessors, risk managers, stakeholders and representatives of related agencies		

2.4.1 Risk pre-assessment (IRGC-step 1)

Risk pre-assessment consists of *research to framing, early warning, screening and selection of conventions and procedural rules*. IRGC-step 1 serves to bring clarification on the risk itself, the dimension of the risk and the involved stakeholders. Also, probable different opinions on the risk should be mapped out. Finally, the organizational capability of stakeholders and current systems should be explored on their strengths and limitations. Although IRGC-step 1 consists of four elements, Renn (2005) pays most attention to *framing*. It is therefore assumed that framing is the most important element of risk pre-assessment, most attention is therefore paid to this sub-step in this thesis (in line with Renn 2005 and Renn et al 2011).

[26] The allocation of deficits to a particular IRGC-step is mainly based on Todd (2011). If not, referred is to the original source (IRGC 2009).

"A systematic review of risk-related actions needs to start with an analysis of what major societal actors[27] select as risks and what types of problems are labelled as risk problems" (Renn 2005, p.24). This is called *framing*: what person A perceives as a risk problem, does not necessarily count as a risk problem for person B. Only if stakeholders agree on an underlying goal (e.g. guarding of public health) *and* stakeholders agree on whether and to what extent the risk influences this goal, acceptation evolves about what requires consideration as a relevant risk (cf. Renn 2005, p.25). This may sound straightforward, but agreement on a goal (also within infectious disease governance) cannot be taken for granted since multiple values influence a risk problem debate.[28] Framing (of risks) both happens deliberately and unintentionally. According to Entman (1993, p.52) framing means that "aspects of a perceived reality are (deliberately) selected in order to promote a particular problem definition, causal interpretation, moral evaluation or treatment recommendation for the item described." Fully developed frames have the following elements: problem definition, causal analysis, moral judgment and a remedy promotion (Entman 1993).

One can think of problem frames as worldviews: some worldviews have become common in society or within organizations, making it difficult to think outside of the worldview or realize change. Nevertheless, the understanding and evaluation of the existence of multiple worldviews, stimulates mutual understanding, system understanding and sustainable progress (cf. Van Egmond and De Vries 2011).[29] If one particular worldview prevails over a long time, the worldview will become a scenario. This is acknowledged by Leach et al (2010) with regard to infectious disease governance. Leach et al (2010, p.371f) argue that framing practices within infectious disease governance became a 'habit':[30] "despite the prevailing complexity in disease dynamics, epidemic governance approaches tend to be selective in terms of framing." The framing of emerging infectious diseases involves "a contamination approach to understand and address epidemics – focused on disease transmission – rather than a configuration explanation emphasizing disease context" (cf. Leach et al 2010, p.372).[31] Particular system framings often become part of narratives about a problem or issue; "narratives therefore suggest and justify particular kinds of action, strategy and intervention" (Leach et al 2010, p.371). The authors acknowledge the goods of this strategy, but emphasize the fact that critical elements of system dynamics and goals are missed out on. Also, Leach et al (2010) argue that alternative narratives which suggest different solutions are forgotten. Research to framing allows people to move "beyond the "outbreak narratives" offered by veterinarians, public-health professionals, and emergency response agencies. Alternative policy narratives may emerge based on different framings of problems and solutions" (Stirling and Scoones 2009, no page nr.). Research to framing might thus lead to a broader variety of measures, ultimately resulting in more *effective* risk governance.

A deficit likely to occur with regard to framing is different stakeholders having conflicting views on the risk issue (Todd 2011), conflicting views may lead to less *efficient* risk governance (especially if not recognized). The aim of studying frames is mutual understanding (Entman 1993, Renn et al 2011, Lechuga et al 2011) "and leads to *acceptance* of a risk policy" (cf. Renn 2005, p.24). Renn (2005) and Renn et al (2011) emphasize on the importance of research to framing, but both articles do not include an explanation on the operationalization of research to framing.[32]

Early warning and monitoring establishes whether signals of the risk exist that would indicate its realization (i.e. monitoring the environment for signals of risks). Early warning and monitoring comprises "data collection, data interpretation and communication between those looking for early signs and those acting upon them" (cf. Renn 2005, p.24); since rapid action is needed in case of an

[27] Governments, companies, scientific communities and the general public.
[28] See for example Oppers (2010) for the multiple values involved in the Q-fever risk debate.
[29] "It is concluded that sustainability problems occur as soon as value orientations (from a particular worldview) become too much one-sided."
[30] The authors refer to this as a particular framing becoming part of a narrative.
[31] The authors argue that goals are defined in terms of business validity and impacts on human mortality and national economies; i.e. politics and power prevail.
[32] Nevertheless, since Q-fever was recognized by conflicts in values and interests, the researcher attempted to operationalize research to framing by using the four elements of a fully developed frame as recognized by Entman (1993): problem definition, causal analysis, moral judgment and a remedy promotion. At least four problem frames were identified by doing desk research: these can be found in paragraph 4.3.1.

infectious disease outbreak and threats can be observed by data collection, early warning and monitoring are essential for *effective* risk governance. *Screening* refers to the fact that there are many possible policy options for intervention, but it is impossible to take them all into account (cf. Renn et al 2011). Screening should make clear which risks are worthwhile to focus a policy on, and "risks should be allocated to different assessment and management routes" (Renn 2005, p.25) in order to foster *efficient* risk governance. Screening could also include the first allocation of a risk into the category simple, complex, uncertain or ambiguous. Deficits likely to occur in the early warning and screening of risks are: signals of a known risk have not been detected or recognized, or the risk is perceived as having only local consequences when it may in fact be much broader and no awareness by the managers of a hazard or possible risk (Todd 2011). *Selection of conventions and procedural rules* needed for a comprehensive scientific appraisal of the risk is a final "major component" of IRGC-step 1 (Renn 2005, p.25). Awareness and knowledge on this selection can lead to "a more cautious apprehension of what assessments mean and imply, but also better understanding of the constraints and conditions under which the results of the assessments hold true" (Renn 2005, p.25). A selection of conventions is unavoidable (and does not necessarily discredit the validity of the results), yet it is essential for stakeholders to be informed about these conventions and understand their rationale (ibid); it is thus implicitly argued that this sub-step mainly serves to foster *acceptance* in risk governance. The selection of conventions is not mentioned or elaborated on in Renn et al (2011). A deficit likely to occur might be over- or under reliance on models (IRGC 2009).

#	Hypotheses for risk pre-assessment
H1a	*Research to how an infectious disease risk is framed, provides insight into how stakeholders approach a risk. This leads to mutual understanding which contributes to acceptance and efficiency (in case there are conflicts of values) in infectious disease governance.*
H1b	*Acknowledgement on the existence of multiple frames and ones own constraints, contributes to effectiveness, efficiency and acceptance.*

2.4.2 Interdisciplinary (risk) estimation (IRGC-step 2)

Interdisciplinary (risk) estimation consists of *risk assessment* and *concern assessment* and serves to make a both a scientific and perceived estimation on the size or severity of a risk. *Risk assessment* means that the best estimate is made of the potential harm. According to Renn (2005) risk assessment goes beyond an estimation of (A, C, P) (see paragraph 2.1) since this risk approach is too simple and does not cover new challenges inherent in many risks the world faces nowadays (Renn 2005). New challenges refer to a "broadening of the scope of events, the addressing of risks on a more integrated and aggregated level, sensibility ranges and integrating risk assessment in a comprehensive technology assessment or option appraisal" (cf. Renn 2005, p.28). Categorized, the challenges of risk assessment can best be described using the terms 'complexity', 'uncertainty' and 'ambiguity' (ibid), and help in over viewing the state and quality of knowledge available about a risk thereby leading to more *effective* and *efficient* risk governance because a more inclusive risk estimation can be made. A more inclusive risk estimation might also lead to higher *acceptance*, since the choice for a certain measure can be better argumented.

King et al (2006, p.1393) mention specific challenges with regard to risk governance for infectious diseases: "a better understanding of patterns of disease" and "quantification of (causal) relations" should be achieved. Also, "new technologies should be used more effectively." In order to achieve this, the "fostering of interdisciplinary approaches to infectious disease that transcend traditional intellectual boundaries is needed" (ibid). Environmental, social-economic and human health experts should be included in risk assessment (IRGC 2008). With regard to infectious disease governance, referred is to the following disciplines (in addition to medics): statisticists, mathematicists, anthropologists, climatologists (King et al 2006). Hoeijmakers et al (2007, p.114) argue that a problem analysis or effects of a proposed solution in many health problems "requires the consultation of various specialists, resulting in the increasing participation in public policy-making of actors outside the government and in mutual interdependency." Hereby Hoeijmakers et al (2007) acknowledge both the need for multi-disciplinarity as well as deliberation.

#	Hypotheses for risk assessment
H2a	*The categorization of systemic risks into the categories uncertain, ambiguous and complex can help clarify the knowledge available and missing. This makes it possible to make a more inclusive risk estimation and thus contributes to effective, efficient and accepted risk governance.*
H2b	*Multiple disciplines should be involved into a risk assessment in case of systemic risks, because this fosters a systems view on the risk (leading to both short- and long term effectiveness).*

Concern assessment refers to public perception about the risk. "Different scientific disciplines, different stakeholders, and representatives of civil society as well as the general public, all have formed their own concepts of risk driven by interest and experience" (cf. Renn 2005, p.31). Because it is primarily perceptions of risk, not actual risk that determines how people respond to hazards (Glik 2007, Renn 2005), the inclusion of concern assessment into risk governance is important. According to Drijver and Woudenberg (1999, p.864) "experts and people who feel threatened themselves judge a risky situation differently, because they judge the same situation on the basis of different factors." Table 2 below shows important factors influencing risk perception of the public.[33] Table 2 contains factors influencing risk perception from various articles, and might be useful for getting a general impression on risk perception with regard to a particular infectious disease risk.[34] Renn et al (2011, p.239) recommend "survey methods, focus groups, econometric analysis, macro-economic modeling, or structured hearings with stakeholders" as a means to operationalize a concern assessment.

Table 2: Determining factors of risk perception for the general public

*Sources: *Drijver et al (1999, p.864),* **Woudenberg and Kuijper (1995, p.12), ^ Kunreuter and Heal (2003 in Renn2005, p.32), ^^ Kahneman and Tversky (1979 in Renn 2005, p.33)[1], ~ Renn (2005, p.33), *** Smith 2003, p.3115

Aspect	Makes More Afraid	Makes Less Afraid
Assumed Controllability*/***	Low	High
Voluntariness*	Low	High
Advantages of the activity*	Few	Many
Origin*	Industry	Nature
Catastophic Potential*/^^/***	High	Low
Trust in responsible authorities*/***	Low	High
Openness in responsible authorities*/***	Little	Much
Attention in the media **/***	- Much media attention - Conflicting messages	- Low media attention - Unified messages
Association with a specific dreadful event^	Yes	No
Losses from risk sources are ~	Not constant, not similar, uncertain	Constant, similar, certain
Perceived susceptibility to an infectious disease risk***	- if comes from a nationally consumed product - if transmission is direct	unavailable

The treatment of the *results* of a concern assessment are subject of discussion in scientific literature: where some argue for equal treatment of risk assessment and concern assessment results, others plea

[33] In their shortlist of important factors, Drijver and Woudenberg (1999) excluded the factor expected annual mortality or morbidity. This is due to their claim that several studies (National Research Council 1989 and Hance et al 1990) have proven that lay people's risk perception is only slightly determined by this.
[34] It therefore might also serve as a means to operationalize framing on a particular infectious disease risk.

for an approach in which scientific risk estimations are decisive. The equal treatment of risk assessment and concern assessment results is favoured by Liberatore and Funtowicz (2003, in Renn 2005, p.33) who argue that "there is no overarching universally applicable quality criterion available in order to evaluate the appropriateness or validity of risk concepts. Scientific risk concepts should therefore compete with concepts of stakeholders and public groups." On the other hand of the spectrum is argued that "scientific concepts of risk are the only ones that can claim inter-subjective validity and applicability and therefore requires risk managers to obtain an assurance that erroneous risk perceptions are corrected via risk communication and education" (Cross 1998 and Coglianese 1999 in Renn 2005, p.33). Renn (cf. 2005, p.34) seems to take the middle way: a concern assessment is important but "those who have the knowledge, skills and/or experience to measure or estimate the strength of relationships between cause and effect should not have equal standing to lay men." In line with this argument, Helsloot et al (2010) argue that scientific knowledge should be decisive in risk management. The discussion on the treatment of the results of a concern assessment versus risk assessment, seems to resemble an ethical discussion and is related to the discussions on deliberative democracy (Meadowcroft 2004). The plea for the inclusion of a concern assessment into risk governance, must therefore be based on the advantages of deliberation: deliberation leads to a higher level of acceptance, is more effective in coping with conflicts, is bottom-up and thereby easier *accepted* by citizens and is more reflexive on the system (cf. Dryzek 2009). Deliberation can help provide an "understanding of the consideration of needs, expectations, capabilities and sensitivities of end users and other stakeholders" (cf. King et al 2006, p.1393). In other words: risk perception research can help providing decision makers with a better view on values and emotions (IRGC 2008). If decision makers are willing to do something with this, it can result in better anticipation of stakeholders response to a certain risk (cf. Slovic 2000, cf. Bults et al 2010), leading to *acceptance* of risk governance (cf. Meadowcroft 2004). Deliberation can furthermore "educate citizens through mutual understanding and gaining insight into the complexity of political judgement" (Meadowcroft 2004, p.3). A higher willingness of citizens to cooperate is the result (Smith 2003), which is essential for *effective* infectious disease governance (as explained in paragraph 1.2.3).[35] Shortly argued: "risk perceptions influence the efficacy of risk reduction strategies" (Williams et al 2010).
Deficits that are likely to occur in the interdisciplinary risk estimation phase (so both in risk assessment as in concern assessment) are: lack of scientific data about the risk and/or about people's concerns, or if there is sufficient information there is a failure to accept it, there is a low confidence level in the data used; the modeling approach or the interpretation of the model's results, lack of understanding or attention to the potential interactions between the different actors and between actors and the risk target and inadequate attention is given to the concerns of stakeholders (Todd 2011).

#	Hypothesis for concern assessment
H2c	*Concern assessment should be integrated in risk governance of systemic risks because it leads to mutual understanding (and acceptance), resulting in a higher willingness to cooperate (and thus effectiveness).*

2.4.3 Risk characterization and evaluation (IRGC-step 3)

Risk characterization and evaluation combined refer to the qualification of risks in terms of acceptability and tolerability. "Risk characterization refers to the evidence-based components for the judgment on acceptability/tolerability, risk evaluation refers to the value-based component" (cf. Renn 2005, p.39). For characterization an interdisciplinary team of scientists is needed (agency staff and external experts), for evaluation all stakeholders.
Risks are acceptable in case they are considered low or non-existing (Bouder et al 2007); in this case risk reduction is not necessary (IRGC 2008). Risks are considered tolerable if the advantages outweigh the disadvantages (Bouder et al 2007); they can be pursued because of its benefits and availability of risk reduction measures (IRGC 2008). A difficulty is how, where and by whom is the line drawn of a risk being acceptable/non-acceptable or tolerable/non tolerable and another. Another difficulty is that

[35] Another advantage of deliberation is the following: "it can enhance the quality of political decisions, because they will be substantively fairer, more adequately reflect collectively and rationally determined goals, and/or more successfully deploy appropriate means to secure these goals" (Meadowcroft 2004, p.3).

both acceptability as tolerability are non-static; i.e. they can change over time. According to Renn (2005, p.37), both the results from the risk assessment and the results from the concern assessment are needed for the judgment on acceptability/tolerability, because they rely on both values and evidence.
Who (which stakeholders, i.e. the level of participation) performs the acceptability/tolerability judgment, is determined by the type of risk. Either should be opted for an instrumental (simple), epistemological (complex), reflective (uncertain) or participative (ambiguity) discourse. This means that if simplicity is the main characterization, the acceptability/tolerability judgment should be done according to standard procedure. If complexity is the main risk characterization, the acceptability/tolerability judgment should be done by the risk assessment team (in this case: RIVM and external experts). If uncertainty dominates, resulting in diverse interpretations for society, risk managers should perform the acceptability/tolerability judgment (in this case: VWS, external experts, stakeholders). In case of ambiguity, there are three possible results: a) ambiguity on evidence but not on values (interpretative ambiguity), b) ambiguity on values but not on evidence (normative ambiguity) and c) ambiguities on both (interpretative and normative ambiguity, Renn 2005, p.37). If there is interpretative ambiguity, the emphasis of the tolerability/acceptability judgment should be on evidence (risk characterization). If there is normative ambiguity, the focus of the tolerability/acceptability judgment should be on values (risk evaluation). IRGC-step 3 describes a structured approach (including the weighing of values and evidence) on how to judge risks in terms of acceptability and tolerability and is therefore assumed to enhance *acceptability*. This IRGC-step is furthermore assumed to foster *efficiency* of risk governance since a role division is decided upon on forehand.
According to Todd (2011) deficits that are likely to occur in IRGC-step 3 are: (deliberate) exclusion of some stakeholders and their views, indecision or lack of responsiveness, lack of transparency, overlooking values to consider social needs, environmental impacts, cost-benefit analyses and risk-benefit balances and timing is wrong for the issue to be properly addressed.

#	Hypothesis for risk characterization and evaluation
H3a	*A functional distinction should be made between risk characterization and risk evaluation, because it deliberately separates the weighing of facts and values. Besides, it clarifies the role division between risk assessors and risk managers. This enhances efficiency and acceptance in risk governance.*

2.4.4 Risk management (IRGC-step 4)

The fourth stage is risk management and refers to "the actions and remedies needed to avoid, reduce transfer or retain the risk" (IRGC 2008, p.13). This stage is dependent on the information derived from the former three IRGC-steps. Three possible outcomes of the former three IRGC-steps are: "an intolerable situation (risk source needs to be abandoned or replaced), a tolerable situation (risks need to be reduced/handled within reasonable resource limits) or an acceptable situation (risks are so small that risk reduction is unnecessary)" (cf. Renn 2005, p.40). With regard to these three possible outcomes, there can be consensus or controversy; the degree of the later is one of the drivers for selecting the appropriate instruments for risk prevention/reduction. The six management components of classic decision theory[36] should be undertaken next (Renn 2005, p.41): 1) identification and generation of risk management options, 2) assessment of risk management options, 3) evaluation of risk management options, 4) selection of risk management options, 5) implementation of risk management options, 6) monitoring of option performance. The second management component should in most instances be done according to the following criteria: "effectiveness, efficiency, minimisation of external side effects, sustainability, fairness, political and legal implementability, ethical acceptability and public acceptance" (Renn 2005, p.42). It is likely that the measuring of options against these criteria creates conflicting results. Renn (2005, p.43) therefore "advises risk managers to use guidance documents on how to handle risk trade-offs and how to employ decision analytic tools for dealing with conflicting evidence and values."

[36] This is based on Morgan and Henrion (1990), Keeney (1992) and Hammond et al (1990).

Every characterization of risk has an accompanying risk management strategy. For simple risk problems this is *routine based*, and holds that "data is provided by statistical analysis, goals are determined by law and the role of risk management is to ensure that all risk reduction measures are implemented and enforced" (Renn 2005, p.44). For complex risk problems, the appropriate management strategy is either *risk informed or robustness focussed.* The former aims at improving the reliability and validity of the results that are produced in the interdisciplinary (risk) estimation phase. The latter aims at improving the buffer capacity of the risk target. For uncertainty induced risk problems, the management strategy should be *precaution based* (aimed at avoiding irreversibility) or *resilience focused*. With regard to the precaution based management strategy, risk characteristics like extent of damage, probability of occurrence, incertitude, ubiquity (geographical dispersion of damage), persistence, reversibility, potential for mobilization[37] and delay effects[38] can be used to provide insight in the degree of remaining uncertainties (cf. Renn 2005). Also, management options to deal with worst case scenarios should be pointed out. This management strategy should be applied if potential threats are known in advance and the system needs to be prepared to face these threats. With regard to the resilience focused management strategy, the capability to cope with surprises should be strengthened. This strategy is protective against unknown or highly uncertain hazards (cf. Renn 2005, p.46). For ambiguous risk problems, the appropriate management strategy is *discourse based*. This means that risk management needs to address the causes for the conflicting views by deliberation (Renn 2005). Risk management according to the ideas of the IRGC is assumed to lead to more *efficient* management (because the management strategy is based on a on forehand decided risk-categorization). It is furthermore assumed to lead to more *accepted* risk management (because of deliberation), in turn leading to more *effective* management (acceptation leads to cooperation). *Effective* management also results from the assessment of (on forehand decided) risk management options (the second of the six management components).
Deficits that are likely to occur in the management phase of the IRGC-framework, are unclear responsibility division, inadequate/ignored information leading to inappropriate decisions, no appropriate regulatory structure or process in place to manage the issue, short-term expedient decisions lead to secondary problems, failure to revisit a risk decision (after new knowledge being available), indecision, unequal allotting of risks and benefits, managers are isolated from the impact of their decisions and not accountable for them and decisions are ignored or poorly implemented (Todd 2011).

#	Hypothesis for risk management
H4a	*The categorization of risks, accompanying management strategy (and level of participation) and appropriate instruments for risk prevention and risk reduction lead to more effective, efficient and accepted risk management.*

2.4.5 Early risk communication (IRGC-step 5)

Risk communication comprises "both exchange of information among risk professionals and communication to the outside world, throughout the whole risk handling chain" (cf. Renn 2005, p.55). Risk communication has first evolved from the education on probabilistic thinking towards laypersons to convincing people that certain behavior was unacceptable. Both were based on one-way communication. Current risk communication emphasizes on two-way communication (Leiss 1996 in Renn 2005) and thereby overlaps with deliberation.[39] The goal of risk communication is mutual understanding, informing and engaging (i.e. learning) and trust building (Renn 2005, Renn et al 2011,

[37] Subcategories here are inequity and injustice, psychological stress and discomfort, potential for social conflict and mobilization and spill-over effects.
[38] These criteria are also mentioned in Ale 2002 (p.113), but it is argued that they do not 'completely line up with the practices in the Netherlands.' The OECD CARAT-system is claimed to be better and includes: hazard identification, release exposure analysis, dose response and risk expression.
[39] IRGC (2008) describes a before-after structure in risk communication: before a decision on a measure, stakeholders are early involved, stakeholders understand the risk and have a voice. After a decision on a measure, an explanation of the rational for a decision takes place, people are allowed to make informed decisions on the risk and the responsibility division is clear.

Pitrelli and Sturloni 2007) and thus contributes to *acceptance*. Early risk communication also contributes to acceptance, because people consider themselves to have the right to know (Renn et al 2011).[40] Since "public trust is essential in encouraging people to play an active part and in the ability to meet a possible emergency" (Pitrelli and Sturloni 2007, p.339); i.e. two-way risk communication leads to cooperation, ultimately resulting in more *effective* risk governance. Risk communication furthermore aims at "making the role and responsibility division clear for those who are central to risk framing, appraisal or management" (cf. Renn 2005, p.55), thereby enhancing *efficiency* in risk governance.
The importance of early risk communication is acknowledged by Drijver and Woudenberg (1999), due to the controllability factor: communication on a risk provides people with knowledge which makes people feel to have more control over a situation. Besides early risk communication, Pitrelli and Sturloni (2007) argue for transparent risk communication. As an example, the authors compare the acting of the WHO during the SARS outbreak where it had a 24hour updating website which was accessible to anyone[41], with the Chinese reaction to the SARS outbreak and the acting of the British government during the BSE crisis in which information was kept from the public. The rationale behind total transparency of the WHO is argued as follows: "panic increases when information is perceived to be hidden or only partly revealed"(WHO 2003). "An honest and open approach, combined with the avowed commitment to use every means available to combat the infectious disease, strengthens the degree of trust with regard to risk managers" (cf. Pitrelli and Sturloni 2007, p.339).
Although Renn (2005) pleas for early communication and involvement, from scientific literature becomes clear that risk communication contains many difficulties. For example: early involvement of the public can lead to overreaction (Pitrelli and Sturloni 2007) and the media can complicate risk communication in several ways (Drijver and Woudenberg 1999).[42] Furthermore, mental noise theory, trust determination, negative dominance theory and misinterpretation or misreading, make risk communication difficult (Glik 2007). Also, Merkelsen (2011) emphasises that the failure of one-way communication not necessarily implies that two-way communication will always be successful.
Deficits that are likely to occur in IRGC-step 5 are: one-way instead of two-way communication, the communication strategy is not adjusted to the situation (i.e. type of risk), communication does not account for how different stakeholders receive and accept information, some stakeholders are alienated because their concerns are treated as irrational or irrelevant, because of a low level of trust in the decision-making process, the information communicated has limited value to some stakeholders that the whole governance process is weakened (Todd 2011).

#	Hypothesis for risk communication
H5a	*Early communication about certainties and uncertainties fosters acceptance about risk governance.*[43]

2.5 Conclusion
The five IRGC-steps "are closely interlinked and should not be seen as sequential steps" (cf. Renn 2005, p.26). Nevertheless, for all separate IRGC-steps a link to (at least one of) the outcome variables can be made. By including a differentiated approach to risks and the societal context, the IRGC-framework as a whole supports the ideas of precaution and participation. Effectiveness and efficiency are fostered through precaution and participation by "reliance on a broader range of knowledge reducing the negative consequences of surprise and preventing for a narrowing of intervention options" (cf. Scoones and Foster 2008). Acceptation is fostered by transparency (through early

[40] Pitrelli and Sturloni (2007) argue that risk management institutions are obliged to provide information even when they are still in uncertainty or incompleteness of information. This resembles the ideas of deliberation being democratic.
[41] Assumed is here that everyone has access to internet.
[42] The most important complication is that the sender has no control over the message delivered. Hance et al (1990) therefore suggest communication to involved parties before the story gets to the media if one has to deal with a small-scale risk problem.
[43] Effectiveness and efficiency are no part of the hypotheses on risk communication, since these are already covered in the risk management hypotheses, reflecting deliberation.

communication about certainties and uncertainties), the weighing of values and facts in an acceptability tolerability judgement and mutual understanding.

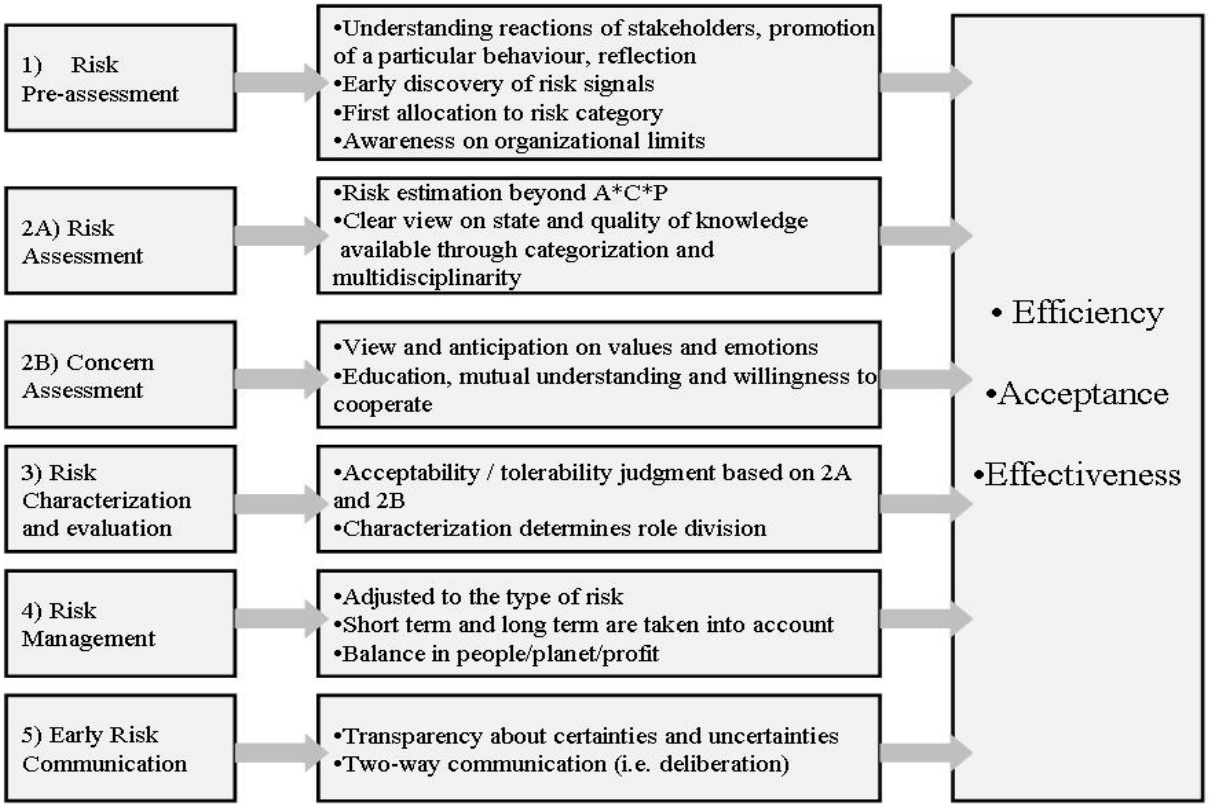

Figure 9: Theoretical Framework
Source: author

In short: This chapter started with an explanation on the reason for the occurrence of risk governance deficits: risk governance deficits can occur as a result of a single approach to all risks. A differentiated risk approach is therefore proposed: the IRGC-framework. According to Renn (2005, p.12), the IRGC-framework offers "two major innovations to the risk field: 1) the inclusion of the societal context and 2) a new categorization of risk-related knowledge." The assumptions behind these two innovations are: factual and socio-cultural knowledge, participation and the principles of good governance are needed in risk governance. The aim of this proposed framework is enhancing effectiveness, efficiency and acceptance in risk governance. With regard to infectious disease governance, effectiveness refers to controlling the number of (human) infections/deaths and preventing for the number of (human) infections/deaths. Efficiency refers to the use of resources (time, money) and is influenced by good cooperation and the variety of measures. Acceptance refers to public support for infectious disease policy. The outcome variables effectiveness, efficiency and acceptance are interlinked. The IRGC-steps are "closely interlinked and should not be seen as sequential steps" (cf. Renn 2005, p.26). Since risk governance is an iterative process, direct causal relations with regard to the separate IRGC-steps and the outcome variables do not exist. Therefore all IRGC-steps are needed for more effective, efficient and accepted risk governance.

3 Methods

This section starts with an explanation on the general method of research. It includes a visual representation of research steps taken (see figure 10). These research steps were needed for being able to answer the main research question: whether (and to what extent) the IRGC-framework is useful for Dutch infectious disease control and if so, what the added value in terms of effectiveness, efficiency and acceptability would be. Paragraph 3.2 clarifies the general desk research method used for previous chapters (1 and 2), but also elaborates on specific (desk) research methods used for the case studies. Interviewee selection is justified in paragraph 3.3, followed by an explanation on participatory observation in paragraph 3.4. Finally, the case selection criteria are elaborated on in paragraph 3.5.

3.1 General method of research

In this research, the assessment and management of infectious disease risks in the Netherlands has been studied; a single country was subject of research. This research was of qualitative character, in order to allow for maximal in-depth exploration of relevant issues. The focus was on two particular infectious diseases and this study incorporates temporal variation because the two case studies took place between 2007 and 2012. According to Verschuren and Doorewaard (1999, p.164) a researcher can achieve depth in his/her case study research through the triangulation of sources and the triangulation of methods. Where the former can be reached by the use of several sources, the latter can be reached by using several research methods. The triangulation of sources is accounted for by using not only official university search engines (Scopus, Web of Science, Google Scholar/Books), but also university books (Rossi et al 2004; Verschuren and Doorewaard 1999), official RIVM search engines (Pubmed), official RIVM documents and articles, sources available to a larger public (e.g. official websites like ECDC, IRGC, or newsletters like Promed). The triangulation of methods is accounted for by doing desk research, semi-structured interviews and participatory observation.

This research started with an exploration of existing literature (see Chapter 1) on environmental health risks (EHR). In particular the focus of the literature search was on previous studies on: the IRGC-framework, risk governance, the challenges with regard to risk governance and infectious disease risks. This was followed by a literature search on evaluation criteria for EHR resulted in few scientific articles, meaning that solely from scientific literature it was difficult to define the preferred outcome of infectious disease policy.[44] Therefore, thirteen 30-minute interviews with risk assessors and managers were held, and used to back up scientific literature with regard to evaluation criteria. This resulted in the following three outcome criteria for evaluation: effectiveness, efficiency and acceptability and is more elaborated on in Chapter 2.

Two infectious disease risks (Q-fever and Schmallenberg Virus) are chosen as in depth case-study, based on case selection criteria (see paragraph 3.5). For each of these case studies, previous studies were consulted (if available) in order to describe the actual assessment and management on this particular infectious disease risk. For each case was analyzed whether all steps of the IRGC-framework took place or not (i.e. Did framing occur? Did interdisciplinary risk estimation take place? Was a concern assessment undertaken? etc.). The absence of IRGC-steps could indicate opportunities for the enhancement of effective, efficient and accepted risk governance. Also, based on this timeline the risk was categorized according to the four categories of Renn (2005, i.e. simple, uncertain, complex, ambiguous), in order to determine the hypothetical risk governance approach.

Desk research was mainly aimed at getting an insight into effectiveness and efficiency with regard to risk governance during the infectious disease risk. A media analysis was done to get an insight in acceptance during the infectious disease risk. An assumption here is that public acceptance is related to the number of published newspaper articles, which is partly acknowledged by Washer et al (2008)[45], Forsythe (1993)[46] and Entman (2007).[47] *LexisNexis*[48] was used as a search engine for the media

[44] An elaborated desk research justification can be found in Appendix 4.
[45] Washer et al (2008) found a reasonable relation between a discourse presented in newspaper articles on MRSA and the discourse present in society on MRSA.
[46] Forsythe (1993) argued that the media can influence risk-framing to a large extent since judgments of risks are influenced by imagination, dramatisation and memorability.
[47] According to Entman (2007) the media have their influence on risk-framing, since media influence the distribution of power by choosing which persons to interview or to what subjects articles are devoted.

analysis. Reasons for performing a media analysis by adding up all published national newspaper articles on Q-fever or SBV (on a weekly basis) were the following: 1) published national newspaper articles were available for both Q-fever and Schmallenberg virus (which fostered the comparability) and 2) the media analysis had to be performed within a reasonable time frame (no more than two weeks). At first no value is given to either positive or negative publications, but solely the publication itself counted. In a later phase, some search words were used to explain peaks in the graph.
Based on the timeline as well as the media-analysis, for both case studies the researcher has chosen three or four moments during the outbreak or threat on which to zoom in either because: a high level of turmoil in society was present, an IRGC-step was missing (possibly leading to a governance deficit) or a combination of both. These moments were chosen as moments in which the IRGC-approach could have been applied, assuming that this would lead to increased effectiveness, efficiency and acceptance. The identified moments served as the basis for semi-structured interviews (N=18) with stakeholders. Aim of the semi-structured interviews was to find out whether a) the categorization of the risk done by the researcher was acknowledged, b) the hypothetical situation would have been possible (feasible) considering the time frame and c) the IRGC-steps could have contributed to the enhancement of effective, efficient and accepted infectious disease governance. Even though this research focused on the possible contribution of the *IRGC-framework* to infectious disease governance, it could not be avoided that interview questions touched upon an evaluation of the risk governance process. The contested character of one case study in particular (Q-fever), caused this research to possibly contain sensitive information: interviewees were therefore made anonymous.
All interviews were tape recorded and a transcript of the answers was made. The tape records were destroyed and the transcripts were returned to the interviewee for revision in order to ensure that interviewees agreed on it. Finally, an analysis on the transcripts was done.

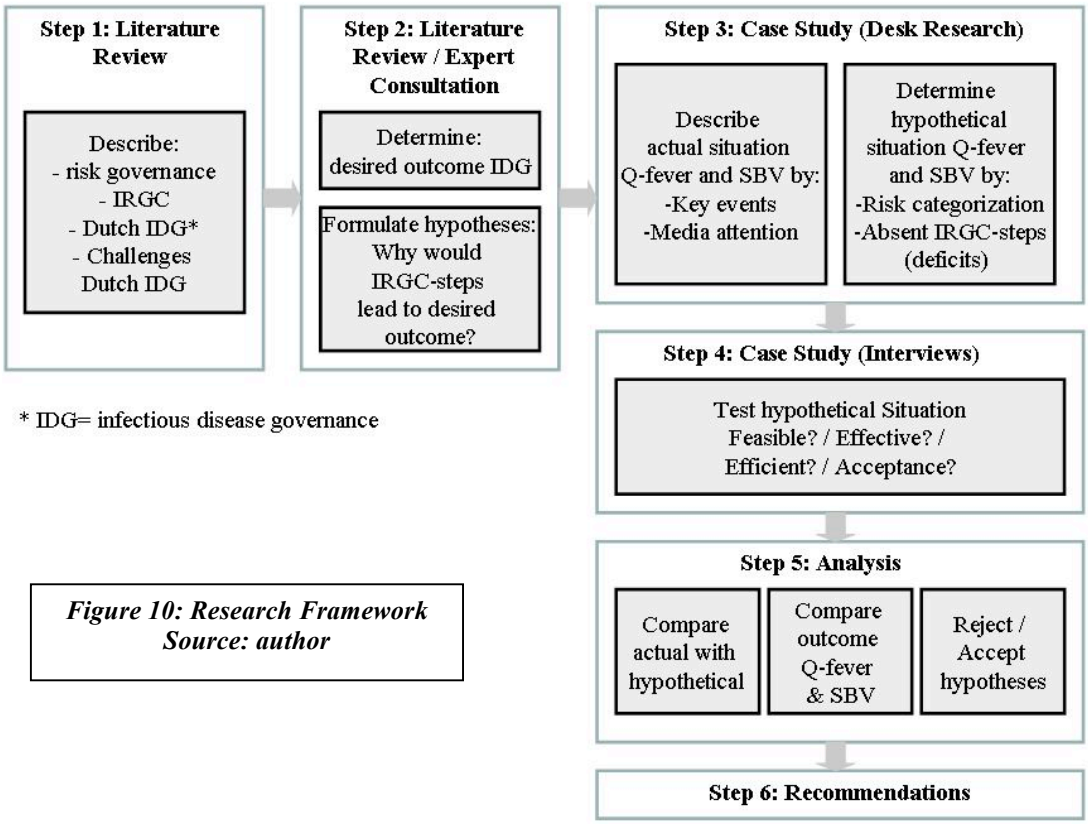

Figure 10: Research Framework
Source: author

[48] *LexisNexis* is a database which, among other things, collects published newspaper articles.

3.2 Desk research justification

3.2.1 General search criteria and sources

For the literature review (Chapter 2) was made use of the scientific search engines Scopus, Google Scholar and Web of Science. The main search criteria were: risk governance, infectious disease and IRGC framework. As mentioned in paragraph 1.3.1, exploratory research revealed no articles on the operationalization of the IRGC-framework. An exploration into the field of infectious diseases resulted in many non-relevant articles. Additional sources were therefore needed: the official website of the IRGC (www.irgc.org) has been used in search for further documents on the IRGC framework in particular. Also, websites of institutions involved in infectious disease governance (ECDC, CDC) were used in search for articles and reference list searches are done (in relevant articles). Because this research was done from the perspective of Dutch infectious disease control (in particular at RIVM-CIb), literature present and suggested during the time of internship and interviews are included. Also, relevant articles from the master program of the researcher are used. Finally, some singular searches were performed, meaning that either these documents were found in a later phase than the systematic literature search, or by searching to specific IRGC-steps. A further specification of the systemic literature search can be found in Appendix 4.

3.2.2 Desk research for Q-fever

In contrast to early 2007 when there were hardly any studies on Q-fever, nowadays many scientific articles and newspaper articles are written about the infectious disease. This study focuses solely on the Dutch Q-fever situation with regard to infectious disease governance from 2005 until 2012. In order to gain knowledge on the actual risk governance process during Q-fever, a timeline of events was made. The timeline mainly served to gain knowledge on the actual risk governance process during Q-fever and starts with the early signals of the Q-fever risk (and start-up of the risk governance process). As events in the timeline are reflected: decisions taken by risk managers, process elements possibly relating to one of the IRGC-steps and possible indications of the risk categorization. The timeline builds on former research, since Van Dijk et al (2010) and GGD HvB (2008) are mainly used. Both Van Dijk et al (2010) and GGD HvB (2008) evaluate the management of Q-fever from a governmental perspective.[49] RIVM (2009), Camp (2011), Post (2010), and van der Giessen (2010) were used additionally for the analysis on the timeline and for categorizing the Q-fever risk.
As far as known by the researcher, there are hardly any documents on the position, knowledge and concerns of civil society and other stakeholders (business, e.g. farmers) about the Q-fever risk. In an attempt to gain objective knowledge about stakeholders' positions on the issue during the period of research (2005-2012), governmental websites were used as search engine resulting in Oppers (2010).[50] In addition, a public hearing on Q-fever (resulting in Van der Bijl et al 2012) on April 24th 2012 was attended.

3.2.3 Desk and participatory research for SBV

The SBV timeline is a combination of participatory observations (in meetings at RIVM and VWS), documents on these meetings, letters to the Chamber of Deputies, RIVM (2011a) and ECDC (2011)

[49] Van Dijk et al (2010) mainly focused on how the ministries of VWS and EL&I reacted to the Q-fever outbreak (2008-2010), which control measures were taken by these ministries and it researched the balance between responsibility of the government, businesses and other organizations. Van Dijk et al (2010) zoomed in on the process from 2008-2010. GGD HvB (2008) mainly looked at the process from the point of view of the regional public health offices within the affected region in the beginning of the first outbreak (2006-2008). Since Q-fever is an ongoing risk, official letters from the Chamber of Deputies and websites were used to extend the timeline until present.

[50] Search words used were consumer values Q fever (consument waarden Q koorts). Derived April 16th 2012, from: http://www.rijksoverheid.nl/documenten-en-publicaties?keyword=consument+waarden+Q+koorts&form-period-from=&form-period-to=&form-department=&form-information-type=. In this report it is argued that the discussions about Q-fever and industrial farming practices were unified (cf. Oppers 2010, p.38). Other documents on this website link Q-fever with industrial farming practices, but do not necessarily contain information on consumer perception.

risk assessment on SBV and finally ProMED mails. ProMED is an international Program for Monitoring Emerging Diseases; it is an "internet-based reporting system dedicated to rapid global dissemination of information on outbreaks of infectious diseases and acute exposures to toxins that affect human health, including those in animals and in plants grown for food or animal feed."[51] Notifications on SBV started on ProMED from November 18th 2011 and still continue at the time of writing. Besides regular updates on the situation concerning SBV, ProMED released information from a variety of sources and countries. Just like with Q-fever, the SBV timeline mainly served to gain knowledge on the actual risk governance process during Q-fever and starts with the early signals of the SBV risk (and start-up of the risk governance process). As events in the timeline are reflected: decisions taken by risk managers, process elements possibly relating to one of the IRGC-steps and possible indications of the risk categorization. Addittionally, each first European SBV notification is reflected in the timeline, as well as trade restrictions.

3.3 Interview justification

A list of possible interviewees was made by the researcher, which was specified after a discussion with both supervisors. This list of possible interviewees was used as a starting point: people were contacted and asked if they had the knowledge[52] and time to be interviewed. If so, an interview was planned of 1,5 hours. If not, interviewees were asked for a possible different contact person. In the interviews itself, some initiated interviews with other persons or organizations. The qualitative character of this study caused the total number of interviewees to be low (N=18), which made the researcher decide to diversify the selection of interviewees. For Q-fever this meant that both representatives of private and public institutions on the human and veterinary side (regional and national), as well as representatives of patient groups were interviewed. For SBV, no patient groups were interviewed since at that time the disease was known to be non-zoonotic. Instead was chosen to explore the risk management field in a more broad sense, outside of the medical stakeholders.
Interview questions were made by the researcher, after which they were checked and adjusted by both supervisors. All interviewees were sent an explanation on the research and interview in advance (see Appendix 5). This briefing served two goals: first, the interviewees were able to become familiar with the IRGC-framework (saving explanation time in interviews) and second, it allowed the researcher to explain the purpose of the research (being testing of the IRGC-framework and not evaluation of the policy).[53] Two test interviews followed, in order to find out whether questions were understood by interviewees.[54] After this, the majority of the interviews (N=15) interviews took place within a time frame of three weeks in order to reduce time bias (this was relevant for SBV since the outbreak occurred at the time).
Because SBV is classified as uncertain risk, suggested involved stakeholders are agency staff (risk assessors and risk managers) external experts, industry stakeholders and directly affected groups. Q-fever is classified as ambiguous risk, which means that on top of the suggested involved stakeholders in case of an uncertain risk, the general public should be involved (see figure 8 paragraph 2.4 or original source Renn 2005, p.53). For SBV this meant that representatives of the industry (GD and LTO), representatives of the governmental veterinary column (NVWA, CVI, ministry of EL&I) and representatives of the governmental human column were selected for an interview (ministry of VWS, GGD, RIVM-LCI, RIVM-LZO). For Q-fever this meant that additionally a general practitioner, a Q-fever patient as well as board member of a foundation for Q-fever patients and a member of the Chamber of Deputies were selected for an interview.

[51] Derived March 29th 2012, from: http://www.ProMEDmail.org/aboutus/.
[52] Interviewees were considered to have sufficient knowledge on the case study if they were directly involved into the risk governance process during either SBV or Q-fever (possibly as representative, contact person or file holder of a stakeholder group during SBV or Q-fever).
[53] The second goal of the briefing was necessary since Q-fever still is a sensitive subject: Van der Bijl et al (2012) started an evaluative research to Q-fever aiming at an acknowledgement of governmental institutes not being transparent, effective and efficient enough. A public hearing initiated by Van der Bijl et al (2012) took place one month after the interviews for this research took place.
[54] The first test-interview has not (completely) been used for the analysis (only for Q-fever risk categorization), since questions differed from the final set of questions.

3.4 Participatory observation

RIVM-CIb has a coordinating role in the control of infectious diseases in the Netherlands. Its task is to signal and advice about possible outbreaks (epidemics) and threats of infectious diseases. Furthermore, RIVM-CIb is a network agency and is in contact with professionals from many different disciplines (laboratories, animal health sector, curative care sector, vaccinology specialists, municipal health services, research institutions). It is also the national focal point for international agencies such as the World Health Organization (WHO) and the European Centre for Disease Control (ECDC). This means that experience on and knowledge about infectious diseases is present in this governmental research institute. Since the researcher does not have a medical background, participatory observation mainly served as a means for the researcher to understand the daily practice of infectious disease control at RIVM-CIb and it allowed the researcher to link theory with practice.

3.5 Case selection criteria

Two cases are subject of study in this research; time constraints are the reason for this limited number of cases. As mentioned in paragraph 1.1.4, the distinction between an outbreak and a threat is arbitrary. Nevertheless, for this research is chosen to study one threat (SBV) and one outbreak (Q-fever) because it is assumed to possibly provide insight into the applicability of the IRGC-framework with regard to time pressure (feasibility). The case selection criteria are further defined and justified in Table 3 below.

Table 3: Case selection criteria

#	***General Set of Case Selection Criteria***	***Justification***
1	The case of study should be linked to an environmental problem.	This selection criterion is in place because of graduation requirements for the Master Program Sustainable Development - Track Environmental Policy Management.
2	The case of study must not have been subject of research before (in particular this refers to the case studies done by the IRGC).	This selection criterion is in place because of a possible larger contribution to literature.
3	The risk problem of study is expected to be categorized as either uncertain, ambiguous or complex.	This selection criterion is in place because of the applicability of the IRGC-framework to systemic risks in particular.
4	Enough information should be available on the case.	This selection criterion is in place because of pragmatic reasons.
5	The case study should have taken place between 2007-2012 or during time of internship.	This selection criterion is in place in order to limit time bias in this research.
#	***Specific Set of Case Selection Criteria 1***	***Justification***
6	The infectious disease threat should have been (or will be) subject of discussion in an expert meeting (DB)	An DB shows the (political) desire for (organized) advice. Assumption: A DB takes place when there is discussion among scientists on a certain issue, without there being an acute threat for public health (like a new outbreak in humans).
#	***Specific Set of Case Selection Criteria 2***	***Justification***
7	The infectious disease threat should have been (or will be) subject of discussion in an OMT.	An OMT shows the (political) desire for rapid (organized) advice. Assumption: An OMT takes place in case of an outbreak in humans (being an acute threat for public health).

Initially, suggestions fitting the set of case selection criteria 1 were Antibiotic Resistant Organisms (e.g. ESBL, MRSA). Suggestions fitting the set of case selection criteria 2 were Q-fever, EHEC, the Mexican flu (or swine flu) and Influenza A (H1N1).

In December 2011 an outbreak (in animals) of Schmallenberg Virus (possibly being zoonotic, meaning a threat to human health) took place. SBV seemed to be an opportunity to include participatory observation as a method of research and was therefore chosen as a case of study. SBV was a completely new virus: this awoke the impression that it could be categorized as a systemic risk because it involved many uncertainties. SBV fitted the case selection criteria 1 until 5 and 6.
Besides SBV, Q-fever was chosen as a case of study because it fitted the case selection criteria 1 until 5 and 7. The evaluation reports of Q-fever (Van Dijk et al 2010 and Van der Bijl et al 2012) suggest that Q-fever could be categorized as systemic risk because it involved many stakeholders and perceived differences of interest. Both SBV as Q-fever originated in animals, making them: 1) possibly better comparable than for example SBV and the Mexican flu and 2) an interesting comparison with regard to the newly built zoonotic structures (these were built after the Q-fever outbreak).

In short: Q-fever and SBV were chosen as case studies for this research. The triangulation of methods was accounted for by doing desk research to previous studies on these infectious disease risks, complemented by participatory observation and semi-structured interviews. The triangulation of sources was taken into account by using several search engines, official websites and internal documents. By applying both the triangulation of methods and sources, the researcher aimed at achieving depth in this study. In chronological order of research, first for both SBV as Q-fever a media analysis was done by accumulating all published newspaper articles per week. The aim of the media analysis was providing insight into acceptance of risk governance. Second, desk research was done resulting in a timeline of events. The timelime of events served as a means to categorize the infectious disease risk, thereby defining which management approach would have been suggested by Renn (2005). The timeline of events furthermore served to discover risk governance deficits (the absence of IRGC-steps) relating to effectiveness, efficiency and acceptance. The results of both the media analysis and desk research, served as a means to define moments in time in which the IRGC-steps could have been applied. These moments were the basis for semi-structured interviews with stakeholders. Interviewees were asked whether appliance of the IRGC-steps would have been feasible but also if it would have led to more effective, efficient and accepted risk governance.

4 Case 1: Q-fever

This chapter contains the first case of study: Q-fever. The infectious disease is introduced in paragraph 4.1. This is followed by a media analysis and description on the governance process of Q-fever containing important decisions and events in paragraph 4.2. Hereby, the third sub-question is addressed. Q-fever is classified according to the IRGC risk categories in paragraph 4.3, which was necessary for being able to determine the suggested discourse and managerial approach (see Figure 2, paragraph 1.1.3). Hereby, the fourth sub-question of this research is answered. An analysis on the actual situation follows, determining which IRGC-framework steps did and did not take place during the governance of Q-fever. This could have led to risk governance deficits, ultimately resulting in lower effectiveness, efficiency and acceptance of Q-fever risk governance. Paragraph 4.4 thus contains an answer to sub-question five. In the hypothetical situation *all* IRGC-framework steps would have been explicitly applied. Paragraph 4.5 therefore contains a description of the hypothetical situation, determining possible moments on which what specific IRGC-step would have hypothetically been feasible (hereby answering sub-question six). Paragraph 4.6 contains an answer to the seventh (and last) sub-question per IRGC-step since it describes whether appliance of all five IRGC-framework steps would have been feasible on those particular moments in time, and if it would have lead to more efficient, effective and accepted risk governance in case of Q-fever. Hereby paragraph 4.6 addresses the last sub-question. Paragraph 4.7 is the concluding paragraph on Q-fever. The answers to sub-questions can be found at the end of each before mentioned paragraph, and can be recognized by their *italic font* and starting with 'in short'.

4.1 Introduction to Q-fever

Q-fever is caused by bacteria called *Coxiella burnetii*, which exist worldwide. These bacteria can infect many animal species, but they mainly appear in cattle, sheep and goats. In most of the cases an infection in animals goes unnoticed (without disease symptoms), but it can result in abortions. If abortions appear on a large scale, many bacteria can be transmitted to other animals or humans. After an infection, an animal can stay infectious and the bacteria can be mainly transmitted by unpasteurized milk or stools or (to a lesser extent) vaginal fluids. The bacteria can survive long outside of its host and can stay contagious for a long time (cf. Van Dijk et al 2010, p.15). Humans can get ill from the *Coxiella burnettii* bacteria by inhalation. The bacteria multiplies in the lungs, after which the blood spreads it through the body. Just like in animals, infections often occur without people having symptoms and if there are symptoms they are not very specific. This means that only a blood test or identification of the bacteria in body tissue can proof whether one is infected with Q-fever or not (cf. Van Dijk et al 2010, p.3).

The first human Q-fever notification appeared in 1937 in Australia. The disease was discovered in employees of a slaughterhouse, and the main symptom was high fever. Because of the fact that at that time the pathogen causing the disease was unknown, the disease was indicated as Q-fever in which 'Q' stood for query. Q-fever was seen as a rare disease in humans in the Netherlands, and was seen as an occupational risk (meaning that those which have intense contact with animals run the highest risk for Q-fever). From 1983 on, a stable appearance of Q-fever in humans in the Netherlands was 20 illnesses per year (Ministry of EL&I 2009).[55]

4.2 Indications on effectiveness, efficiency and acceptance of risk governance during Q-fever

In May 2007, a general practitioner and a hospital announce a high number of patients with lung disease to GGD HvB (see timeline May 25th/27th 2007). Research reveals the lung disease infections are caused by the *Coxiella burnetii* bacteria (see timeline July 2nd/5th 2007). The risk governance process evolves after this cluster of Q-fever patients is recognized. A Q-fever outbreak this size was unique since it never occurred before in the world. In 2007, risk assessors and risk managers thus did not expect the outbreak to increase to such numbers and the same hold for 2008. Table 4 shows the number of notifications and deaths related to Q-fever: for this research this number serves as an indication of effectiveness of risk governance.

[55] Freely translated by the researcher from Dutch to English.

Table 4: Number of reported Q-fever notifications (indication on effectiveness)
Source: Derived March 7th 2012, from: http://rivm.nl/Onderwerpen/Ziekten_Aandoeningen/Q/Q_koorts.

Year	# of reported human notifications	# of reported human deaths	# of reported animal deaths
2012	11	1	
2011	81	5	
2010	504	11	62.500[56]
2009	2354	7	
2008	1000	1	
2007	168	0	

Despite the efforts of risk assessors and risk managers in 2007 and 2008, the number of Q-fever infections increases until 2009 and 2010 is the first year in which a decline in the number of Q-fever patients is notified since the occurrence of the outbreak in 2007. Several events on the timeline could be an indication of inefficiency in the process, resulting in less effective risk governance: rejection of the notification obligation (see timeline October 25th 2007, the notification obligation was proposed for the first time on October 3rd 2007 by OMT and adopted on June 12th 2008), other proposed OMT measures which are not or in a later phase adopted by BAO (see timeline July 23rd 2007), and some new measures which seem to pop up in a later phase of Q-fever governance (e.g. transport/visitor ban: see timeline October 10th 2009, breeding ban: see timeline November 11th/30th 2009, Q-fever vaccination for humans: see timeline December 2010).
Q-fever is nowadays known as a disputed infectious disease, and led to a decrease in trust with regard to the government.[57] Several events on the timeline could be an indication of low acceptance with regard to risk governance for Q-fever: Chamber of Deputies questions (see timeline May 23rd 2008, August 2009, January 14th/15th 2010, November 7th/17th 2011), assignation of Commission Van Dijk (see timeline January 19th 2010, resulting in Van Dijk et al 2010), foundation Q-uestion? (see timeline early November 2009), discussion in Chamber of Deputies resulting in 13 resolutions (see timeline March 1st 2010), National Ombudsman research (see timeline January 2012, resulting in Van der Bijl et al 2012), foundation for Q-fever (see timeline February 2012). The media analysis (see upper half Figure 11) reveals high peaks in turmoil in society (measured by number of Dutch published newspaper articles on Q-fever).
In short: All of the above are indications of possible risk governance deficits, implying a decrease in effectiveness, efficiency and acceptance of risk governance during Q-fever. Therefore, assumed is that risk governance during Q-fever could have possibly been improved by applying the IRGC-framework.

Short legenda of Figure 11:
The upper half of the graph represents the acceptance of risk governance measured by number of published newspaper articles in national newspapers. The upper half of the graph furthermore reflects the number of human Q-fever infections, providing an indication on risk governance effectiveness. A graphical presentation of the key decisions in the Q-fever process can be found on the lower half of Figure 11. These serve as an indication on efficiency of risk governance during Q-fever. Key decisions are defined as: decisions risk managers made (OMT/BAO decisions) possibly influencing the effectiveness of risk governance. The lower half of the graph shows some events related to acceptance, these are colored red (e.g. Zembla documentary and Van Dijk (2010) being published). The key decisions and events are possibly related to the 'acceptance' peaks and number of human infections and are defined by desk research and interviews.[58]

[56] See timeline May 11th 2010.
[57] Derived on July 30th 2012, from: www.rijksoverheid.nl.
[58] For practical reasons the figure does not reflect weeks, but months (week numbers were to small to be readable). Furthermore, the graph starts in august 2007 but before august 2007 three publications were found on Q-fever: October 20th 1995, October 31st 2002 and December 16th 2005. These newspaper articles were not relevant for this study (no relation to the Q-fever outbreak in the Netherlands) and therefore not included.

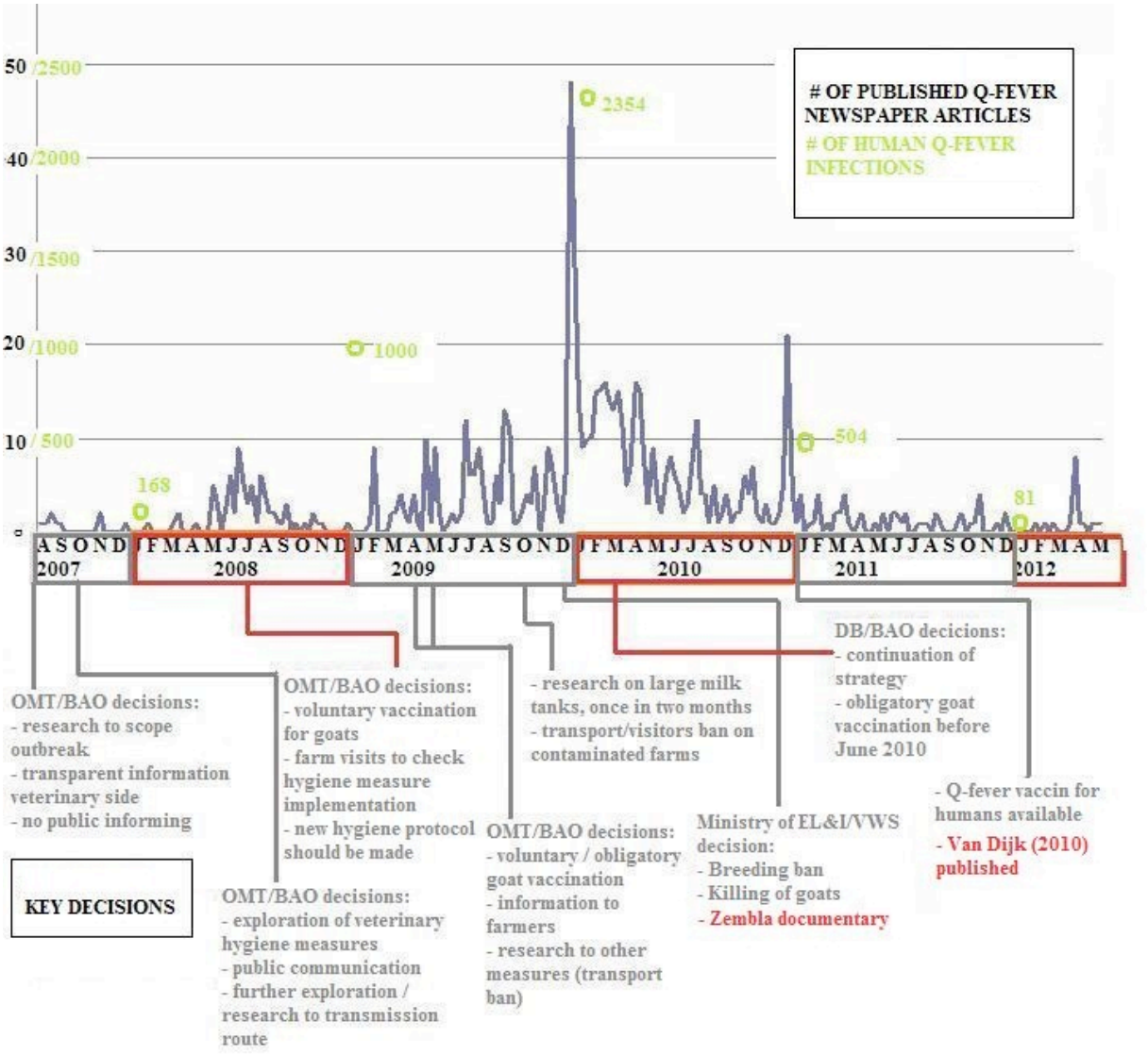

Figure 11: Number of reported infected patients, newspaper publications and key decisions during risk governance of Q-fever
Source: multiple sources

4.3 Q-fever classified as ambiguous risk

Renn (2005) describes four possible risk categories (simple/uncertain/complex/ambiguous). Each category belongs to a different discourse and is accompanied by its own management strategy (see Figure 2, paragraph 1.1.3). Both desk and field research are done in order to determine to which risk category Q-fever belongs; this will make it possible to determine the hypothetical risk management approach.

4.3.1 Desk research reveals Q-fever is an ambiguous risk

Before 2006 Q-fever was seen as a simple risk since the number of Q-fever patients was low and stable over the last years. At the end of May 2007, a hospital doctor and a general practitioner in Herpen announce a high number of patients with lung disease to GGD HvB (Van Dijk et al 2010, p.35, GGD HvB 2008, p.47). At first sight, the cause for this lung disease was not known (reflecting elements of uncertainty). This might be a reason for the risk being recognized as systemic by all (almost all) stakeholders two months after. Some complexity was involved in the Q-fever risk, because

of the fact that the *Coxiella Burnettii* is present in the environment and transmission also takes place through the air[59] (exactly locating the farm from which the pathogen originated turned out to be difficult). Several indications for Q-fever becoming a (normative) ambiguous risk follow, among them are: heavy discussion being the result of the OMT proposed measure on rules for the minimal distance of industrial farming with regard to living areas (see timeline May 12th 2009), cooperation between the human and veterinary column should be improved (see timeline December 20th 2010), a civil society initiative against industrial farming (see timeline July 2009), the foundation of Q-uestion (see timeline early November 2009) and the large amount of media attention (see figure 11). However, many disputes on risk perception (indicating that Q-fever can mainly be classified as ambiguous risk) are implicit and therefore not necessarily visible on the timeline. Therefore, an exploration[60] is done to the existence of possible multiple frames with regard to Q-fever (for an explanation on framing, see paragraph 2.3.1). The results of this exploration are an operationalization of IRGC-step 1: research to framing and shown in Table 5 below. The rise or existence of multiple frames are a possible reason for turmoil in society to occur (low acceptance with regard to risk governance) since stakeholders do not see the problem in the same way and thus stakeholders can have different ideas on solutions for a problem.

Table 5: Exploration on the existence of multiple frames with regard to the Q-fever risk

Element of frame	**Problem frame 1**	**Problem frame 2**	**Problem frame 3**	**Problem frame 4**
problem definition	Industrial farming is the problem (Oppers 2010, p.7, http://www.megastallen-nee.nl/?page_id=1967 and Algemeen Overleg 2012/#544)	The lack of information given by the government is the problem (Van der Bijl et al 2012, p.26ff)	The infectious disease causing human deaths is the problem	Economic loss (because of infectious disese in animals), privacy violation, impact on living security of farmers, (Van Dijk et al 2010, p.57 and 110) psychological impact[61] are the problem
causal analysis	An irresponsible number of animals is placed together in small cages causing infectious diseases to pop up (http://www.megastallen-nee.nl/?page_id=1967 Algemeen Overleg 2012/#544)	Because there was too little information on Q-fever given by the government, I have taken unnecessary risks (Van der Bijl et al 2012, p.31f)	There are multiple reasons for an infectious disease to arise: natural, environmental, social etc. Q-fever is caused by the bacteria Coxiella Burnettii, which has an increased presence in our environment at the moment (Van Dijk et al 2010, p.63)	Q-fever is caused by the bacteria Coxiella Burnettii, which is always present in our environment (Van Dijk et al 2010, p.110)
moral judgment	- culling is bad - industrial farming is bad - compensating farmers it not good because farmers choose for this themselves - inaction of the	- The government (in particular the ministries VWS and EL&I) are responsible for informing and educating the public about public health risks - Farmers are responsible for injuries to public	- guarding of public health should have a prominent priority. After this, other values can be taken into account (Van Dijk et al 2010, p.52-3) - protection of public	- transparent communication about contaminated farms is violation of farmers privacy (Van Dijk et al 2010, p.57)

[59] This was not known in 2007, but proven in September 2009.
[60] There is an emphasis on exploration, since it is likely that there can be more frames identified if time allows it to put more time in research to framing. The identified frames are the most prominent ones reflected in Van Dijk et al (2010) and Van der Bijl et al (2012). An example of a 'missing' frame is one 'belonging' to farmers.
[61] Boerderij Vandaag May 22nd 2010: *De kleine dingen geven het grote verdriet* (newspaper article), Boerderij Vandaag December 16th 2009*: Niet besmet, toch maakt Q-koorts einde aan bedrijf* (newspaper article), Boerderij Vandaag March 19th 2008: *'LNV en GD bemoeilijkten onderzoek rond Q-koorts*' (newspaper article).

	government with regard to industrial farming practices is not good - several values should be taken into account: good information, fair prices for products, animal friendly practices, the landscape, the environment and public health (http://www.megastallen-nee.nl/?page_id=79 and Oppers 2010 and Algemeen Overleg 2012/#544)	health (Van der Bijl et al 2012, p.28 and 30)	health is the responsibility of the government, but citizens and farmers are responsible to some extent as well (RIVM 2003)	
remedy promotion	Reshaping the industrial farming system (http://www.megastallen-nee.nl/?page_id=79 and Algemeen Overleg 2012/#544)	Compensation for patients, compensation for further research to Q-fever, acknowledging of the lack of information given by the government (Van der Bijl et al 2012, p.32, 38), education and timely providing of information (ibid, p.28)	Isolation of animals/contaminated persons, vaccination, culling of animals, breeding ban, obligatory vaccination	Preferably voluntary vaccination, hygienic measures, in order to refrain from economic damage. Culling is only a last resort option, and has to be coupled with compensation for farmers
Actor to which this frame 'belongs'	**PvdD, civil society groups**	**Q-fever patients**	**According to Van Dijk et al (2010): ministry of VWS**	**According to Van Dijk et al (2010): ministry of EL&I. According to Q-fever patients: the government.**

Whether frames 3 and 4 were actually present is disputed: according to Van Dijk et al (2010, p.110) EL&I and VWS had a different view on what was sufficient evidence for intervention.[62] Besides, differences of opinion existed within the risk assessment/management process on the risk and on values: EL&I prioritized business and privacy reasons over public health, while VWS perceived this the other way around (Van Dijk et al 2010, p.110, timeline December 11th 2007). This means that Van Dijk et al (2010) acknowledges the existence of Problem frame 3 for VWS and Problem frame 4 for EL&I. However, in the public hearing of April 24th 2012, former minister of VWS (Ab Klink) argues that both in VWS as in EL&I the priority was with public health. Klink thus argues that in reality Problem frame 3 and 4 do not reflect the interests of VWS and EL&I respectively.

In the perception of many Q-fever patients, the government as a whole represents problem frame 4: "the government has prioritized economic interests over public health" (Van der Bijl et al 2012, p.30); "The government should have taken measures more adequately and should have provided information" (ibid, p.28), "The government should have informed the public" (ibid, p.53). According to other patients, there were multiple parties representing problem frame 4: "The government, RIVM, farmers, and GD mis-managed Q-fever completely. They should have taken the measure of culling in 2008 and should have provided us with information at the time. I had the right to know about this risk" (Van der Bijl et al 2012, p.31).

The existence of multiple *perceived* problem framings can thus be acknowledged by desk literature and participatory observation. *Actual* representation for some problem frames seems to be undisputed (problem frame 1 could represent stakeholders groups like citizens and Partij voor de Dieren (PvdD), problem frame 2 could represent Q-fever patients), but the representation of frame 3 and 4 seems to be more disputed (i.e. there seems to be no consensus on which frames farmers, RIVM, GD, ministries VWS and EL&I would represent) and therefore requires further research.

[62] According to Van Dijk et al (2010, p.110) EL&I required new scientific proof before measures were taken, Coxiella Burnettii was always present in the environment and thus proof of this being the cause was needed. According to Van Dijk et al (2010, p.110) VWS had the opinion that existing scientific knowledge was sufficient.

4.3.2 Interviewees acknowledge Q-fever being an ambiguous risk

Interviewees were asked whether they could describe the characteristics of the Q-fever risk in 2007. The open character of this question, caused the answers being extended and including many details. In order to find out whether it would be possible to categorize the risk according to the four IRGC categories, two methods were used: 1) the answers were summarized into few words and 2) the answers were filtered for on forehand decided words. With regard to the latter, the words differed per risk category: for the simple category was looked at all synonyms for usual, extra ordinary (or the opposite, indicating a systemic risk). From this became clear that most of the interviewees viewed the risk in 2007 as being other than simple, or in other words as systemic. The prevailing risk category until 2007 is uncertainty. After this, the text was searched for synonyms for uncertainty, complexity and ambiguity. Since ambiguity is a not commonly used word, the text was also searched for parts of sentences containing 'conflicts of interest' or 'differences in opinion.' This analysis revealed that uncertainty and complexity synonyms were mentioned by interviewees as being present in the early phase of the risk (before 2007), but uncertainty prevailed over complexity. Some interviewees did not explicitly mention uncertainty or complexity (indicated by X in the Table 6). A reason for this can be that interviewees perceive complexity and uncertainty as being inherent in infectious disease governance.

Interviewees were asked as well whether they thought the characteristics of the risk changed during time. From answer summaries became clear that many assumed Q-fever in 2007 being an unique risk and stakeholders did not imagine it happening a second time. More knowledge became available and the outbreak continued, which resulted in a shift from uncertainty to more complexity. Some interviewees mentioned conflicts to arise between farmers and citizens, others mentioned the slow progress of the process due to differences in opinion (they were not understood or heard by others). Some interviewees mentioned ambiguity explicitly as being the prevailing risk category, from others it became clear during the interview that the prevailing risk category was ambiguity.

In short: both desk and field research reveal that Q-fever can be categorized as ambiguous risk. This means that Renn (2005) would have suggested an approach involving (public) participation for Q-fever.

Table 6: Q-fever risk categorized according to interviewees

Interviewee	**Word scan with regard to simple vs. systemic**	**Word scan with regard to complexity, uncertainty, ambiguity**	**Summary of answer (before 2007)**	**Summary of answer (during time)**	**Other indications for Q-fever being an ambiguous risk (during the interview)**
Q1	Worries, severity (2x)	source was unknown, we looked for one source not multiple sources	Worried about the risk, but not everyone had this sense of urgency	Slow progress due to differences in opinion on the severity of the risk, once only (unique risk)	
Q2	More than usual, unique, strange/special risk, worried	X	Unique risk, process delays	Slow progress, once only (unique risk), conflict farmer and citizens	Differences in opinion with regard to how much evidence was needed.
Q3	An outbreak of this size was something new, however difficult to frame the risk	Few was known about Q-fever: the cause, source and health implications were unknown	Ignorance	Differences in opinion on the severity of the risk, once only (unique risk)	Different ideas on the risk considering the evidence and values. In my opinion, EL&I thought Q-fever making people sick was a problem to be solved on the 'human' side.
Q4	Special (2x)	Source was	Special risk,	Slow progress,	Different ideas on the risk

		unknown, few people were expert on Q-fever, little publications available, health implications unknown	uncertainty involved	differences in opinion on the severity of the risk, once only (unique risk)	considering the evidence and values.
Q5	Strange symptoms in a unusual time of the year, worried about the risk, strange phenomenon	Reason for strange symptoms was unknown at first, few publications on Q-fever. The risk was uncertain and complex at first.	Sense of urgency was present from my side, but not with everyone	ambiguous	The veterinary and human side of infectious disease governance had a different perception on the problem.
Q6	Occupational risk, at first sight not different from usual, risk for humans not so large	Little was known about Q-fever, we knew too little to take effective action	Occupational risk, uncertainty	Knowledge gaps are filled, risk was more severe than assumed first	Increasing turmoil in society, dissatisfaction about governmental policy.
Q7	Severe, extra ordinary, sense of urgency	X	Unique risk, sense of urgency was present	Risk was more severe than assumed first, conflict farmer and citizens	
Q8	We did not think the Q-fever risk for humans was going to be severe	Knowledge gaps	Q-fever outbreaks in animals were present since 2005, but they never resulted in problems with humans other than direct contacts	More knowledge became available but not enough due to complexity, not felt taken seriously	There were many different opinions on the size/severity of the risk. Also, not every direct stakeholder was completely informed all the time.
Q9	X	Many uncertainties, nobody knew how severe the situation was	Uncertainty	Ambiguous because of more differences in opinion and interests	

Note 1: the X means that no particular words or indications belonging to this category were found.
Note 2: Q9 was a test-interview after which the structure of the interview has changed. Therefore, the answers of this interviewee are only used for the categorization of the risk.

4.4 Extent to which actual risk governance resembles the suggested IRGC-approach

Some steps of the IRGC-framework are implicitly or explicitly present in the structures of infectious disease control, some are not. The absence of IRGC-framework steps taking place could have lead to risk governance deficits (see chapter 2). Therefore, this paragraph points out the present and absent IRGC-framework steps in infectious disease governance for Q-fever and the (possible) resulting governance deficits.

4.4.1 Partial risk pre-assessment (IRGC-step 1) during actual risk governance

Several events on the timeline (2006, May 25t/29th 2007, June 1st 2007) indicate that efforts to collect and interpret signs of risk (*early warning*) took place during the Q-fever outbreak. In the early phase of the Q-fever outbreak though (July 23rd 2007), the OMT of July 23rd 2007 advised structural monitoring which was declined in the BAO meeting. Furthermore, in the early phase of the outbreak, there were contacts between those looking for early signs (GD, general practitioner, hospital) and those acting upon them (GGD, RIVM-LCI) indicating that early warning took place.
With regard to *screening*: once a week there was a so called signaling meeting at RIVM-LCI. Later, weekly response meetings took place. In contrast to early warning and screening, the timeline and existing documents indicate no signs of *explicit research to framing and existing conventions*. The absence of these IRGC-steps could have led to risk governance deficits occurring.

The first risk governance deficit that can be identified in risk pre-assessment is: B1 failure of managers to respond to early signals that a risk is emerging. Deficit B1 can be derived from the timeline (2006: the ministry of EL&I considered research to be of lesser relevance and June 11th 2007: RIVM-LCI argues that number of notifications is within yearly marges). The consequences of this deficit are possible lower efficiency: if EL&I would not have rejected research to *Coxiella Burnetii* in 2006, a broader range of knowledge could have possibly been present in 2007 when an outbreak occurred. Earlier recognition of Q-fever being an outbreak could have fostered effiency at the time as well. However, Q-fever was soon recognized as an exceptional risk which is proven by an OMT taking place on July 23rd 2007. Whether deficit B1 could have been prevented for if the IRGC-framework would have been applied is questionable, since deficit B1 was no result of an absent IRGC-step taking place (early warning and screening did take place). Limited resources will always allow risk assessors and managers to prioritize between risks.
A second occurring deficit is A3: different stakeholders having conflicting views on the issue (Todd 2011). The timeline (July 11th, 23rd, October 25th, December 11th 2007) reflects there are implicit indications of stakeholders possibly having conflicting views on the issue. Research to framing could have explicitly revealed these conflicting views on the risk. This could have fostered the effectiveness, efficiency and acceptance of risk governance through mutual understanding.

4.4.2 Partial interdisciplinary (risk) estimation (IRGC-step 2) during actual risk governance

4.4.2.1 Implicit risk assessment, mainly (human) medical experts (IRGC-step 2a)

According to Renn (2005, p.26), "the final product of risk assessment is an estimation of the risk in terms of a probability distribution of the modeled consequences." This final product resembles the aim of an OMT or DB (Timen 2010). OMT and DB took place several times (June, October 2007, June 2008, July 2008, May and November 2009, March 2010, June 2011) in case of Q-fever. Besides this, on April 9th 2010 an expert meeting with participants from Europe and the USA was held in Paris resulting in a risk assessment report (ECDC 2010) on Q-fever. Risk assessment was thus no absent IRGC-step during the Q-fever process. Nevertheless, a risk governance deficit (A4) occurred and could have possibly prevented for. Deficit A4 refers to the failure to adequately identify and involve relevant stakeholders in risk assessment. The timeline (November 3rd 2009) and Table 8 below show that OMT/DB participants were unequally included with regard to human health/animal health and not all (from literature) advised disciplines (environmental experts, climatologists, economists, mathematicists) were included in the risk assessment. According to the ECDC (2010, p.8), the following factors were taken into consideration when relevant in their risk assessment: ethics, appropriateness, economic evaluation, harms and benefits. This could be an indication of a broader range of disciplines being involved in the ECDC (2010) risk assessment. Table 7 below shows this partly to be the case. The consequence of deficit A4 could have been a lower level of acceptance (due to unequal representation of stakeholders) as well as lower effectiveness (economists could have advised about monetary consequences of measures and environmental experts/mathematicians could have possibly modeled the spread of the bacteria).

Table 7: Participants DB and OMT during Q-fever
Source: RIVM, ECDC (2010)

OMT #40	*Permanent participants* Sanquin, NHG, GGD HvB, GD for animals, NVWA, hospital/laboratory, advisor, NVMM, RIVM-LCI, internist, GGD Amsterdam, head RIVM-CIB. *Observers* GGD HvB, GG&GD Utrecht, RIVM (LIS, LCI 3x, LZO, EPI 2x)
OMT #41	*Permanent participants* RIVM-CIB, RIVM-LCI 2x, GGD Amsterdam, internist (2x), NVMM. *Advisors* lung doctor, doctor (microbiologist), doctor medical microbiologist, NVWA 2x (veterinary inspector and technical expert), GD for animals, GGD HvB 2x, NHG, RIVM (LIS 2x, EPI)
OMT #42	*Permanent participants* head RIVM-CIb, RIVM-LCI doctor (infectious diseases), internist, NVMM. *Advisors* LUMC (gynaecologist), RIVM (EPI 2x, LIS, LZO), NVWA 2x, hospital 4x, GD for animals, GGD HvB 2x
OMT #43	*Permanent participants* RIVM-LCI, RIVM-CIb. *Advisors* RIVM (LZO 2x, EPI), CVI,

	KVGN, NVWA 3x, GGD HvB 2x, GD for animals 2x, WVA, vet, university veterinary expert
OMT #46	RIVM-CIb 3x, NVMM, hospital 2x, NVWA, GGD HvB 2x, GD for animals, NKAL, RIVM (LIS, EPI, LZO), CVI, GGD Amsterdam, GGD Brabant ZO, AID
DB 2008	RIVM-CIb, GGD HvB, GD for animals, CVI, UU (veterinary), Ministry of EL&I, Ministry of VWS, NVWA 2x, RIVM (LZO, EPI, LCI), LTO
DB 2009-1	RIVM-CIb, vet 2x, CVI 2x, GD for animals, RIVM (LZO, LCI 2x, LIS)
DB 2009-2	RIVM-CIb, vet, CVI 2x, RIVM LCI 2x, stigas, GD for animals 2x
DB 2009-3	RIVM-CIb, vet, CVI 2x, RIVM LCI 2x, GD for animals 2x, GGD Brabant ZO
DB 2009-4	RIVM-CIb, vet, CVI 2x, RIVM LCI 2x, GD for animals 2x, GGD Brabant ZO
DB 2011	RIVM-CIb, CVI 2x, NVWA, GD for animals, UU (veterinary), stigas, vet, COM, RAC, hospital, GGD HvB, general practitioner, RIVM (LZO, EPI, LCI)
ECDC (2010) risk assessment	Participants were mainly from regional, national or supra-national governments (20 persons), Sanquin (NGO, 1 person), an independent expert (1) and business/government (1) and had a medical or veterinary background (ECDC 2010, p.7).

4.4.2.2 Absence of a concern assessment (IRGC-step 2b)

From the timeline does not become clear that an explicit concern assessment to Q-fever took place. Questionnaires from GGD HvB and hospital to Q-fever patients and risk groups were aimed at finding the common source (July 2nd/5th/13th 2007), or at gaining more knowledge on the medical aspect of the outbreak (August 10th 2007).

The absence of a concern assessment could have led to risk governance deficit A3: lack of adequate knowledge about values, beliefs and interests and therefore about how risks are perceived by stakeholders. The consequences of deficit A3 could have been lower acceptance of risk governance. Indications for this can be found on the timeline on early November 2009 (Q-uestion foundation), March 1st 2010 (Chamber of Deputies discussions), May 23rd 2008, January 14th and 15th 2010 (Chamber of Deputies questions), January 2012 (National Ombudsman research). Media attention and association with industrial instead of natural sources are important factors influencing risk perception of the public (see Table 2, paragraph 2.4). Since Q-fever receives much attention in the media (see timeline June 22nd 2007, December 5th/6th 2009, figure 11)[63] and Q-fever is associated with discussions in scale increases in industrial farming (see civil society initiatives: timeline July 2009, February 10th 2012 and Chamber of deputies discussions: timeline May 23rd 2008, August 2009, January 14th/15th 2010, November 17th 2011 and Oppers 2010), a concern assessment could have anticipated on the concerns of stakeholders and the values[64] associated with the Q-fever risk. Anticipation on these concerns and values could have fostered acceptance in risk governance.

4.4.3 Possible implicit risk characterization and evaluation (IRGC-step 3) during actual risk governance

The advice of the OMT is in turn weighed in a BAO with regard to the managerial feasibility (including economic, political and juridical feasibility). Since the OMT advice is taken as input for a BAO, the evidence based component is taken into account while deciding upon measures. The timeline does however not reveal whether value based concerns of (in)direct stakeholders are weighed in decisions upon measures. The timeline thus does not reveal whether deficit A5 occurred: failure to consider variables that influence risk appetite and risk acceptance. Todd (2011) mentions the (deliberate) exclusion of some stakeholders and their views as a possible deficit for this IRGC-step, whether this deficit occurred does not become clear from the timeline. The media analysis could help in identifying whether values are weighed in deciding upon measures. The notification obligation is decided upon on June 12th 2008: among this time, a peak can be seen in the upper half of figure 11. However, this peak in turmoil in society could also be the results of the increasing number of Q-fever patients. Another important measure is the culling of goats and is decided upon in December 2009; in

[63] Camp (2001) and Van Dijk et al (2010) in particular mention the show Zembla in December 2009 as a media source influencing public opinion.

[64] The values in the Q-fever debate resemble the values present in the debate around industrial farming (Oppers 2010) and are: good information, fair prices for products, animal friendly practices, the landscape, the environment and public health (Oppers 2010, p.3).

figure 11 a peak in turmoil in society can be seen in this period as well. However, there are other peaks visible in the graph in February, April, June and August 2009 and several in 2010, which cannot necessarily be linked to measures decided upon by risk managers. From the turmoil in society graph thus does not become clear whether societal concerns are (sufficiently) taken into account while deciding upon measures. The consequences of this possible occurred deficit are lower acceptance with regard to measures and lower cooperation (resulting in lower effectiveness and efficiency).

4.4.4 No participatory risk management (IRGC-step 4) during actual risk governance

The timeline reveals that Q-fever can be classified as ambiguous risk. If ambiguity is involved Renn (2005) proposes participative decision making (also called deliberation). The timeline does indicate a representative of farmers taking part in risk management (LTO, November 19th 2008) but the timeline does not indicate signs of citizens taking part in risk management.
A possibly linked deficit is B12: inappropriate management of conflicts of interests, beliefs, values and ideologies or B4: inappropriate balancing of benefits and costs in an efficient and equitable manner. The consequence of this deficit is dissatisfaction with management (low acceptance), leading to lower cooperation resulting in lower effectiveness. The many evaluations (see timeline January 19th 2010 and January 2012) and civil society initiatives (see timeline early July 2009, November 2009, February 10th 2012) could be an indication of this dissatisfaction with the management. Participatory management could have fostered mutual understanding (and thus acceptance and effectiveness). Possibly, participatory management could have fostered the variety of measures as well (resulting in higher effiency and effectiveness).

4.4.5 Partial early risk communication (IRGC-step 5) during actual risk governance

The goal of ideal risk communication with regard to those outside the immediate interdisciplinary (risk) estimation or risk management process is informing and engaging. Informing did take place, but engagement did not. In other words: communication took place one-sided; communication *to* the public took place, communication *with* the public possibly not (at least it cannot be derived from the timeline). With regard to the (regional) public, early involvement took place (June 21st/22nd 2007). With regard to the national public, on July 23rd 2007 it was decided that no early informing of the risk should occur. Several certainties and uncertainties were communicated to the public on October 4th 2007 though. Whether uncertainties and certainties were sufficiently early communicated to the public thus does not really become clear from the timeline, but according to Van Dijk et al (2010, p.111) and the minister of VWS as EL&I early communication towards the public did not take place (see timeline December 20th 2010). One-sided communication is mentioned as a risk governance deficit in Todd (2011). The consequences of this deficit are: a lower level of acceptance (which is acknowledged by Van Dijk et al 2010).

In short: absent IRGC-steps were research to framing, existing conventions and concern assessment. Partly applied IRGC-steps were risk assessment (a broader variety of disciplines is involved in the IRGC risk assessment) and risk communication (IRGC risk communication focuses on certainties and uncertainties and early involvement). The following risk governance deficits would possibly not have occurred if all IRGC-steps were (fully) applied: A3, A4, A5, B12 (see Appendix 1) and one-way communication. The analysis on absent and present IRGC-steps thus suggests there possibly being room for added value with regard to effectiveness, efficiency and acceptance in case of full appliance of all IRGC-steps.

4.5 Description of the suggested IRGC-approach during Q-fever (hypothetical situation)

Several steps of the IRGC framework did not occur in reality. In the hypothetical situation, all IRGC-framework steps would have been applied. Both the time line and media analysis helped defining possible moments in time in which the IRGC-framework steps could have been applied.

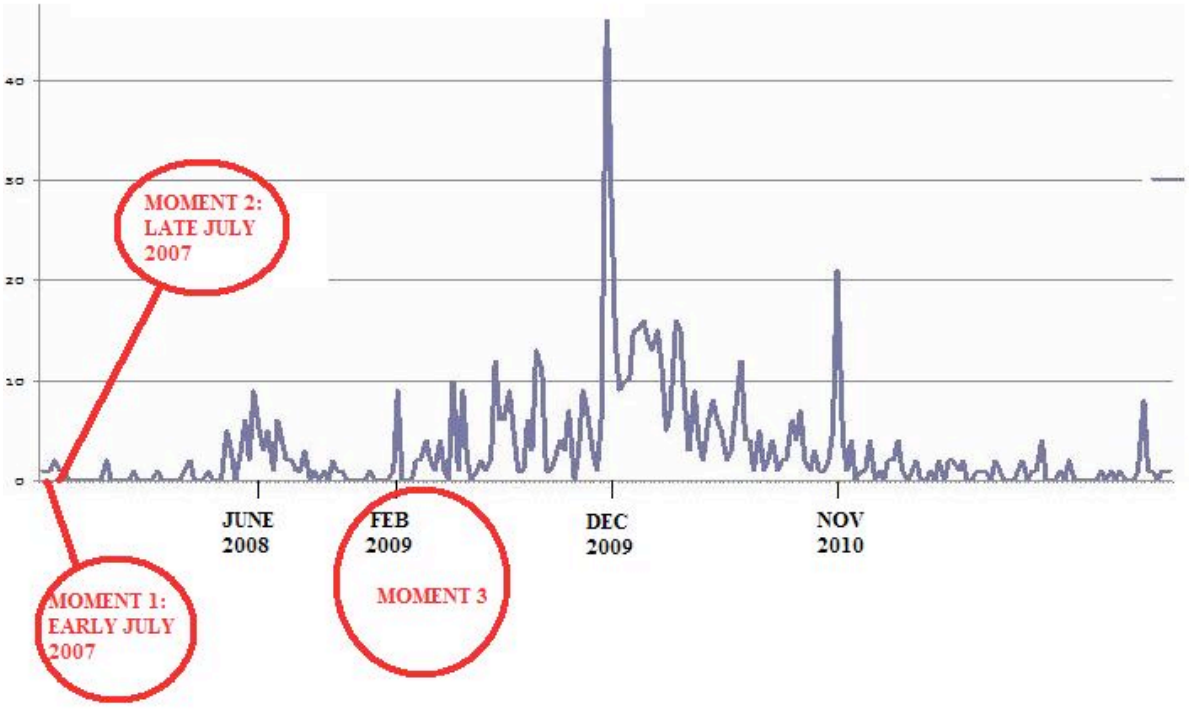

Figure 12: When could the absent IRGC-steps possibly have been applied during the Q-fever outbreak?
Source: author

Moment 1 is linked to IRGC-step 1: risk pre-assessment. Ideally, some pre-assessment elements takes place continuously (screening and early warning), while other elements (research to framing and existing conventions) can take place once a risk is recognized as being a risk. Desk research reveals that Q-fever was recognized as being a risk in early July 2007, since then first contacts between RIVM-LCI, the general practitioner and GGD took place about Q-fever. Since early warning and screening did take place in the actual situation, questions are asked on research to framing and existing conventions. The emphasis of the questions was on research to framing, since the intent and operationalization of research to existing conventions was not completely clear.
Moment 2 is linked to IRGC-step 2: interdisciplinary (risk) estimation (containing risk assessment, 2a, and concern assessment, 2b). This moment is chosen because a first risk estimation is made in the first OMT on Q-fever. Hypothetically, a broad range of disciplines would have been involved into the risk assessment. Also, hypothetically a concern assessment takes place around the same time a risk assessment takes place.
Moment 3 is linked to IRGC-step 4: risk management. The reason for choosing February 2009 as a moment is based on the media analysis: from February 2009 on one can see that publications in national newspapers are increasing (with a peak in December 2009). Based on the timeline, one can see that civil society initiatives were started in 2009 and a further analysis on newspaper publications revealed that Q-fever was increasingly associated with industrial farming; ambiguity on values became visible in the Q-fever debate.
With regard to risk communication (IRGC-step 5), no specific moment in time was chosen because of the fact that risk communication is central in the IRGC framework and should occur throughout the whole process. Since the field of literature on risk communication is extended and containing many controversies, this research will solely focus on early communication about certainties and uncertainties to the general public for the hypothetical situation.
No specific moment is chosen for risk characterization and evaluation (IRGC-step 3) either, since the input for this are the results of both the risk assessment and concern assessment. Since the latter did not take place, it seemed to be too far-fetched to pick a moment for this to take place. Instead, interviewees were asked a more general, fundamental question: whether they thought a judgement

based on values and facts should take place and whether they thought this was inherent into the OMT/BAO structure.
In short: hypothetically, research to framing and existing conventions would have occurred in early July 2007. A concern assessment would have taken place in late July 2007 (and would possibly have been repeated), about the same time the first OMT took place. Participatory management would have taken place in February 2009, since at the time there were several indications for the Q-fever risk being ambiguous. This hypothetical situation served as the basis for questions to stakeholders.

4.6 Suggested IRGC-approach feasible, more effective, efficient and accepted?

Among the aims (see paragraph 3.1) of the semi-structured interviews were finding out whether: b) the hypothetical situation would have been possible (feasible) considering the time frame and c) the IRGC-steps could have contributed to the enhancement of effective, efficient and accepted infectious disease governance. In order to fully grasp the added value with regard to effectiveness and efficiency, interviewees were also asked for the contribution to measure variety since both effectiveness and efficiency are related to this (see paragraph 2.3). Measure variety refers to the idea that effectiveness and efficiency are fostered by timely pointing out all possible intervention measures.

4.6.1 Pre-assessment in early July 2007

4.6.1.1 Framing feasible, considered of low added value

Interviewees were asked whether it was possible or feasible in July 2007 to make a short overview (or quick scan) of all involved stakeholders and their view of the problem by doing desk research (framing) considering the time pressure. Although not all interviewees were sure about the feasibility of research to framing because of other reasons (e.g. not part of usual practice (Q6), a lack of mutual understanding (Q8)) with regard to time pressure there were hardly any doubts (6/8 argued research to framing being feasible in July 2007).
Furthermore, interviewees were asked whether they thought such a quick scan would have had added value with regard to the outcome variables effectiveness, efficiency, measure variety and acceptance in case of Q-fever. Interviewees were asked about their opinion on the added value of research to framing by doing *desk research only*. Most interviewees (6/8) mentioned actual contact as a prerequisite for one or more of their answers on added value.[65] Since research to framing is preceding a concern assessment in which actual contact *does* take place and all IRGC-steps are interlinked,[66] a separation of questions does not truly reflect the IRGC-framework. It is therefore difficult to conclude that the answers on research to framing with regard to the added value are reflecting true opinions on this matter.
In short: research to framing was explained to interviewees as making a short overview of all involved stakeholders and their view on the problem by doing desk research only. This was considered feasible to do with regard to the time pressure in July 2007. In the IRGC-framework, research to framing and a concern assessment are sub-sequent steps, but the IRGC-steps were separated in the interviews because of practical reasons. Explained in this way, interviewees considered research to framing to be of low added value with regard to effectiveness, efficiency and acceptance. Many (6/8) interviewees favoured actual contact over desk research.

Table 8: Results on feasibility and added value of research to framing for Q-fever

Interviewee	***Feasible?***	***A: Acceptance B: Efficiency C: Measure Variety D: Effectiveness***	***Remarks***
Q1	Yes	A: Yes B: No	A: You can grow together towards a solution. B: No. Unless the political frame (culling never again) was discussed and the result

[65] Either interviewees mentioned actual contact as a prerequisite at the first sub-question on added value, or during further sub-questions on added value with regard to desk research to framing.
[66] One should keep in mind though that the five IRGC-steps "should not be seen as sequential steps but rather as closely interlinked elements" (cf. Renn 2005, p.26).

		C: Yes D: Maybe	would have been a different political frame. C: Yes, but only if actual contact takes place. If one thinks for another, there is the danger of being wrong. Actual contact might stimulate creativity: ask stakeholders. D: Only if it takes place frequently, because then stakeholders get used to jargon. Difficult though to find representatives. *Interviewee emphasized on actual contact with stakeholders.*
Q2	Yes	A: Yes B: ? C: ? D: ?	A: Infectious disease control is more than finding and eliminating the source: interests are involved and it is very useful to be aware of this. B: I do not know. Cooperation is based on trust, if one asks about how stakeholders perceive a risk you do not know anything about trust. C: I do not know. D: Difficult to say. It is always good to reflect on ones daily business and take a step back for a look at the bigger picture. *Interviewee emphasized on actual contact with stakeholders.*
Q3	Yes	A: Maybe B: Maybe C: Yes D: ?	A: People should be questioned about the risk. B: Maybe. During Q-fever the patient as a stakeholder was missing. Better start with a too large group of stakeholders than forgetting one and include it later; this costs more time. C: It could stimulate creativity. D: Missing. *Interviewee emphasized on actual contact with stakeholders.*
Q4	Yes	A: Maybe B: No C: Maybe D: ?	A: Now everyone only focused on his own responsibilities. Maybe mutual understanding would have been the result, if explicit discussion on perception would have taken place. B: Not in July 2007. C: Maybe measures could have fitted practice better (e.g. hygiene measures) if actual contact and a measure-test would have taken place. Or other measures (transport ban) would possibly have sooner popped up. D: Missing. *Interviewee emphasized on actual contact with stakeholders.*
Q5	?	A: No B: No C: ? D: ?	A: It would only be of added value if actual contact takes place. Politicians might be able to estimate how stakeholders perceive a risk, medics have a limited scope (hardly looking at (general) policy). B: No further explanation. C: Missing. D: Missing. *Interviewee emphasized on actual contact with stakeholders.*
Q6	Yes	A: No B: ? C: No D: ?	A: Acceptance goes up if stakeholders are involved into the process and if stakeholders think measures are adequate. B: Missing. C: Implicitly it was assumed that certain measures (e.g. culling of animals) were not among the possibilities: I think this was only the case when people got sick (so in 2007 no added value for measure variety). D: Missing. *Interviewee emphasized on actual contact with stakeholders.*
Q7	?	A: Yes B: Yes C: ? D: ?	A: No further elaboration. B: If this problem was tackled in a more structured way, we would have possibly done a scenario analysis. C: Missing. D: Possibly if worked with scenarios in 2007, anticipation on a three times as severe problem could have taken place.
Q8	Yes	A: No B: No C: ? D: ?	A, B: Was feasible to do, but at the time stakeholders did not understand each other so there would not have been any added value in this. C, D: Missing.

4.6.1.2 Not clear whether selection of existing conventions was feasible or of added value

The analysis on existing conventions was explained to interviewees as being research to existing rules, habits and definitions within an organization. In such an analysis, answers are given to questions like: What is the definition of risk within our organization? What are our assumptions about risk exposure? What are the limits of mathematical tools used within our organization? Interviewees were asked whether such an analysis would have been feasible considering the time pressure in early July 2007 and what it would have contributed for Q-fever in terms of A) the balance in short- and long term effectiveness, B) acceptance, C) efficiency and D) the variety of measures.

With regard to feasibility, 2/7 argued that a more thorough analysis should be done and therefore it would not be possible or feasible during a crisis (Q1, Q6), two others however argued that due to a present sense of urgency there is more possible in crises than could be imagined by outsiders (Q1, Q8). 3/7 answered maybe to the feasibility of the analysis on existing conventions. The difference in

these answers could have been the result of having a different idea by performing such an analysis: some favoured a more thorough analysis, while others thought of a short analysis. Besides this, some prerequisites were essential according to interviewees: one interviewee mentioned that there should be acceptance on the idea that there is more than event*consequence*chance (Q2), three others mentioned that the results of such an analysis should be discussed with each other (Q1, Q5, Q7). More than half (4/7) of all interviewees was positive about the added value of an analysis on existing conventions with regard to acceptance and the balance in short- and long term effectiveness (5/7).
In short: 4/7 of the interviewees were positive with regard to such an analysis and its contribution to the balance in short- and long term effectiveness and 5/7 with regard to acceptance. However, interviewees had different ideas on how to perform an analysis on existing conventions (thoroughly or short) and mentioned prerequisites with regard to their answers. Therefore, no general conclusions can be made on the added value and feasibility of such an analysis.

Table 9: Results on feasibility and added value of research to existing conventions for Q-fever

Interview ee	***Feasible?***	***A: Effectiveness B: Acceptance C: Efficiency D: Measure variety***	***Remarks***
Q1	Maybe	A: ? B: Yes C: Yes D: Maybe	On the one hand you want to do such an analysis in a sound way, on the other hand there is an urgency to act or take measures. Besides, stakeholders should be flexible and open for different worldviews. A: In July 2007 the focus was on doing research, not on control or prevention. B: No further explanation. C: No further explanation. D: Only if the analysis is discussed with others (the dialogue is crucial for it to be of added value) outside of the organization.
Q2	Maybe	A: Yes B: Yes C: Yes D: Yes	A prerequisite for doing this is some kind of acceptance that there is more than event*consequence*chance; this is not the case by many medics because they are too beta-oriented. In times of crisis it is not possible to do this. A: I see it as a shortcoming of infectious disease control that we have a limited medical view. B: No further explanation. C: Possibly. Someone more indirectly involved (like the head of GGD) or a politician can do this. A difficulty with the latter is that many argue politics, money and power should be separated from science. D: Yes, but impossible to say with one hundred percent certainty.
Q3	X	X	Interviewee considered him or herself as being not in the position to answer this question.
Q4	Yes	A: Yes B: No C: Maybe D: Maybe	A problem is that within organizations, on differing units of an organization, there can be differences as well. For example: LCI is more focused on control of health risks, LZO is more focused on prevention for health risks. A: Yes, an international consultation during Q-fever is the example. Here, an Australian guest reflected on common practices in the Netherlands and was an example of thinking out of the box. B: Not in this phase, there was too much unclear. C: Not directly but maybe if we would have come up sooner (in 2008) with other measures (see D). D: A human vaccination as measure (as suggested by Australia) is in my opinion rejected because of the assumption that it would not work. Other examples: vaccination of cattle and transport ban.
Q5	No	A: Yes B: Yes C: Maybe D: Yes	Such an analysis would have been feasible, but in 2003. I think it is strange that at the time no research took place to the import of enormous large amounts of goats in the Netherlands. A: It is essential for stakeholders to look beyond their own frame, people lock themselves in their own frames. Essential is that stakeholders discuss it with each other. B: Could foster mutual understanding. C: On the short term this does cost money, on the long term it is difficult to say how it will turn out in terms of efficiency but I am positive towards the idea. D: It could stimulate creativity.
Q6	May	A: No	A short analysis would have been possible, but I favour a thorough analysis.

	be	B: Yes C: No D: No	A: It is not possible to change an organisation in times of crisis. B: Because we would have included stakeholders earlier in the process. C: Because it was not common practice, it would have given many struggles at the time. D: The choice for measures can be different, the set of measures stays the same.
Q7	No	A: No B: ? C: ? D: No	In this specific situation, it would have not been feasible to perform such an analysis and discuss it with each other (the latter is in my opinion essential for added value) because the human and veterinary column were not on the same line. A: No because discussion on this analysis would not have occurred. B, C: Missing D: No further explanation.
Q8	Yes	A: Yes B: Yes C: ? D: Yes	There is more possible in crises than one can imagine. Essential is though that those needed in a meeting, have to have the sense of urgency for this potential risk. In 2007 this was the case, but not in 2005 or 2006 (while in my opinion the potential risk was present earlier than 2007). A: Because one tries to explain more detailed how one comes to a certain conclusion, mutual understanding (and more effectiveness) is the result. B: How much it contributes to acceptance I cannot say. C: Missing D: Seems logical.

4.6.2 Interdisciplinary (risk) estimation in late July 2007

4.6.2.1 Multidisciplinarity considered of added value and possibly feasible

As described above, risk assessment was associated with an OMT and took place for the first time at the end of July 2007. Interviewees were asked whether they thought that considering the characteristics of the risk, it was unambiguously clear which knowledge was needed. 3/8 of the interviewees argued this not to be the case. For 2/8, it was difficult to derive a clear yes or no from the answers and one interviewee was not present at this meeting (and therefore did not consider him/herself to be in the position to answer this question). Some interviewees referring to knowledge missing, (implicitly) referred to medical knowledge missing (Q2, Q6, Q7). One interviewee (Q5) explicitly used the categorization of risk in answering this question.

Also, the feasibility of a broad variety of disciplines was part of the questions on risk assessment. There was consensus on the fact that *time pressure* would not have been a problem. However, there were doubts about the feasibility of the inclusion of a broad variety of disciplines into the risk assessment in 2007 for other reasons: it took place in the middle of the summer (Q4), there were too many uncertainties at that time (Q5), there was no sense of urgency present in 2007 (Q8). Both Q4 and Q5 proposed 2008 as an alternative. One interviewee added that a variety of disciplines is not always needed (Q6), and another strongly argued that there would be no room for a broader variety of disciplines *within* the present OMT/BAO structure but if considered to be of added value possible to organize in a different meeting (Q2).

Table 10: Results on feasibility and added value of multi-disciplinarity in risk assessment for Q-fever

Interviewee	***Knowledge gap clear?***	***Feasible?***	***A: Effectiveness B: Acceptance C: Efficiency D: Measure variety***	***Remarks***
Q1	No	Yes	A: ? B: ? C: No D: Maybe	A: Scientists are very detailed and not practice oriented, which makes it difficult. Input from scientists is good, but infectious disease managers have to decide what to do with it. B: Missing. C: Not necessarily: scientists always plea for further research, and there is not always money for this. D: The more people, the more opinions. As long as there is a strict division between knowledge input providers and those who make the decisions, it can be helpful.
Q2	No	Yes	A: Maybe B: No C: Maybe D: Yes	A: for the balance in short- and long term effectiveness are not necessarily more or other scientists needed, as long as both short- and long term are explicitly on the agenda, this should be taken into account. B: for outsiders they are still a bunch of scientists.

				C: As a result of D, time wise it would have turned out positive. D: this is a point that should be acknowledged.
Q3	Maybe	Yes	A: Yes B: Yes C: Maybe D: Yes	A: A **climatologist** could for example provide insight in how a bacteria spreads through the environment. B: No further elaboration. C: better start with a broad variety of disciplines and thin out while time goes by. On the short time this thus means higher costs, on the long term less time and money. D: More disciplines means a broader view on the problem.
Q4	? (missing)	No	A: Yes B: Maybe C: ? D: ?	Feasibility: In 2008 this could have taken place, we could have looked at the risk from a more systematic point of view, also because at that time it was clear that the risk continued. A: an expert on **risk communication** would have been of added value at the time. Also an **economist** could have explicitly looked at the factual costs with regard to the veterinary and human column. *Mathematicians* were present. An **environmental** expert: if looked at other projects, there is often an environmental expert involved but not in infectious disease control (which is a lack). B: Depends on the outcome. Not sure whether practically oriented stakeholders (e.g. farmers or vets) see the difference between scientist a and scientist b. C: Missing. D: Missing.
Q5	?	No	A: Yes B: Yes C: Yes D: Yes	A: I doubt whether a broad variety of disciplines would have added value in 2007 because we knew too little about underlying causes for the risk (about the system in which the risk occurred). Medics are good at looking at individual persons, but they often forget about the broader context in which a risk occurs. In 2007 there sociologists, mathematicians or climatologists could not have helped controlling the disease. In order to make a more inclusive risk estimation, we should have entered the size-of-industrial-farms-variable into the model. In 2008 a **mathematician** and an **expert with systems view about the spread of the disease** could have contributed. B, D: If in 2008 a broad variety of independent researchers would have gotten together, a different set of measures would probably have been the result. We would have both prevented for turmoil in society (beginning in 2009), as well as culling all those goats. C: An independent, multidisciplinary team of scientists can make decisions with which probably not everyone is happy, but it would have lead to actions.
Q6	Yes	Yes	A: ? B: Yes C: Yes D: No	A: An OMT is in my opinion meant for control (short term effectiveness), DB is meant for prevention (long term effectiveness). B: The more viewpoints included, the better you can communicate to the public about everything you have thought of. You thus leave less knowledge gaps, resulting in lower turmoil in society. However, participation is more important for acceptance. C: As a result of D: more proportionate measures ultimately lead to lower money and time spending. D: Maybe more precise or adjusted measures could have been the result. I think risk assessors (RIVM) should be given the task to decide which disciplines are needed for a risk assessment. **Socio-economic** experts should **not** take part in a risk assessment, this knowledge is included in a BAO.
Q7	No	Yes	A: M B: Yes C: ? D: Maybe	Feasibility: A broad variety of disciplines does not have anything to do with the fact that there was a gap between the human and veterinary column. A, B: The focus was on control of the infectious disease, the long term is not discussed. It is not about the quantity, but about the quality of disciplines. A **socio-economic** scientist would have had added value with regard to acceptance: Q-fever caused an enormous decrease in trust with regard to the government. C: Missing. D: A **lawyer** could have contributed with regard to the possibilities from a legal point of view. Maybe not in OMT itself though.
Q8	?	N	A: Yes B: Maybe	A: Said with present knowledge. However, in 2008 a meeting was organized in which an **ethic** was present. This expert contributed

			C: Yes D: Yes	enormously with regard to Q-fever and pregnant women. Especially with new risks a broad variety of disciplines is of added value, it helps in keeping an open mind towards the risk. B: No further elaboration. C: Although knowledge gaps will not be completely filled, a broader variety of disciplines can contribute to efficiency. D: Other disciplines look from other viewpoints.

Note: ? in this table means that the answer could not be derived. If the answer was missing, it is explicitly reflected in the table.

Furthermore, interviewees were asked whether they thought a variety and equal distribution of disciplines would have contributed to A) the balance in short- and long term effectiveness, B) acceptance, C) efficiency and D) the variety of measures.
According to four interviewees, a variety of disciplines could contribute to the balance in short- and long term effectiveness because it would result in a more inclusive risk estimation and would help keeping an open mind towards the risk. It was less sure though, whether it would have contributed to effectiveness in 2007. The year 2008 was more often given as an alternative. One interviewee argued that for the balance in short- and long term effectiveness are not necessarily more or other scientists needed, but both the short- and long term effectiveness should be explicitly on the agenda (Q2). Another argued that short term effectiveness is discussed in an OMT and long term effectiveness is discussed in a DB (Q6).
Four out of eight interviewees argued that a broader variety of disciplines would contribute to acceptance: a different set of measures would have lead to different perception, or measures taken could have been better explained. Not everyone was sure though: two interviewees questioned whether the general public would see the difference between scientists from different disciplines (Q2, Q4).
Interviewees were less sure about whether a broader variety of disciplines involved in a risk assessment would contribute to efficiency. Reasons were: scientists always arguing for further research (Q1), although maybe positive with regards to the long term, on the short term it would cost more money and time to bring many scientists together (Q3). On the other hand: three interviewees argued that more proportionate or inclusive measures as a result from a broader inclusion of disciplines, would lead to less money and time spending (Q2, Q6, Q8).
Four out of eight (4/8) interviewees agree that a broader variety of disciplines would result in a broader variety of measures, because different disciplines look from different viewpoints. One interviewee argued that not necessarily more or a wider variety, but more proportionate measures could be the result (Q6).
In short: it is difficult to conclude that it was unambiguously clear which knowledge was needed on Q-fever in July 2007, 3/8 said no while 3/8 was not sure. The feasibility of the inclusion of a variety of disciplines within a risk assessment with regard to time pressure is unanimously agreed on, however when or where exactly this should take place is disputed. Although many were not sure if a variety of disciplines would have had added value with regard to Q-fever risk management in 2007, 2008 was often given as an alternative. Half of the interviewees (4/8) argued that the involvement of multiple disciplines within a risk assessment would have contributed to effectiveness, acceptance and measure variety. Interviewees were less sure about the contribution for efficiency; 3/8 argued it could positively contribute to efficiency in the long term. There was no consensus on which disciplines should be involved, mentioned were: environmental expert (3x), communication expert (1x), lawyer (1x), mathematician (1x), ethic (1x), socio-economist (1x), economist (1x).

4.6.2.2 Concern assessment feasible, considered added value for acceptance
With regard to concern assessment, interviewees were asked whether they thought it was feasible (considering the time pressure) to perform a concern assessment. Many (6/8) of the interviewees thought it would have been feasible in July 2007 to perform a concern assessment and provided ideas on how to perform such an assessment in the future. The answers ranged from the idea to bring stakeholders together in a meeting (on the regional level, or national level) (Q1, Q3, Q5), to panels or random sampling by telephone (Q4). Also mentioned was the possibility to ask questions when visiting farms (Q8), since in case of zoonotic diseases farm visits often take place. Remarkable was that many of the interviewees found an opportunity to perform such an assessment within the existing

structure. One of the interviewees doubted whether there was a sense of urgency present among stakeholders in 2007; the interviewee therefore argued that a concern assessment was probably not feasible in 2007, but it maybe it would have been 2008 (Q7). Another interviewee argued for more structural meetings, because of the fact that mutual understanding among stakeholders would be a time consuming activity. This should take the form of a commission in which some fixed and some changing participants take part, the latter depending on the type of zoonotic disease (Q5).
Besides, interviewees were asked about what they thought a concern assessment would have meant for the acceptance of Q-fever policy. The majority of the interviewees was positive about this, due to the fact that it would contribute to mutual understanding among stakeholders. Three of the interviewees mentioned that a concern assessment could prevent for conflicts, frustrations and scapegoating (Q3, Q5, Q6), three others mentioned that simply the idea of being heard could contribute to acceptance as well (Q2, Q4, Q7). According to one interviewee, acceptance starts with communication (Q1) and another argued that it would result in more involved stakeholders. Even though the majority was positive about a concern assessment, two interviewees doubted whether it would be possible to perform a representative random sample (Q2, Q8).
In short: six out of eight interviewees were positive about the inclusion of a concern assessment with regard to acceptance for Q-fever, the same amount of interviews considered it being feasible. The same amount of interviewees argued it would have been feasible to do such an assessment in July 2007. In theory, a concern assessment is the subsequent step of research to framing. Interviewees thought the inclusion of a concern assessment in infectious disease governance would be of added value with regard to acceptance, but this was not the result of the answers of research to framing. This difference in answers can be explained by the method of questioning: interviewees often mentioned actual contact as a prerequisite for added value. Research to framing was explained to interviewees as desk research to values and emotions of stakeholders, a concern assessment was explained to as field research to values and emotions of stakeholders.

Table 11: Results on feasibility and added value of a concern assessment for Q-fever

Interviewee	***Feasible?***	***When or how to do this***	***Acceptance up?***	***Remarks***
Q1	Yes	OMT or maybe earlier on regional scale	Yes	Will positively contribute to acceptance. In my perception, increasing acceptance starts with communication.
Q2	Yes	Not in OMT but a unit within RIVM can do this	Yes	It is very difficult to perform a representative random sample. Society cannot be divided in groups. A better alternative would be to look at the problem from different points of view: what would be the problem from an economic point of view, what would be the problem in terms of public health etc. Nevertheless, both will positively contribute to acceptance because stakeholders are heard and possibly better understood.
Q3	Yes	Bring stakeholders together in a meeting	Yes	I think that if you bring stakeholders together (risk managers, farmers and citizens), you can prevent for conflicts. Also, turmoil in society is prevented for if groups are allowed to participate, if they have a voice. If you exclude stakeholders from participation, this can result in small frustrations, small conflicts, ultimately leading to something larger.
Q4	Yes	Panels. Or maybe telephone interviews: GGD for citizens, GD for farmers.	Yes	Possibly yes. LTO already does this for example: meetings are organized in which farmers can express their worries. Many farmers were just worried at the time and wanted to know how they could help. I think that a concern assessment also would result in more involved stakeholders.
Q5	Maybe	Bring stakeholders together in a meeting.	Yes	In 2007 a meeting was organized on the regional level (Herpen) on which farmers, citizens and risk managers were present. This meeting proved to be very effective with regard to acceptance: stakeholders talked about the problem, expressed their anger and worries. The result was better understanding among stakeholders and no scapegoating. In 2008 Q-fever became a national problem, and thus such meetings should have taken place on larger scale in order to have the same result.

		Preferably a structural commission including some fixed and some changing stakeholders (depending on the infectious disease) is founded.	No	Doubt whether something like this is always feasible in times of crisis. A structural commission, which meets regularly is in my opinion a good alternative since infectious diseases are always present in our society.
Q6	Yes	X	Yes	I think a concern assessment would have resulted in mutual understanding among stakeholders. Until today, the government is blamed for the fact that we did not take measures while there simply were none to take.
Q7	2007:No 2008: Yes	X	Yes	Now policy is made *about* involved stakeholders instead of *with* them. I think that if you would have asked stakeholders about their perception on the risk in an early phase (and not only make them part of an OMT which is what happened now in 2009), this would have positive results with regard to acceptance because people feel taken seriously and understand why certain measures are taken. A concern assessment is feasible only if a sense of urgency was present. This was the case in 2008 but not in 2007.
Q8	Yes	Questions can be asked when visiting farms.	?	Difficult to predict whether it will contribute to acceptance, there are many different opinions. Also, there will be a vital difference in outcome of this concern assessment if people are first informed or not.

4.6.3 Unclear whether risk characterization and evaluation would be of added value

Interviewees were asked whether the weighing of facts and values was inherent to the OMT/BAO structure of infectious disease control. Three out of eight interviewees answered this question positive, two others thought it was possibly the case. The question on presence of this weighing in OMT/BAO structure influenced the questions on added value: if a weighing of facts and values was perceived to be already inherent in the OMT/BAO structure, no added would have been the result in case of Q-fever (see Q2, Q3, Q4, Q8). The more general approach chosen for this question (interviewees were asked whether they favoured the normative idea of explicitly weighing scientific facts and values and use this for policy determination) turned out to be confusing for interviewees which can implicitly be derived from the answers given: interviewees considered this question to resemble the questions on interdisciplinary risk estimation (which comprises a risk assessment and a concern assessment) or this resemblance could be derived from the answers given (Q1, Q3, Q7). Another interviewee explicitly mentioned this question to be too theoretical (Q2).[67]

In short: three out of eight interviewees strongly believe a weighing of facts and values is inherent in infectious disease governance, two others think it is probably (implicitly) the case. The general method of questioning caused confusion. Also, a variety of answers (with regard to the added value in terms of acceptance and efficiency) was the result. From the answers can therefore not be derived whether explicit weighing of facts and values would have contributed to risk governance for Q-fever in terms of acceptance and efficiency.

Table 12: Results on feasibility and added value of an explicit weighing of values and facts for Q-fever

Interviewee	***Presence OMT/BAO ?***	***A: Acceptance B:Effectiveness, Efficiency or Measure Variety***	***Remarks***
Q1	No	A: Yes B: Msybe	A: No further elaboration. B: Both a concern assessment as a risk assessment involving more disciplines does cost money on the short term. This might turn out favourable with regard to efficiency on the long term. But efficiency is not the most important variable in infectious disease control.

[67] The focus of this question was mainly on the outcome variable acceptance, and if time allowed it in the interviews an exploration was done to (one of the other) outcome variables.

Q2	Maybe implicit	A: No B: ?	A: The weighing of facts and values is done by risk assessors/managers so I do not see why it would contribute to acceptance. People being heard would contribute. B: Efficiency: Too hypothetical question, very difficult to say.
Q3	Yes	A: Maybe B: Maybe	A: It could be positive for acceptance. B: It could turn out positive for the variety of measures.
Q4	Yes	A: No B: No	A, B: Because this weighing is already included in the OMT/BAO structure, there is no added value.
Q5	Yes		Question missing.
Q6			Double interview, question not asked.
Q7	? (missing)	A: Yes B: Maybe	A: Scientific risk assessment has been done very well, but risk perception we missed completely. Measures were made proportionate with regard to the farmer, but not necessarily they were proportionate for the citizen. So I think it would have contributed to acceptance if we would have weighed perception on the risk. B: Effectiveness: Q-fever management has focused mainly on the short term effectiveness (controlling the disease). Only after a while the long term effectiveness got into the picture. Maybe an OMT with different expertises (mathematicians, socio-economists) could have come up with the idea that the Q-fever outbreak would repeat itself.
Q8	Maybe, implicit	A: Could not be derived B: ?	A: It is impossible to not weigh perception, though a strict division between values and facts should be made. B: Missing.
Q9	Not asked, test interview	A: Maybe B: Yes	A: Only if politicians are willing to act according to this weighing it would contribute to acceptance. B: Efficiency: Because of the fact that communication can be adjusted to the situation it would contribute to efficiency.

4.6.4 Participatory risk management in February 2009 feasible, different timing is preferred

Interviewees were showed Figure 11 representing turmoil in society, and asked whether a participative management approach (starting in February 2009) would have prevented for the peak in turmoil in society in December 2009. Furthermore, interviewees were asked whether they thought a participative approach would have contributed to A) the balance in short- and long term effectiveness, B) acceptance, C) efficiency, D) the variety of measures. Furthermore, interviewees were asked whether they thought a participatory approach would have been feasible during the Q-fever outbreak. In some cases (if time allowed for it), an additional exploration was done to the added value of participation in terms of responsibility recognition of stakeholders.[68]

With regard to the feasibility of the participatory approach, in general there was consensus it would have been possible to actively involve stakeholders. Even though positive, many (six) interviewees mentioned that participation in February 2009 would have been too late in the process and therefore opted for an earlier involvement in 2007 or 2008.

With regard to the balance in short- and long term effectiveness, four interviewees were positive. One interviewee argued that participation does not necessarily results in a weak consensus (Q2). Another stated that participation will mainly contribute to the long term effectiveness, in terms of proportionate action. On the short term though, participation can slow down the process (Q7). One interviewee remarked that participation contributes to a balance in short- and long term effectiveness, only if people will constructively contribute to the thinking process and do not plea solely for their own interests (Q4).

If a participative approach would have been applied in 2007 or 2008, the majority of the interviewees (6/8) was positive its contribution to acceptance. As mentioned before, many argued that February 2009 would have been too late to apply the participatory approach. Three interviewees explicitly emphasized this again with regard to the effects for turmoil in society (Q5, Q6, Q7). However, one of these three also argued that a participatory approach could have positively contributed to turmoil in society if applied in February 2009 though: if at the time the government would have been more transparent about contaminated farms (as a result of the needs made clear by citizens through stakeholder participation), maybe the peak in turmoil would have been prevented for (Q6).

[68] The reason for this is Todd (2011) mentioning an unclear responsibility division as a possible occurring risk governance deficit in this IRGC-phase.

Remarkable was that two interviewees related their answer to the 'basisoverleg' from the existing structure, using it in a different way. Where Q2 used it as argument that participation is present within the existing structure, Q7 argued that this meeting takes place *after* the decision making process and has the purpose of informing stakeholders. Since being heard and having a voice are essential for a contribution to acceptance, in order for this meeting to contribute it should take place *before* the decision making process.

Half of the interviewees (4/8) argued that participation of stakeholders would have a positive effect on efficiency. The following arguments were given: because one can prevent for discussion (Q1), in case of large problems, participation of many stakeholders is essential for good cooperation (thereby stimulating efficiency, Q6), a more inclusive process leads to efficiency on the long term (Q3, Q5). The other half was not sure about participation contributing to efficiency, but did not reject the idea either: there is a reasonable chance that participation of local vets and farmers would have lead sooner to societal relevance and thus sooner to other, different or better measures (Q2), because of mutual understanding as a result from former crises, stakeholder participation can contribute to efficiency. However, at the time being I do not know what would have been the result (Q8). Two persons argued that participation could go both ways for efficiency: it can slow down the process and cost more on the short term, but it can also increase the sense of urgency and positively stimulate the process (Q7). And Q8: positively it could contribute to other measures resulting in lower time and money spending, negatively stakeholders could have made interests pleas slowing down the process.

Most interviewees argued that a participatory approach would contribute to the variety of measures (three yes, three maybe), mainly there would be more people looking at the problem from different viewpoints. Q1 argued that it would contribute to the variety of measures because there would be more moments in which a policy can be adapted to the situation. This is somewhat in line with Q6 who argued that the set of measures is fixed (and therefore the answer to the question was No), but participation could have lead to more proportionate measures.

In short: six out of eight interviewees argued public participation to be feasible. However, February 2009 would have been too late to involve indirect stakeholders in order to have added value with regard to the effectiveness, efficiency and acceptance. Earlier involvement (2007 or 2008) of indirect stakeholders was suggested, and is mainly argued to contribute positively to acceptance and the variety of measures. Interviewees mentioned some difficulties with regard to participation: possible delay due to lobbying interests and difficulty in organizing (or finding a representative for)'the citizen'.

Table 13: Results on feasibility and added value of participatory management for Q-fever

Interviewee	**Feasible?**	**A: Effectiveness B: Acceptance C: Efficiency D: Measure Variety E: Responsibility Recognition**	**Remarks**
Q1	Yes	A: ? B: ? C: Yes D: Yes E: Yes	Feasible: Can be included into the OMT/BAO structure or somewhere outside of this. It does not necessarily need to be a physical meeting, it can also be a skype conference. A, B: Missing. C: Because you can prevent for discussion. D: Because there are more moments in which a policy can be adapted to the situation. E: Because you are part of the process. As soon as someone has the idea that he/she has a voice, this person feels involved with the problem. In general: it is very important that an analysis is performed on such a figure. A high number of national newspaper publications does not necessarily mean there is turmoil in society. In case of Q-fever, there were weekly updates about the number of patients published.
Q2	Yes	A: Yes B: Yes C: Maybe D: Maybe	Feasible: Such a meeting does exist at the ministry of EL&I (basisoverleg). Could have taken place in 2008 already. A: This does not necessarily result in a weak consensus. B/C/D: There is a reasonable chance that participation of local vets and farmers

		E: ?	would have lead sooner to societal relevance and thus sooner to other/different/better measures and acceptance. E: Difficult. The participatory approach does fit with the Dutch culture, but I do not know what it would mean for the responsibility recognition of stakeholders.
Q3	Yes	A: Yes B: Yes C: Yes D: Yes	Feasible: Yes but stakeholders should have participated already in 2008, 2009 was too late because the lamb season started already. A: Yes it could have prevented for many infections and deaths. But participation of citizens should have taken place in 2008 already. B: If participation in combination with transparency would have taken place in an early phase (2008), the peak in turmoil in society would have prevented for because you as a risk manager you can explain why certain measures are the best option. C: It might cost more on the short term, but on the long term less. D: I think that sooner a breeding ban would have been in place and thus the culling would have been prevented for. It is always difficult to decided for risk managers when to act with regard to a risk. But with regard to risks for public health: these are increasing because of intensive farming, the changing climate. We thus should change our way of dealing with risks and rather come together with stakeholders too many times than too little. Compare experts with a parent and the uninitiated one with a child: while a parent can think too complex, a child sometimes can come up with creative and clear ideas.
Q4	Maybe	A: Maybe B: Yes C: Maybe D: Maybe E: Yes	Feasible: not sure, it was extremely busy in February 2009. Also with the many Chamber of Deputies questions. A: Only if people do not plea solely for their interests and will constructively contribute to the thinking process. B: The communication towards vets was too little. If they would have participated, it could have prevented for turmoil in society. C: Participation can go both ways: positively it could contribute to other measures resulting in lower time and money spending, negatively stakeholders could have made interests pleas slowing down the process. D: Maybe if vets would have participated, a breeding ban would have been a solution. But this is said with present knowledge. E: LTO for example took the responsibility to make the hygiene protocol as a result from participation in the process.
Q5	09: No 08: Yes	A: ? B tm E: 09: No 08: Yes	Feasible: Not in February 2009. This should have taken place in an earlier phase (2008). A: Missing. B/C/D: February 2009 would have been too late. According to the OneHealth principle, stakeholders should discuss and build up a relation continuously. If taken place sooner (2008 or continuously), it would have created opportunities with regard to the variety of measures and acceptance. E: participation would have lead to mutual understanding, more transparency and a higher feeling of responsibility towards society.
Q6	Yes	A: ? B: 09 Maybe / 07 Yes C: Yes D: No E: Yes	Feasible: Always. If it would lead to the ultimate result is another question. A: Missing B: February 2009 would have been too late, but earlier participation would positively contribute to acceptance of the population. However, if in February 2009 the government would have been more transparent about contaminated farms (as a result of the needs made clear by citizens through stakeholder participation), maybe the peak in turmoil would have been prevented for. C: In case of large problems, participation of many stakeholders is essential for good cooperation. D: Possible measures were already present. Maybe more proportionate measures would be the result. E: Because of a discussion with multiple stakeholders, everyone can draw his/her own conclusions. The result is a societal discussion, which could lead to a higher feeling of responsibility within society.
Q7	09: No 08/07: Yes	A: Yes B: 09 No / 07/08 Yes C: Maybe D: Maybe	Feasible: Time is not the problem. But 2007/2008 would have been a better alternative for stakeholder participation, especially in between the lamb season and the next patient peak. Difficult would have been to organize 'the citizen' though. Nowadays there are patient groups, but they did not exist at the time. A: Will mainly contribute to the long term effectiveness, in terms of more proportionate action. On the short term, participation can slow down the process. B: If stakeholders are heard and their opinion is taken into account, it will positively contribute to acceptance. At the moment all decisions have been made and are then communicated to stakeholders in the so-called basisoverleg. However, the decision

			making process has ended and so opinions of stakeholders cannot be taken into account anymore. If this basisoverleg takes place before decision making (which I applaud), it can contribute to acceptance. C: I favour trying it, because so far never did. In between an OMT and BAO there is not much time and participation can slow down the process and cost more on the short term. On the other hand, if stakeholders would have participated they could have increased the sense of urgency for this problem and stimulated the process. D: The larger the group of people looking at the problem, the higher the chance that there is a person thinking out of the box.
Q8	?	A: ? B: Maybe C: Maybe D: ?	Feasible: I do not know, difficult to say. A: Missing B: In my opinion is the result from interaction a different/better view on how stakeholders react. Whether it would contribute to acceptance, I am not sure. C: Because of mutual understanding as a result from former crises, stakeholder participation can contribute to efficiency. However, at the time being I do not know what would have been the result. D: Missing In general: For a sound comparison on turmoil in society between Q-fever and SBV, one should also look at published newspaper articles before august 2007.

4.6.5 Early risk communication considered important for acceptance

Interviewees were asked whether they thought early communication about certainties and uncertainties to the general public took place in case of Q-fever. Also, they ware asked whether early communication about certainties and uncertainties would lead to A) trust, B) acceptation and C) responsibility recognition in the general public, ultimately leading to lower turmoil in society (D). If the question is answered as a general question (not separating answers to the subquestions), it is indicated by A, B, C, D.

In general interviewees agreed on the fact that communication about certainties and uncertainties in particular did not occur in case of Q-fever. Whether communication in general took place in an early phase of the process is dependent on the scope: communication on the local level was good in 2007 (Q3, Q5), but it was not on the national level (Q4, Q7).

Five interviewees argued that communication about certainties would lead to trust, acceptation and responsibility recognition, ultimately resulting in lower turmoil in society. Most consensus was on this particular type of communication contributing to trust and responsibility recognition. Only one interviewee was not sure whether communication about certainties and uncertainties would lead to a higher level of acceptation within society, because it was argued that risk communication is based on people being able to make choices. If there are no choices for the public one communicates to, there is no point in communicating (Q7).

In short: seven out of eight interviewees argued that early communication about certainties and uncertainties did not take place in case of Q-fever. Five out of eight argued it would have lowered turmoil in society (as a result of increasing trust (5/8), acceptance (5/8) and responsibility recognition (6/8)).

Table 14: Results on feasibility and added value of early risk communication for Q-fever

Interviewee	**Early (un)certainty communication took place?**	**A: Trust B: Acceptation C: responsibility recognition D: Turmoil in society**	**Remarks**
Q1	No	A, B, C, D: Yes	Much communication has taken place in the beginning, but the focus was not necessarily on certainties and uncertainties. A, B, C, D: I assume people can deal with certainties and uncertainties. Honesty, being informed and uniformity among risk managers are very important elements for risk communication.
Q2	No	A, B, C, D: Yes	Much communication to the general public took place, but the focus was not necessarily on certainties and uncertainties. What is asked by journalists, that is communicated. Maybe communication about certainties and uncertainties should be included in the Q&A sections on

			governmental websites. A, B, C, D: Turmoil in society can be a result from uncertainty, but can also be a result from the certainty that something is a problem. At the moment, communication is more dependent of journalists: what they ask, we communicate (reactive). It would be better if we had a pro-active communication strategy.
Q3	No	A, B: Yes C: Yes D: Yes	Especially in 2008 too little has been communicated: the number of patients was twice as much as 2007, so the initial assumption of Q-fever being an unique risk did not hold anymore. This has not been communicated to the general pulic. A, B: One does not have to be happy with the news, but the situation is clear. If no communication about certainties and uncertainties takes place, the result can be distrust in the government and turmoil in society. C: Through clear communication, everybody is given his/her own responsibility. I do think that it should be mentioned explicitly that it is expected everyone uses the information properly. For example with the 5% abortion limit: if a farmer is honest and transparent, mutual understanding is the result and people can help each other. D: Transparency fosters lower turmoil in society.
Q4	No	A: Yes B: Yes C: Yes D: Yes	The GGD has proposed transparency towards the general public in an early phase in a BAO, but because of a veto this did not happen (the idea was that it would have resulted in unnecessary turmoil in society). I think openness would have been good. If one does not hear anything, one answers questions with the own knowledge. A: People will start to distrust risk managers if nothing is told. This is a lesson learned from other policy terrains as well. B: If nothing is communicated, people think nothing happens. This results in a very skeptical attitude towards the policy. C: Because people have the idea they can actually do something: they *will* go to the doctor for a test in case of vague symptoms. D: No further elaboration.
Q5	No	A, B: Yes C: Yes D: ?	Locally there has been well communicated, but not on a national level (especially not in 2008, then it was a chaos). If communication takes place, it should be unified. Otherwise, nobody is trusted. A, B: We should treat the public as 2.0: people can read information on the internet, books, newspapers and can better deal with information than assumed. If people are informed to a realistic extent, a panic reaction can be prevented for. C: Risk managers should not deny problems in communication and also not providing the impression that people exaggerate their feelings. Turmoil in society can be prevented for through communication. D: Missing.
Q6	No	A, B, C, D: Maybe	We did early communicate to medics, but this we did not do in the beginning to indirect stakeholders. Contaminated farms were not made public for example. During Q-fever, we had a reactive communication policy (this was common policy). Disadvantages are: being dependent on what questions journalists pose plus time and money spending on reacting on the questions the Chamber of Deputies pose. The advantage is that you save money on the short term, which you do have in case of a pro-active communication policy. A, B, C, D: At the time, for Q-fever it did not seem useful to communicate in an early phase because of the fact there were no possible measures to take. Not sure whether early communication about certainties and uncertainties would have contributed to lower turmoil in society. However, if communication is not sound, questions from the Chamber of Deputies (originating from the public or media) will be posed to the ministries. This information should have been available already according to the Chamber of Deputies, meaning that some distrust is already present in society.
Q7	No	A: Maybe B: No C: Yes D: Maybe	In 2007 there was no communication about certainties/uncertainties. In 2008 maybe implicitly. Only in 2009 we discussed a communication strategy with several stakeholders. A: I question whether citizens trust the government if they say they do not know, this depends on the sort of risk. A typical question for communication experts. However, during Q-fever there is decided *about* the citizen not *with* the citizen. As a result, citizens had the idea nothing

			happened in 2008 which is not true. In case of better communication, society probably would have thought differently. B: Risk communication is based on people being able to make choices. If you live in the South of the Netherlands, you do not have any reasonable options (you will not move) if the government communicates there being a problem with a possibility of getting sick. Tourists do have options in this case. C: As an example can be referred to the responsibility recognition of farmers, which changed somewhere between 2007 and 2008. D: Difficult but not impossible. Maybe if a risk communication expert decides about it.
Q8	Maybe	A: Maybe B, C: ? D: ?	Maybe certainties and uncertainties have not been communicated to the public explicitly. A: Difficult and dependent on the group you communicate to. As an example: with SBV information meetings for farmers and vets were organized. People were very positive about the fact that both certainties and uncertainties were communicated. However when the same was done to the general public, an overload of attention in the media was the result. The latter can be a result from the attitude towards the government due to Q-fever. B, C: Missing. D: Risk communication is very difficult. How to tell the truth without causing an over reaction (which will absolutely not help you in an effective control or prevention of the risk)? Answer cannot be derived.

4.7 Conclusion

Desk research to the Q-fever outbreak revealed a high number of human infections, a high number of published newspaper articles and it seemed that all possible intervention measures were not explicitly pointed out from the start of the outbreak. Respectively, this would indicate that effectiveness, acceptance and efficiency with regard to Q-fever possibly could have been improved by applying the IRGC-framework. Both desk and field research suggest Q-fever can be categorized as ambiguous risk. According to Renn (2005) a participatory governance approach would have been applied in this case. Actual risk governance did not completely match with the suggested IRGC-approach in the sense that research to framing, existing conventions and concern assessment were absent IRGC-steps, risk assessment would have occurred with the involvement of a broader variety of scientific disciplines and risk communication would have been early with an emphasis on certainties and uncertainties. From desk research could not be derived whether a weighing of facts and values explicitly took place during the governance of Q-fever. The (partial) absence of the IRGC-framework steps are assumed to have left room for the occurrence of governance deficits. The analysis on absent and present IRGC-steps thus suggests there possibly being room for added value with regard to effectiveness, efficiency and acceptance in case of full appliance of all IRGC-steps.

An hypothetical situation was presented, in which research to framing and existing conventions would have taken place in early July 2007, a concern assessment in late July 2007 and participatory management in February 2009. This hypothetical situation served as the basis for questions to stakeholders. Semi-structured interviews served as a means to find out whether the hypothetical situation would have been possible (feasible) considering the time frame and whether the IRGC-steps could have contributed to the enhancement of effective, efficient and accepted infectious disease governance.

The feasibility of appliance of research to framing, multi-disciplinarity in risk assessment, a concern assessment in July 2007 and public participation in February 2009 was not disputed with regard to time pressure. Different timing of these IRGC-steps was however proposed for multi-disciplinarity in risk assessment and participatory management. Furthermore, other feasibility issues concerning some of the IRGC-steps were expressed: when, where or which experts exactly should be involved into a risk assessment, how to operationalize a representative concern assessment, possible delay due to lobbying interests and difficulty in organizing (or finding a representative for) ‘the citizen’ with regard to participatory risk management and possible overreaction with regard to early communication about certainties and uncertainties.

The following IRGC-steps were by interviewees considered to contribute to effectiveness, efficiency or acceptance: a concern assessment (six out of eight interviewees thought this would positively

contribute to acceptance), multi-disciplinarity in risk assessment (four out of eight interviewees thought this would positively contribute to effectiveness, acceptance and measure variety), participatory management (six out of eight interviewees argued this to mainly contribute to acceptance and the variety of measures) and early communication about certainties and uncertainties (five out of eight interviewees argued this to foster acceptance).
Interviewees considered research to framing to be of low added value with regard to effectiveness, efficiency and acceptance which strikes with the answers of added value as a result from a concern assessment since a concern assessment is a subsequent, interrelated step of research to framing. A possible explanation for this contrasting difference is the separation of research to framing and concern assessment. Research to framing was explained to interviewees as making a short overview of all involved stakeholders and their view on the problem by doing desk research only. Many interviewees favoured actual contact over desk research. For the interviews, the five IRGC-steps were separated for practical reasons while in theory "the five IRGC-steps should not be seen as sequential steps but rather as closely interlinked elements" (cf. Renn 2005, p.26).
No conclusions can be drawn with regard to the feasibility and added value of research to existing conventions and risk characterization and evaluation. Interviewees had different ideas on how to perform research to existing conventions (thoroughly or short) and mentioned prerequisites with regard to their answers. The feasibility of risk characterization and evaluation was disputed and a variety of answers was the result with regard to the added value of this IRGC-step. The result of the Q-fever case study with regard to the hypotheses for the IRGC-framework is presented in table 15.

Table 15: Hypotheses rejection/acceptation as a result of the Q-fever case study

#	**Hypothesis**	**Q-fever added value?**
H1a	*Research to how an infectious disease risk is framed, provides insight into how stakeholders approach a risk. This leads to mutual understanding which contributes to acceptance and efficiency (in case there are conflicts of values) in infectious disease governance.*	Not acknowledged by interviewees
H1b	*Acknowledgement on the existence of multiple frames and ones own constraints, contributes to effectiveness, acceptance and efficiency.*	Not acknowledged by interviewees
H2a	*The categorization of risk into the categories simple, uncertain, ambiguous and complex can help clarify the knowledge available and missing. This makes it possible to make a more inclusive risk estimation and thus contributes to effective, efficient and accepted infectious disease governance.*	Cannot be accepted or rejected by interviews only
H2b	*Multiple disciplines should be involved into a risk assessment in case of systemic risks, because this fosters a systems view on the risk (leading to both short- and long term effectiveness).*	Partly acknowledged by interviewees
H2c	*Concern assessment should be integrated in risk governance of systemic risks because it leads to mutual understanding (and acceptance), resulting in a higher willingness to cooperate (and thus effectiveness).*	Acknowledged by interviewees
H3a	*A functional distinction should be made between risk characterization and risk evaluation, because it deliberately separates the weighing of facts and values. Besides, it clarifies the role division between risk assessors and risk managers. This enhances efficiency and acceptance in risk governance.*	Cannot be accepted or rejected by interviews only
H4a	*The categorization of risks, accompanying management strategy (and level of participation) and appropriate instruments for risk prevention and risk reduction lead to more effective, efficient and accepted risk management.*	Partly acknowledged by interviewees
H5a	*Early communication about certainties and uncertainties fosters acceptance about risk governance.*	Acknowledged by interviewees

5 Case 2: Schmallenberg Virus (SBV)

This chapter contains the second case of study: SBV. The infectious disease is introduced in paragraph 5.1. This is followed by a media analysis and description on the governance process of SBV containing important decisions and events in paragraph 5.2. Hereby, the third sub-question is addressed since an overview is given on the actual effectiveness, efficiency and acceptance of SBV governance. SBV is classified according to the IRGC risk categories in paragraph 5.3, which was necessary for being able to determine the suggested discourse and managerial approach (see Figure 2, paragraph 1.1.3). Hereby, the fourth sub-question of this research is answered. An analysis on the actual situation follows, determining which IRGC-framework steps did and did not take place during the governance of SBV. This could have led to risk governance deficits, ultimately resulting in lower effectiveness, efficiency and acceptance of SBV risk governance. Paragraph 5.4 thus contains an answer to sub-question five. In the hypothetical situation *all* IRGC-framework steps would have been explicitly applied. Paragraph 5.5 therefore contains a description of the hypothetical situation, determining possible moments on which what specific IRGC-step would have hypothetically been feasible (hereby answering sub-question six). Paragraph 5.6 contains an answer to the seventh (and last) sub-question per IRGC-step since it describes whether appliance of all five IRGC-framework steps would have been feasible on those particular moments in time, and if it would have lead to more efficient, effective and accepted risk governance in case of SBV. Hereby paragraph 4.6 addresses the last sub-question. Paragraph 5.7 is the concluding paragraph on SBV. The answers to sub-questions can be found at the end of each before mentioned paragraph, and can be recognized by their *italic font* and starting with 'in short'.

5.1 Introduction to SBV

The Schmallenberg Virus (SBV) was a new virus first discovered in a village in Germany named Schmallenberg. Therefore, the new virus was named after its place of discovery. SBV resembled viruses from the family Bunyaviridae, which are all vector borne. The Bunyaviridae family exists of several subgroups, of which SBV resembles the Akabane group the most. In this sub-group, there are six variants (genuses) of which two non-zoonotic, two zoonotic and two with neutralizing antibodies. SBV resembled the non-zoonotic variant the most.

SBV mainly affected sheep. While the mother sheep did not show remarkable symptoms of carrying the disease, malformations with newborns occurred if the mother sheep was infected with SBV during pregnancy. The newborns had deformed bones and lacked brain tissue. In cows, it is discovered that SBV has caused watery diarrhoea with a spontaneous recovery after 3-10 days. If cows were infected during the first weeks of pregnancy, it could lead to malformations in calves. The first notifications of deformed newborns in sheep were earlier in time than the first notifications on deformed newborns in cows; this is caused by the longer gestation period of the latter animals.

Since the discovery of the new virus in November 2011, there were many uncertainties concerning SBV: it was likely to be transmitted by midges, because of the fact that this is the same for viruses from the Bunyaviridae family. Furthermore it was not sure whether SBV can be transferred from animals to humans. It was also not sure what the risk groups were in case of zoonotic risk.

5.2 Indications on effectiveness, efficiency and acceptance of risk governance during SBV

On November 18th, 2011 scientists from the Friedrich Loeffler institute in Germany identified the presence of viral sequences in serum from cattle. These viral sequences did not resemble an existing, known virus, but did show resemblance with the family Bunyaviridae. The new virus is named after the village of discovery: Schmallenberg (SBV). The first Dutch notification of malformed lambs to the GD takes place on November 25th 2011: it becomes clear that this is caused by SBV. According to the new zoonotic structures in infectious disease control, on December 7th 2011 contacts between the GD, the ministry of EL&I and RIVM take place on the occurrence of this virus in animals. The first Dutch notification (to the GD) of malformed calves takes place on December 13th 2011. On the same day, contacts between GD and RIVM-LZO take place. RIVM-LZO and RIVM-LCI discuss on December 15th 2011 on the possibility for SBV to be a risk for humans. Soon after (December 16th 2011), a meeting takes place in which a first risk assessment is done on SBV including the risk for human health (this results in the risk assessment of December 21st 2011). The minister of EL&I decides upon

a notification obligation on December 20th. On January 26th 2012, a Dutch general practitioner argues that pregnant women should avoid coming at farms. This in contrast to the RIVM-LCI advice of pregnant women staying away from farms during births of animals. Some ambiguity is thus involved in the early process, which is one of the reasons for a DB on February 15th 2012. This DB results in advice to the ministers (who share it with the Chamber of Deputies): serological research should define whether SBV is zoonotic or not. Both Germany and the Netherlands perform serological research. Both researches conclude that SBV is not zoonotic. This means that no human infections or deaths occurred as a result of SBV, and (short term) *effectiveness* as defined in this research thus cannot be improved. With regard to efficiency: the threat with regard to human health took less than six months. A risk assessment was made 3 days after the first contacts between GD and RIVM and serological research was performed within three months. It therefore is questionable if further or more deliberate appliance of the IRGC-framework would have led to a more *efficient* process.
The media analysis revealed that turmoil in society was limited: only few national newspaper articles are devoted to the SBV risk and only a handful of questions have been asked to GGD with regard to SBV and possible occurring human symptoms (see timeline Week 1 2012). *Acceptance* with regard to risk governance for SBV thus seemed high.
In short: all of the above are indications of effectiveness, efficiency and acceptance of risk governance during SBV, which suggest that risk governance during SBV could hardly have been improved by applying the IRGC-framework. Figure 13 is a visual representation on efficiency and acceptance during SBV governance. Effectiveness cannot be reflected in the figure, since there were no human infections or deaths as a result from SBV.

A graphical presentation of the key events from the SBV process can be found on the lower half of Figure 13 (colored in black). Just like with Q-fever, key events reflect decisions risk managers made (OMT/BAO decisions). Since turmoil peaks in case of SBV were not higher than five, one should keep in mind that the peaks in the graph are no "real peaks." Therefore, less key events could be identified (if compared to Q-fever). The following events are additionally reflected in the lower half of the graph (colored in red): every first notification per country and economic restrictions. Since SBV was a threat for human health, the results of the serological tests were considered an event as well. The upper half of the graph represents turmoil in society measured by number of published newspaper articles in national newspapers.[69]

[69] For practical reasons the figure does not reflect weeks, but months (week numbers were to small to be readable). Furthermore, the graph starts in august 2007 but before august 2007 three publications were found on Q-fever: October 20th 1995, October 31st 2002 and December 16th 2005. These newspaper articles were not relevant for this study (no relation to the Q-fever outbreak in the Netherlands) and therefore not included.

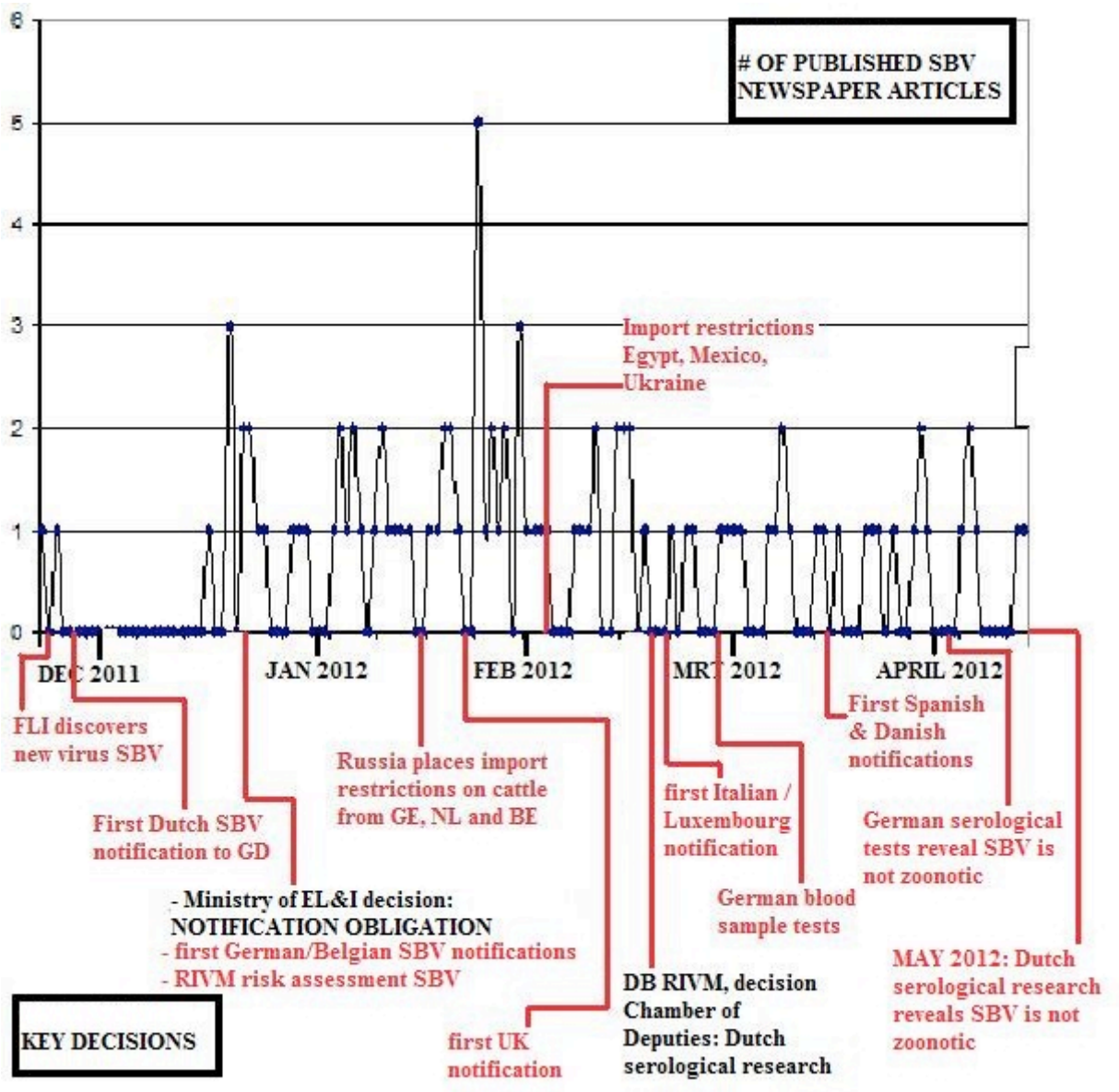

Figure 13: Newspaper publications and key decisions during risk governance of SBV
Source: multiple sources

5.3 SBV categorized as uncertain risk

5.3.1 Desk research reveals SBV is an uncertain risk

SBV was a new virus that resembled viruses from the Bunyaviridae family. This assumed relation caused risk assessors to relate SBV to elements of this known family like midges being the transmitting vector, both cows as well as sheep being vulnerable for the disease and probably no risk for humans (no zoonotic component). However, some elements of SBV were particularly odd or severe: such severe brain damage has never been seen before in cattle, *if* the disease was zoonotic it was not sure what it would do to human embryos and it was not clear if the midges season was already over. In the risk assessment made by RIVM and others in December 2011, the risk with regard to humans was considered to be very low (although this could not be said with one hundred percent certainty). The uncertain element seemed to take the upper hand since meetings on the potential zoonotic disease were organized and the disease was dealt with according to the new zoonotic structures. Furthermore, if SBV would be zoonotic it had the potential to cause severe damage. Apart

from two statements considering the severity of the risk (see timeline January 2nd and 26th 2012), ambiguity with regard to the SBV risk for human health did not seem to be present. This can be backed up by the fact that GGDs only received a handful of questions with regard to the SBV risk for human health, the media analysis revealed few newspaper publications on the issue and the advice of the DB (serological research) was quickly approved of by the ministries. This suggested SBV risk with regard to human health could be classified as an uncertain risk.

5.3.2 Interviewees suggest uncertainty prevails

Interviewees were asked whether they could describe the characteristics of the SBV risk with regard to human health in December 2011. Furthermore, interviewees were asked whether they could describe if the characteristics of SBV changed during time. Other than with Q-fever, interviewees were directly asked whether they thought there were differing opinions with regard to the scientific evidence and perception. The reason for this was that, other than with Q-fever, there were no scientific papers or evaluations yet from which could be concluded that ambiguity with regard to the risk was involved. It was clear that hardly any elements of ambiguity were present. Interviewees suggest SBV to contain uncertain, complex elements and simple elements: this perception on the risk changed during time. In the early phase of the risk (December 2011), most interviewees implicitly categorized SBV as an uncertain risk. This changed to complexity or simplicity until the results of serological tests. Since interviews were held starting from the end of April 2012, there was much more certainty with regard to the zoonotic component of SBV, the spread, transmission route etc. This could have caused bias in the answers of interviewees with regard to the uncertain elements on the risk: time bias might have lead to toning down the present uncertainty in the early phase on the risk. An expert argued it to be common practice that in case an infectious disease is not known, related viruses are looked for (S7) and several interviewees (S2, S5, S10) argued not to be concerned in December 2011 with regard to the SBV risk for human health.

Table 16: SBV risk categorized according to interviewees

Interviewee	Word scan with regard to simple, complex, uncertain, ambiguous	Summary of answer (during time)	Do you think stakeholders had divergent views on the risk with regard to scientific evidence and perception?	Other remarks
S1	Aside from an assumed relation with Akabane, we knew little. Scientific facts were not available. Pregnant women were a risk group in my opinion, we did not know anything about the risks for them.	It remains unclear how SBV has spread so quickly, so largely spread (geographically) and so dense	No.	The scenario analysis revealed that many risk managers did not realize that complexity is involved if an infectious disease starts in a vector; many thought of transport and trade bans (which will not work in case a disease can be transmitted by vectors)
S2	Early December there was much uncertainty. Late December we took stock of what we knew: there were some uncertainties but not that many that we could not do anything. There were no signs from the GGD of human contaminations. We thought the risk for humans would be not high, it was no Q-fever2 (latter 2x).	Maybe in the beginning, the human column (VWS, RIVM, GGD) had a higher fear for SBV due to the past experience with Q-fever. This fear however decreased for all parties during time.	Difficult to say. In general citizens prefer zero risk and find the government to be responsible for controlling infectious disease risks. Zero risk is however non realistic.	As soon as the short term effectiveness was accounted for (control of the disease), the focus of research could have shifted to the causal relations for SBV (where did the virus come from, what can we do about it?)
S3	There is a relation with the environment and the climate and vectors (complexity).	There was a long period of doubt with regard to the zoonotic component	From human and veterinary medical science there was close to no evidence on SBV	I think citizens and GGD doubted whether the zoonotic component

	There was much uncertainty for us with regard the (human) risk until the inf@ct message.	of SBV.	being zoonotic. However, GGD is asked to monitor people with regard to possible symptoms. This is a contrast by which is implicitly communicated that there is uncertainty.	was not present (as argued by scientists); certainty on this was required. Only in the beginning risk perception differed from scientific risk estimation.
S4	Due to new zoonotic structures in infectious disease control, the diagnosis was quickly made. There was uncertainty about the zoonotic component of the risk.	Human risk decreased (no illnesses or abortions notified). Especially after the blood test results revealed no zoonotic component. Not clear how SBV can have spread to quickly.	X	X
S5	Many things were not completely certain, but there were strong assumptions that SBV was non-zoonotic and transmitted by vectors. We did not worry about the risk for humans.	During time, more evidence became available and the more was confirmed SBV was non-zoonotic.	No. Although I do think that doing research to SBV not being zoonotic was necessary for all stakeholders.	X
S6	Much uncertainty. Little we could say on the size, severity or type of risk.	Research to the zoonotic component of SBV took place and revealed that it SBV is no human risk (what everyone already thought)	No but I do think that research to the possible human risk was necessary.	X
S7	It was uncertain what the virus would do exactly, but standard procedure is resembling the virus to other viruses.	The results of research revealed that SBV is non-zoonotic.	Hardly any. There was consensus among scientists, maybe the public and farmers were a little more sceptical (due to the Q-fever history).	X
S8	There was no reason for panic, since SBV was a retrospective risk (nothing could be done anymore about contaminated animals). The risk for humans close to zero.	The results from blood tests of risk groups, revealed SBV to be non-zoonotic.	No. This is acknowledged by the fact that there has not been turmoil in society.	X
S9	Much was unknown, all evidence was based on related viruses.	The relation with other viruses was proved, there did not occur symptoms in humans, serological research revealed no contaminations in humans.	No. There has also not been turmoil in society (which can be seen as evidence for the non-existence of differing views).	X
S10	We thought SBV was an animal disease with hardly to no risk for humans. According to scientific literature and related viruses, we assumed the risk for humans to be very small.	A scientific test proved SBV to be non-zoonotic.	No. Opinions on the risk were close together. Research to the non-zoonotic component of SBV was necessary though.	X

Note 1: X means that no particular words or indications belonging to this category were found.

In short: According to desk research, SBV with regard to human health could be classified as mainly being an uncertain risk. Interviews mainly suggested SBV to contain uncertain elements until the results of the serological tests are available. Besides uncertain elements, SBV contained complex elements (S1, S2, S3, S4) since causal relations for the occurrence of SBV remain unclear. Some uncertainty and complexity are inherent in infectious disease governance, but the management decisions taken (notification obligation, research to the zoonotic component of SBV) suggest uncertainty had the overhand at the time. Time bias in the research (interviews were held in April, much more certainty was present concerning the SBV risk for human health at that time) could have

caused interviewees to tone down the level of uncertainty with regard to the SBV risk for human health.

5.4 Extent to which actual risk governance resembles the suggested IRGC-approach

5.4.1 Partial risk pre-assessment (IRGC-step 1) during actual risk governance

Several events on the timeline (August, September, November 25th, December 6th and 7th 2011) indicate that screening and early warning took place. Involved parties in the early phase of the outbreak were GD, European contacts and the German government (FLI), and in Week 49 Dutch vets, ministries and RIVM are notified. In week 51 an informing message is sent to all GGDs (inf@ct), an early warning and response message is sent to all European national health authorities (EWRS message). Research to existing conventions might have happened implicitly by the many evaluations and research taking place (Van Dijk et al 2010, RIVM 2009, GGD HvB 2008, Timen 2010), resulting in a better idea on what existing norms and rules necessary for scientific approval of a risk estimation were. Also, a new zoonotic structure had been built (One Health, EmZoo project) which reflects a change in the organizational structure as a result of reflective research. From the timeline does not become clear that research to framing took place. The absence of research to framing could have led to the occurrence of risk governance deficit A3: lack of adequate knowledge about values, beliefs and interests and therefore about how risks are perceived by stakeholders (IRGC 2009). Just like with Q-fever, SBV is linked to problems in industrial farming in the Chamber of Deputies (see timeline Week 5). Research to framing might have foreseen this and anticipation on this (through risk communication) could have taken place. The result of deficit A3 could be low acceptance with regard to risk governance. However, apart from few incidents (see timeline January 2nd, 26th, March 3rd 2012) in which individuals express their opinion on the SBV risk and risk governance, both the media analysis and the timeline do not reveal indications for low acceptance with regard to risk governance for SBV.

5.4.2 Partial interdisciplinary (risk) estimation (IRGC-step 2) during actual risk governance

5.4.2.1 Explicit risk assessment (IRGC-step 2a) took place

Several methods have been used to calculate probabilities: a risk assessment is made by RIVM and ECDC (see timeline Week 51), a scenario analysis is done in Week 5, in Week 6 by EFSA (with a Bluetongue model) and in week 9 by the German Robert Koch Institute (blood samples are taken from farmers). The results of this risk assessment were shared with many stakeholders.

According to Todd (2011) a deficit which can occur in this IRGC-step is: lack of scientific data about the risk. This resembles the IRGC (2009) risk governance deficit A2: lack of adequate knowledge about a hazard, including probabilities and consequences. The IRGC would classify the uncertainties involved in the SBV risk as non-knowledge (see Renn 2005, p.30 categories of uncertainty): SBV was a new infectious disease and scientific tests or researches just did not took place in the past. Non-knowledge can be resolved using scientific approaches, but does take time (and thus might not always be possible in case of an outbreak). The estimation of the risk thus possibly becomes fuzzy, because more subjectivity is involved in the risk estimation (cf. Renn 2005, p.30). The solution to this is using additional information such as "subjective confidence level in the risk estimates, potential alternative pathways of cause-effect relationships, ranges of reasonable estimates, loss scenarios and others" (ibid). As mentioned above, several methods to assess the risk took place meaning that this phase of the IRGC-framework has been applied.

Nevertheless, from the timeline does not become clear whether attention is paid to the long term implications of the risk. On ProMED (March 3rd 2012), a professor questions why no research has been done to the cause of SBV, its appearance and longitude of presence. The timeline does not reveal whether all (from literature) advised disciplines were included (environmental experts, socio-economic experts, mathematicians). On the scenario analysis, an entomologist was present though.

5.4.2.2 Absence of a concern assessment (IRGC-step 2b)

The timeline does not indicate that an explicit concern assessment took place. The absence of a concern assessment could have led to risk governance deficit A3: lack of adequate knowledge about values, beliefs and interests and therefore about how risks are perceived by stakeholders. The

consequences of deficit A3 could have been lower acceptance of risk governance. However, both the media analysis and the low number of posed questions to GGD (see timeline Week 1 2012) suggest there being low turmoil (and high acceptance) in society. Low turmoil in society might have been the result of 1) the low zoonotic possibility, 2) perceived legitimate management, 3) timing of the risk (taking place during Christmas/new year), 4) other risks being perceived more urgent at the moment (e.g. the financial crisis).[70] Since desk research reveals there being low turmoil in society, a concern assessment would probably not have contributed much to the acceptance of risk governance. However, a concern assessment could have revealed the reasons for high acceptance with regard to risk governance for SBV. This could have served as a 'lesson-learned' for future crises; i.e. acceptance on the long term could have been improved by performing a concern assessment. Furthermore, a concern assessment taking place might have stimulated trust in the government positively.

5.4.3 Risk characterization and evaluation (IRGC-step 3) possibly occurred

Participatory observation in the scenario analysis made clear that if SBV was zoonotic, it possibly would have resulted in an intolerable situation since one of the scenarios had severe consequences (human abortions). Even though the scientific risk assessment revealed there hardly (close to zero) to be any risk for humans, the government decided upon a notification obligation and research to the zoonotic component of SBV. This might have been the result of 1) a weighing of facts and values, i.e. sick people and turmoil in society was expected if SBV would have been zoonotic or 2) disputing views on the size or severity of the risk among experts (e.g. see timeline Week 1 and 4 2012: statements in press of Willem Takken and Olde Loohuis in a magazine contrasted with RIVM advice given on the public website) or 3) no values are weighed but these decisions are made in order to be on the safe side in case SBV did turn out to be zoonotic. Since the second point is acknowledged in the timeline (January 26th 2012), it seems that risk assessors and managers considered variables that influenced risk appetite and risk acceptance, and deficit A5 thus did not occur.

5.4.4 Risk management (IRGC-step 4)according to the IRGC-ideas

From desk research and interviews (paragraph 5.3) becomes clear that SBV could be classified as an uncertain risk. In case of an uncertain risk, Renn (2005, p.53) advises to include the following stakeholders into the management: agency staff, external experts, industry and directly affected groups (i.e. reflective discourse).

The ministry of EL&I decides in the early process upon a notification obligation; this automatically involves the (animal) industry (by legal obligation) and representatives of the industry into the process. According to the IRGC, "the management of uncertain risks should be guided by the precautionary approach" (cf. Renn 2005, p.46). The main objective should be to make the system resilient, for which (among others) the following instruments can be used: diversification of the means for approaching identical or similar ends, reduction of the overall catastrophic potential, design of systems with flexible response options and the improvement of conditions for emergency management and system adaptation (ibid).

The implementation of the notification obligation caused the conditions for emergency management to be improved: it required stakeholders to be transparent about the occurrence of SBV and others to be ready to respond. Many of the other means do not seem to be applicable in this case, since there was a means to end the uncertainty concerning the potential human risk: performing a serological test on risk groups. The results of the serological tests ended the uncertainty element with regard to the risk for humans. Desk research thus suggests risk management for SBV (implicitly?) resembles the ideas of the IRGC-framework.

In a later phase of the outbreak (once was clear that SBV was non-zoonotic), SBV might be seen as a complex risk since causal relations for the occurrence of the risk remained unclear. In case of complex risks, Renn (2005, p.53) advises to include agency staff and external experts into the process (i.e. epistemological discourse). Since SBV did not appear to be a risk with regard to human health, the management of the complexity concerning SBV goes beyond the scope of this thesis.

[70] This is a suggestion of possible consequences for low turmoil in society. The fourth suggestion is derived on April 16th 2012, from: http://www.nationaalcrisiscentrum.nl/document/onderzoeksresultaten-risico-en-crisisbarometer-4e-meting.

5.4.5 Early risk communication (IRGC-step 5) took place

There are several indications that information sharing to indirect stakeholders has been transparent. On the regional level transparency in communication becomes clear from the inf@ct message sent to all GGDs (see timeline week 51), a notification appears on the RIVM website (wee 51), questions and answers concerning SBV are made public at www.rijksoverheid.nl (Week 52) and a map showing contaminated areas on several governmental websites and press communication took place (February 16th 2012). On the national level early communication becomes clear from timeline week 52 (LTO being positive about transparency) and on the international level from Week 2, 7 and 10 in 2012 and the fact that an early warning and response message is sent to all European national health authorities (EWRS message, December 21st 2011). Desk research thus suggests that the goal of risk communication ("informing and engaging with regard to those indirectly involved" cf. Renn 2005, p.55) is reached with regard to informing. Nevertheless, some argue that risk communication is not sufficient or confusing (Week 9 March 3rd, Week 10 March 5th). From desk research it is also not completely clear whether there was an emphasis on certainties and uncertainties in risk communication. Since SBV was no ambiguous risk, Renn (2005) would not have advised deliberation (i.e. two-way communication with indirect stakeholders). The communication strategy thus seems to be adjusted to the type of risk.

In short: the absent IRGC-framework steps were research to framing, and concern assessment. Some IRGC-steps seem to have occurred according to the ideas of the IRGC: research to existing conventions (this might have happened implicitly by the many evaluations and research[71] taking place), risk assessment (IRGC-step 2a, it did take place explicitly though the timeline does not reveal whether all disciplines suggested from literature were involved), weighing of facts and values (IRGC-step 3, the government decided upon a notification obligation and research to the zoonotic component of SBV even though scientific evidence revealed there to be hardly any human risk), risk management (IRGC-step 4, it should have included agency staff, external experts, the industry and directly affected groups which seemed to be the case) and early risk communication (IRGC-step 5, although from desk research it remains unclear whether the emphasis of risk communication was on certainties and uncertainties). The appliance of many of the IRGC-steps might have fostered the occurrence of few risk governance deficits, resulting in high effectiveness, efficiency and acceptance of risk governance with regard to SBV. The absence of research to framing and a concern assessment could have led to risk governance deficit A3, resulting in low acceptance with regard to risk governance. However, the media analysis and timeline do not reveal acceptance in society to be low. The analysis on absent and present IRGC-steps thus suggests there possibly being little room for added value with regard to effectiveness, efficiency and acceptance in case of full appliance of all IRGC-steps.

5.5 Description of the suggested IRGC-approach during SBV (hypothetical situation)

Few steps of the IRGC framework did (partly) not occur in reality. In the hypothetical situation, all IRGC-framework steps would have been (explicitly) applied. Both the time line and media analysis helped defining possible moments in time in which the absent IRGC-framework steps could have been applied.

[71] On/as a result of Q-fever.

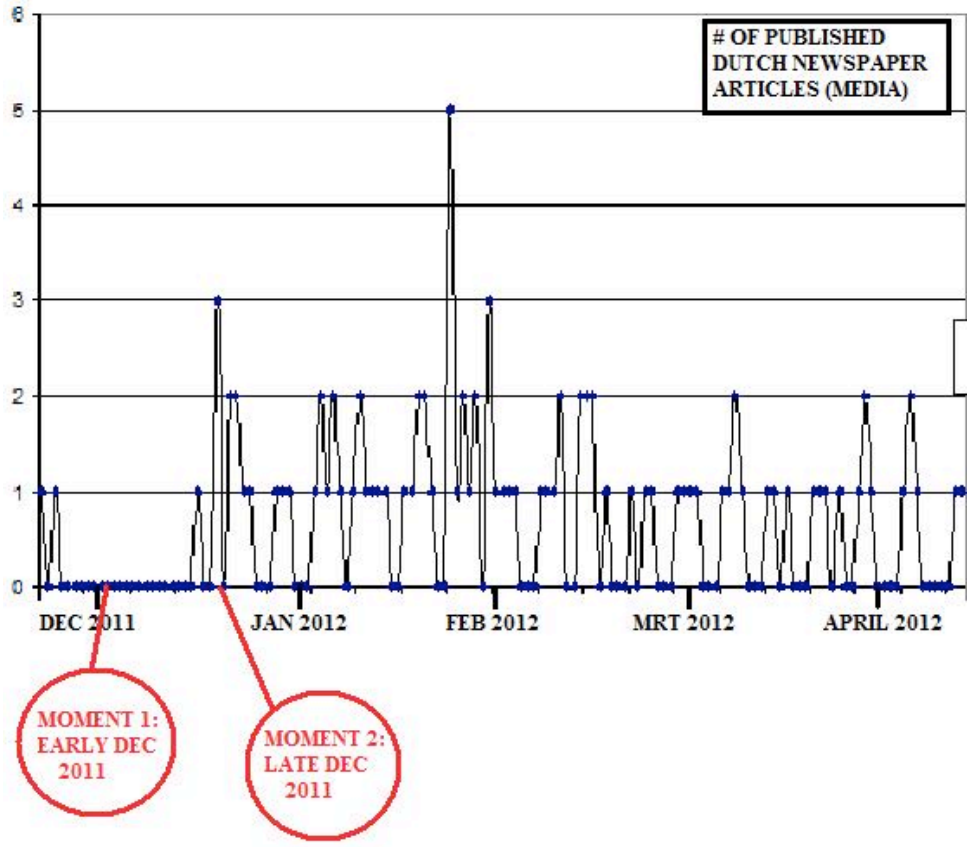

Figure 14: When could the absent IRGC-steps possibly have been applied during the SBV outbreak?
Source: author

Moment 1 is linked to IRGC-step 1: risk pre-assessment. Research to framing and existing conventions hypothetically takes place during the early discovery of a risk. Therefore, this step of the framework is linked to early December 2011 since then contacts between GD, the ministries EL&I and RIVM-LZO take place: the first ideas on SBV possibly being zoonotic are discussed (see timeline December 7th 2011). On December 15th 2011, contacts between RIVM-LZO and RIVM-LCI take place, suggesting the possible zoonotic component of SBV. The emphasis of the questions in the interviews was on research to framing, since research to existing conventions might have occurred implicitly (see paragraph 5.4.1).
Moment 2 is linked to IRGC-step 2: interdisciplinary (risk) estimation. An explicit risk assessment (IRGC-step 2a) is published on December 21st 2011. Hypothetically, a concern assessment (IRGC-step 2b) takes place around the same time.
The focus of the interviews was thus on the absent IRGC-steps: research to framing and concern assessment. Since desk research revealed there being few absent IRGC-steps, additional questions were asked on the other IRGC-steps and served as a confirmation of desk research findings or a general exploration to the ideas of the IRGC. For the IRGC-steps found present in the actual situation, no moments were defined for the interviews. Risk management (IRGC-step 4) was no part of the interview questions, since desk research revealed this took place according to the IRGC-framework ideas.
In short: hypothetically, research to framing and existing conventions would have occurred in early December 2011. A concern assessment would have taken place in late December 2011, about the same time the RIVM risk assessment took place. This hypothetical situation served as the basis for questions to stakeholders. Additionally, questions were asked on the other IRGC-steps in order to confirm desk research findings. These additional questions furthermore served as a general exploration to the ideas of the IRGC, therefore no additional hypothetical moments were defined.

5.6 Suggested IRGC-approach feasible, more efficient, effective and accepted?

Among the aims (see paragraph 3.1) of the semi-structured interviews were finding out whether: b) the hypothetical situation would have been possible (feasible) considering the time frame and c) the IRGC-steps could have contributed to the enhancement of effective, efficient and accepted infectious disease governance. In order to fully grasp the added value with regard to effectiveness and efficiency, interviewees were also asked for the contribution to measure variety since both effectiveness and efficiency are related to this (see paragraph 2.3). Measure variety refers to the idea that effectiveness and efficiency are fostered by timely pointing out all possible intervention measures.

5.6.1 Pre-assessment in early December 2011

5.6.1.1 Framing feasible, considered of low added value

Interviewees were asked whether it was possible or feasible to make a short overview (or quick scan) of all involved stakeholders and their view of the problem by doing desk research to framing considering the time pressure in the early phase of the outbreak (December 2011). Most interviewees (6/8) argued research to framing being feasible in December 2011, although one interviewee (S6) doubted whether it would work in practice (and considered the question to be theoretical).

Furthermore, interviewees were asked whether they thought such a quick scan would have added value with regard to acceptance of the policy. The focus was placed on this particular outcome variable (acceptance), because the first couple (S5, S6) of interviews on SBV revealed it being difficult to theorize on this question with regard to all outcome variables. Only if time allowed it, other outcome variables were subject of discussion in interviews (S2, S9) and in one case (S10) answers were derived. Half of the interviewees (4/8) argued it to be better to ask stakeholders directly instead of doing desk research to framing (S7, S8, S9, S10) in order to have added value with regard to acceptance. One should keep in mind though that answers on added value could have been influenced by the fact that acceptance was already high in case of SBV (S5, S7, see also media analysis SBV) leaving little room for improvement.

In short: research to framing can be considered feasible, also under time pressure. Half of the interviewees (4/8) preferred actual contact over desk research. The focus of questions with regard to added value was on acceptance. Research to framing would not have contributed much in terms of acceptance, but one should keep in mind that the media analysis revealed acceptance already being high.

Table 17: Results on feasibility and added value of research to framing for SBV

Interviewee	***Feasible?***	***A: Acceptance B: Efficiency C: Measure Variety D: Effectiveness***	***Remarks***
S1	X	X	Interviewee considered his/herself not in the position to answer this question; this interviewee is therefore not weighed in the analysis.
S2	Yes	A: ? B: Yes	A: With regard to indirect stakeholders I do not know if it would have contributed to acceptance. Maybe it would have had added value with regard to acceptance among direct stakeholders: feedback to (measure) executing stakeholders could have been better. B: because of anticipation on stakeholders reactions.
S3	Yes	A: ?	A: There was much uncertainty in the beginning about SBV, so I do not know whether it would have contributed to acceptance.
S4	X	X	Double interview, because of time constraints this question is left out; this interviewee is therefore not weighed in the analysis.
S5	Yes	A: No B: No C: Yes	A: There was already considerable level of acceptance with regard to the measure (notification obligation) and the way it has been implemented. Besides, it was a political choice to implement a notification obligation. B: In the human column, already relatively little money has been spent on SBV. C: Maybe we could have anticipated on when there would be sufficient efficient evidence considering SBV, resulting in different measures if discussed with risk managers.

S6	Yes	A: Yes	A: Informing of stakeholders *before* decision on a measure leads to a higher level of acceptance (adjusted answer).
S7	?	A: Yes	A: I think research to framing implicitly took place at the basic meeting in the Hague because a discussion between stakeholders took place and it contributed to acceptance. In addition: agreements on (unified) communication to the media contributed to acceptance as well. *Interviewee emphasized on actual contact with stakeholders.*
S8	?	A: No	A: Increase in acceptance only if people are heard, not by desk research. It is very difficult to think how others think: better make sure that stakeholders come together and discuss. *Interviewee emphasized on actual contact with stakeholders.*
S9	Yes	A: No B: No C: No	A: it is better to ask directly because it gives a better impression of the situation. Besides, stakeholders have the idea of being heard. B: It saves time if asked directly, desk research can be time-consuming. C: The set of measures is approximately fixed for every infectious disease. *Interviewee emphasized on actual contact with stakeholders.*
S10	Yes	A: Yes B: Yes	A: It is very important to have an idea on the perception of a risk. There are representatives available for some stakeholder groups to ask this, for the remaining stakeholder groups (for which no representative is available) it is more difficult to get an impression on risk perception. B: mutual understanding fosters an efficient process (derived from answer). *Interviewee emphasized on actual contact with stakeholders.*

5.6.1.2 Not clear whether Selection of Existing Conventions was feasible or of added value

The analysis on existing conventions was explained to interviewees as being research to existing rules, habits and definitions within an organization. In such an analysis, answers are given to questions like: What is the definition of risk within our organization? What are our assumptions about risk exposure? What are the limits of mathematical tools used within our organization? Interviewees were asked whether such an analysis would have been feasible considering the time pressure in December 2011 and what it would have contributed for SBV in terms of A) the balance in short- and long term effectiveness, B) acceptance, C) efficiency and D) the variety of measures.

Half of the interviewees argued such an analysis to be feasible, two of them (S4, S9) argue that such an analysis actually took place as well (although before the SBV outbreak). Some argued such an analysis should be done extendedly or thoroughly (S1, S4, S9). Half of the interviewees (5/9) found it difficult to say something with regard to these outcome criteria in particular (S3, S6, S7, S8, S10). Many argued the outcome criteria not to be of added value in case of SBV for at least one criteria (S1, S5, S7, S9), but added that it could be of added value in case of future risks.

In short: many interviewees did not consider research to existing conventions to be of added value with regard to SBV or found it difficult to say something with regard to the relation between such an analysis and an outcome criteria. Half of the interviewees argued that an analysis to existing conventions was feasible (5/9), two out of ten argued it actually took place as well (although more thoroughly).

Table 18: Results on feasibility and added value of research to existing conventions for SBV

Interviewee	***Feasible?***	***A: Effectiveness B: Acceptance C: Efficiency D: Measure variety***	***Remarks***
S1	No	A: No B: ? C: ? D: Yes	Feasible: It is an important, fundamental thing to do but a luxury for which is no time in crises. A: For SBV no. In general absolutely! Infectious diseases transmitted by vectors are different from classical infectious diseases in the sense that they need a different approach to control them. I see this analysis on existing conventions as a means to make clear whether we can deal with future crises. B, C: Missing. D: It is always good to step back and reflect on your organization and actions.
S2	?	?	Missing question.
S3	Yes	A: ? B: Yes	Feasible: Yes and should be on the agenda in OMT and BAO because such a reflection is then done on both scientific as managerial level.

		C: Maybe D: ?	A: I do not know. B: Because you can share your risk perception, uncertainties and assumptions. C: The cause-effect relation of these kind of methods is difficult to measure. It could positively contribute to cooperation, since you gain knowledge on someone's position with regard to the risk problem. D: I do not know.
S4	Yes	A: ? B: Yes C: Yes D: No	Feasible: Such an analysis is done after Q-fever and the results are applied in case of SBV. A: Missing. B: No further elaboration. C: The analysis positively contributed to the cooperation between institutions. D: The choice for a measure can be influenced, but the set of measures remains equal.
S5	May be	A: ? B: Yes C: No D: Yes	Feasible: For some institutions it was feasible (ministry of VWS), for some not (RIVM) since at the latter there is more time pressure at the beginning of an outbreak. A: One should make it explicit if measures should be adjusted to short- and long term effectiveness. B: If everyone makes clear his assumptions, you can more easily estimate what everyone wants. What often happens, is that people talk and talk about the detailed content, while the problem is somewhere else. C: For SBV no because we spent little time on the risk. For other, larger risks it might contribute. D: Maybe it stimulates creativity. In theoretical sense one should always research everything before acting, this is practically not feasible: we continuously make assumptions. It thus can contribute to the variety and improvement of measures.
S6	?	?	It is always good to make your assumptions explicit. I think it is very hard to say something about such an analysis in relation to SBV.
S7	Yes	A: ? B: No C: Maybe D: ?	An abstract, general analysis would have been feasible. A: Not applicable to SBV, we started doing research but effectiveness questions cannot be answered (yet). B: I do not think stakeholders want information about the limits of the analysis. C: It is possible, but difficult to say. I think we made our knowledge limits clear in case of SBV. D: Difficult to say.
S8	?	?	Very difficult question to answer. It is very difficult to know how a different sector deals with or perceives a risk and in particular how this will work out in practice.
S9	Yes	A: ? B: ? C: ? D: No	Feasible: Yes and such an analysis has been done as well. Should be done extendedly, one time. D: There is a fixed set of measures. A, B, C: not asked for since interviewee argued it already happened.
S10	Yes	?	It could be useful and feasible, but difficult to say how it will work out with regard to the outcome variables.

5.6.2 Interdisciplinary (risk) estimation in late December 2011

5.6.2.1 Multidisciplinarity no added value for SBV, yes in general

An explicit risk assessment is done by RIVM (2011a) and ECDC (2011). Interviewees were asked whether they thought that considering the characteristics of the risk, it was unambiguously clear which knowledge was needed. This was confirmed by six of the interviewees, though some (S2, S7) mentioned explicitly that only the medical knowledge needed was known.

Also, the feasibility of the inclusion of a broad variety of disciplines into the process was part of the questions on risk assessment. This was also confirmed by the majority of the interviewees (6/10). Furthermore, interviewees were asked whether they thought a variety and equal distribution of disciplines would have contributed to A) the balance in short- and long term effectiveness, B) acceptance, C) efficiency and D) the variety of measures with regard to SBV. Four out of ten interviewees (S1, S2) argued a variety of disciplines within the risk management process to positively contribute to the balance in short- and long term effectiveness concerning SBV. Two interviewees who answered no with regard to SBV and the effectiveness balance (S5, S9) were positive about the contribution for other or future infectious diseases. Reasons mentioned were the focus being too much on the short term and medical science at the moment (S2, S3) , but also interaction between disciplines would help understanding the system (S1). As an alternative for the inclusion of a broader variety of disciplines was mentioned: making the long term effectiveness more explicit (S5). Interviewees did

not think there was much added value to gain regarding SBV in particular. Since a broader variety of disciplines might lead to more inclusive argumentation, more proportionate measures and better argumentation on decisions (leading to lower turmoil in society) could be the result in general though (S2, S6, S7, S8).

In short: it seemed to be clear which knowledge was needed with regard to SBV, though this could have referred to medical knowledge only. Most interviewees did not doubt about the feasibility with regard to the inclusion of a variety of disciplines within the process. Although for SBV not everyone was sure about the added value with regard to the balance in short- and long term effectiveness if a broader variety of scientific disciplines would be included into infectious disease governance, more than half of the interviewees (6/10) argued that this would contribute to the balance in short- and long term effectiveness in general. Reasons mentioned were the focus being too much on the short term and medical science at the moment (S2, S3), but also interaction between disciplines would help understanding the system (S1). Since a broader variety of disciplines might lead to more inclusive argumentation, more proportionate measures and better argumentation on decisions, interviewees argued higher effectiveness, efficiency and acceptation to be the possible result in general.

Table 19: Results on feasibility and added value of multi-disciplinarity in risk assessment for SBV

Interviewee	***Knowledge gap clear?***	***Feasible?***	***A: Effectiveness B: Acceptance C: Efficiency D: Measure Variety***	***Remarks***
S1	Yes	May be	A: Yes B: ? C: ? D: No	Knowledge gap: the fact that the knowledge was not available is a different thing. Feasibility: If information was not available within the network, it was known whom to contact outside of the network. A broad variety of disciplines should be involved into the process in my opinion, but maybe not at the same moment. A: I think knowledge exchange between disciplines is always positive. Scientists can come up with short term solutions, politicians should guard the long term strategy. Interaction between these two is good, but maybe not at the same moment. Every discipline has its knowledge circle. Interaction between disciplines, makes knowledge circles overlapping. This helps understanding the system. B: Missing. C: Missing. D: Depends on the infectious disease, but for SBV no because midges are very difficult to control.
S2	No	Yes	A: Yes B: Maybe C: Maybe D: yes	Knowledge gap: Yes with regard to human/veterinary medical knowledge, No with regard to economic/social knowledge. Feasibility: Also feasible under time pressure. Interaction between differing disciplines increases, and distrust decreases. A: At the moment I feel that one does not look beyond his/her own medical discipline. A broader involvement of disciplines could contribute to the balance between short term and long term effectiveness. Humans are capable of controlling infections naturally; we should not take this away by emphasizing short term control. Finding the right balance between naturally fighting an infection and medically controlling it is the key. B: A more inclusive advice would be the result, but only if scientists agreed with each other and were solely responsible for their field of expertise. C: Maybe we would have spent less money. D: the focus could have changed. As soon as there was short term (medical) knowledge about possible exposure (when would be the next midges season), research could start on studying the system or other disciplines.
S3	Yes	Yes	A: Yes B: No C: ? D: Yes	Knowledge gap: Although I was not present at this meeting, I think this risk assessment was done carefully. Feasibility: I feel that the medical domain wants to keep the problem in its own discipline, this is a pity. A: The focus in infectious disease control is on (human and veterinary)

				medical science, while environmental aspects are playing a large role. There is no eye for the long term: sustainability questions are asked but I do not see anyone doing something with it. It is necessary we do because one day there will be a vector which *is* dangerous for humans. B: There was hardly any turmoil in society during SBV. C: Missing. D: I feel that mainly short term measures were taken during SBV, which is important for controlling an outbreak. However, as far as I know, not much happened for the long term.
S4	?	Yes	?	Feasibility: Always feasible, not always necessary. Double interview, other questions not asked (or could not be derived from the q-fever interview).
S5	No	Yes	A: No B: No C: No D: Yes	Knowledge gap: It was partly clear, partly not. Several research proposals were done, not everything is actually performed which could indicate that in terms of specific knowledge it was not completely clear what knowledge was needed. Feasibility: However difficult for different disciplines to communicate (they easily get into the details). A: For SBV no. For other infectious diseases yes, since there is sometimes conflicting effectiveness with regard to the short term and long term. E.g.: Measures taken for BSE on the short term (exclusion of animal remains from animal food) had effect on the long term. *Interviewee mentioned inclusion of a broader variety of disciplines, or alternatively making the long term vision explicit.* B: For SBV no. For larger problems in which a larger group of society is involved, a broad variety of disciplines could be favourable. A balance in necessity of inclusion of a particular discipline and the idea that everyone is interfering in the process should be found. C: For SBV No. For other infectious diseases it is dependent on the severity of the measures and the present state of acceptance. D: Every discipline has its own toolkit.
S6	Yes	No	A: No B: No C: No D: No	Feasibility: in practice we had a limited budget and limited time for SBV. The priority is thus a medical one: controlling the disease. In case of a long term problem and budget availability it is possible. A: The budget for SBV was not known in the beginning. Then one stays with the short term priorities. B: In theoretical sense a broader variety of disciplines does result in more inclusive argumentation and higher acceptance, in practice not. Especially not with SBV since much was unknown. C: It can even result in higher spending of resources on the short term. On the long term it might be favourable. D: Not for SBV.
S7	Yes	No	A: Maybe B: Maybe C: Yes D: Maybe	Knowledge gap: clear with regard to the medical knowledge gaps. Feasibility: Not in times of crises. A: On the long term this could contribute to the balance in control and prevention. B: Policy makers need concrete, clear advice. This might be difficult if more disciplines are involved. C: Possibly negative on the short term, but positive on the long term. D: I can imagine that social- or psychological considerations are important to take into account, I can imagine this has an effect on the measures taken.
S8	Yes	Yes	A: Maybe B: Maybe C: ? D: ?	Feasibility: Feasible, though dependent on the infectious disease whether necessary. A social scientist can be of added value for the short term (control), an environmental scientist can be of added value for the long term. A: Only on the long term. First the control of the risk is necessary. B: Soundness of knowledge is in my opinion contributing to acceptance. C: Missing. D: Missing.
S9	?	Yes	A: No B: ? C: ? D: No	Knowledge gap: The infectious disease was unknown, so at first knowledge gaps were not known. Answer could not be derived. Feasibility: if considered important, in times of crisis the sense of urgency make these things more easy to organize. A: for SBV no. For other infectious diseases in which many more is unknown, it could be. Think about an environmental expert in case of

				environmental pollution. B, C: Missing. D: there is a fixed set of measures for every infectious disease outbreak. The argumentation can change though, leading to a different choice of measure.
S10	Yes	May be	A: Yes B: ? C: ? D: Yes	Feasibility: Maybe with regard to the time pressure not feasible, but yes if it is built into the structures. Possible at RIVM, there is enough knowledge available. But not sure if it should be done at RIVM. In case of SBV a scenario analysis was made which might be comparable. A, D: Only if formally built into existing structures. B, C: Missing.

5.6.2.2 Concern assessment no added value for SBV, yes in general

With regard to concern assessment, interviewees were asked whether they thought it was feasible (considering the time pressure) to perform a concern assessment in December 2011. The majority (8/10) argued a concern assessment to be feasible. Besides, interviewees were asked about what they thought a concern assessment would have meant for the acceptance of SBV policy. Three interviewees (S4, S7, S9) argued it contributed to acceptance of the policy, since a concern assessment *did* take place (although implicitly). Four others (S2, S5, S6, S10) argued a concern assessment would not have contributed for acceptance of SBV, since it was already high. In general though, these interviewees were positive towards doing a concern assessment because: it would be favourable for the cooperation of citizens (S1), it would lead to trust (S3), emotions do play a role in risk management (S6).

In short: a concern assessment was perceived to be feasible to perform in December 2011 considering most interviewees (8/10). In general, interviewees were positive towards the idea of performing a concern assessment. A concern assessment would not have contributed much to acceptance of SBV. Reasons for this are the following: a concern assessment was (implicitly) done and turmoil in society already was not high during SBV.

Table 20: Results on feasibility and added value of a concern assessment for SBV

Interviewee	***Feasible?***	***When or how to do this?***	***Acceptance up?***	***Remarks***
S1	Yes	X	Yes	In fact, this question is one for risk communication experts. In my opinion it is always reasonable to include indirect stakeholders. It is also favourable for the cooperation of citizens.
S2	Yes	X	No	Concern assessment should have been done before the notification obligation. No acceptance increase in case of SBV, for other infectious diseases possibly.
S3	Yes	X	?	At the moment, a concern assessment does not take place explicitly. If done, the communication strategy can be adapted. This will lead to trust and perceived possibly acceptance (the latter not sure).
S4	Yes	X	Yes	It is feasible and we did a concern assessment. In my opinion it contributed a lot for acceptance.
S5	Yes	Random sampling, asking questions to representatives of stakeholder groups	No	No problem for the feasibility. No increase in acceptance for SBV. Positive for other infectious disease risks. I plea for a proportionate concern assessment (in line with the severity of the problem).
S6	No	X	No	It would not have been feasible in December 2011. Risk managers had many things to do. Turmoil in society was not high for SBV, therefore for this particular risk no contribution for acceptance. For other risks possibly, since emotions also play a role.
S7	Yes	Asking questions on organized meetings.	Yes	A concern assessment did take place, but not explicitly. Farmers and vets were asked about their risk perception on organized meetings. I think it positively contributed to acceptance, and I am positive towards the idea of doing this explicitly for future infectious disease risks.
S8	Maybe	X	No	Difficult to realize a representative concern assessment for a large group. For a smaller group easier to organize, but then it is not representative for acceptance of society. No increase in acceptance for SBV, for other infectious disease risks not sure because of feasibility problem. I think the communication of sound information influences acceptance: if wrong

				scientific information is communicated, or there is incomplete scientific information it results in turmoil in society (e.g. industrial farming).
S9	Yes	Random sampling, asking representatives of stakeholder groups.	Yes	A concern assessment is done implicitly: yes it is feasible. From experience: in general stakeholders are glad if they are heard and included in the process. A concern assessment will contribute to acceptance, but it is definitely not the only contributing factor.
S10	Yes	X	Maybe	Feasible because we looked at SBV in retrospective. There was not much turmoil in society during SBV. Maybe if we would have done a concern assessment with SBV, we would have paid less attention to the problem. A presumption for contribution to acceptance, is that you make your concern assessment known to the public: let people know that you do research to peoples concerns. I think it would be good to have an instrument to test peoples perception, since the ideas risk managers have (without doing a concern assessment) on public perception are not necessarily right.

5.6.3 Unclear whether Risk characterization and evaluation would be of added value

Interviewees were asked whether the weighing of facts and values was inherent in the OMT/BAO structure of infectious disease control. Almost all interviewees (9/10) argued such a weighing to be present, although five of them argued it to be implicitly inherent. Furthermore, interviewees were asked whether they thought a weighing of values and facts would have contributed to A) the balance in short- and long term effectiveness, B) acceptance, C) efficiency and D) the variety of measures for SBV policy. Many interviewees found it difficult to make statements concerning the specific added value in terms of the outcome variables with regard to SBV (S1, S4, S5, S8, S9, S10), but in general interviewees agreed on the fact that both facts and values should be taken into account.

In short: nine out of ten interviewees argued that a weighing of facts and values does take place in infectious disease governance, though five of them argued it to take place implicitly. Many interviewees found it difficult to make statements concerning the specific added value in terms of the outcome variables with regard to SBV, but interviewees acknowledged the importance of this IRGC-step.

Table 21: Results on feasibility and added value of an explicit weighing of values and facts for SBV

Interviewee	***Present in OMT/BAO structure?***	***A: Effectiveness B: Acceptance C: Efficiency D: Measure Variety***	***Remarks***
S1	?	A: Yes B: ? C: ? D: ?	Not in the position to answer whether this is present in the OMT/BAO structure. A: On the short term I think a weighing of facts and values prevents for anger/distrust, on the long term it contributes to trust/goodwill. This is favourable for control and prevention of infectious diseases. B, C, D: Missing.
S2	Yes, implicit	A: Maybe B: ? C: Maybe D: ?	A: This should be done at the policy level. B: Difficult to say. C: Maybe. Sometimes you are chasing the facts, like in case of SBV. D: Risk perception should be weighed but the emphasis should be on scientific facts. Policy should be mainly based on scientific facts. Answer could not be derived.
S3	Yes	A: ? B: ? C: ? D: No	I think this weighing of facts and values takes place in an OMT though the focus is on scientific facts. A: It is not always possible to synergize scientific knowledge and risk perception, both have their own dynamic. Both should be weighed though. B, C: Missing. D: Not for SBV. Maybe it could have for Q-fever, but this should be researched then.
S4	Yes, implicit	?	An OMT is in place for scientific facts, a BAO for political feasibility. In both implicitly a weighing of values and facts takes place.
S5	Yes,	A: No	A: for SBV not. But in general it could contribute to the balance between

	implicit	B: No C: No D: No	short- and long term effectiveness. Though an distinction should be made between facts and values with regard to the short term and facts and values with regard to the long term. B: for SBV No. In general I do think that it would contribute to acceptance because now sometimes the facts (and effectiveness of measures) are criticized while the underlying issue is value based. An example is the Q-fever discussion and the link to industrial farming: people simply do not want large farms (value based) but the facts are not necessarily in favour of small farms. C: Not for SBV. In general it is important separate facts and values and it could contribute to better understanding (possibly leading to higher efficiency). D: for SBV No, in general Yes.
S6	Yes	A: No B: No C: No D: No	Within the new structures, I do think that risk perception is slightly covered. Therefore, the answer to A, B, C and D is no. If a risk is perceived to be high, money is made available for it.
S7	Yes	A: No B: No C: Maybe D: Yes	A: It will not contribute to the long term effectiveness. Maybe it could contribute to the short term effectiveness. B, D: not in case of SBV. Though if there would have been a lot of turmoil in society, the government might have opted for different measures. C: Can go both ways, it can cost more but also less.
S8	Yes, implicit	A: ? B: ? C: ? D: ?	OMT/BAO: maybe. Turmoil in society does play a large role in risk management. If societal unrest is expected, (implicitly) it is a reason to act. A: Dependent per risk. Difficult to say. B: in general it is positively contributing to acceptance if you can make clear to the public that values are taken into account. C: Missing. D: If turmoil in society is expected, this is a reason for action.
S9	Yes	A : ? B: ? C: ? D: ?	A: Difficult to relate to practice. B: In general: Yes. C: If one does not weigh values and facts, it will finally work out less efficient because of Chamber of Deputies questions for example. D: Not or less relevant in case of SBV.
S10	Yes, implicit	A: Yes B: ? C: Yes D: Maybe	At the moment people in OMT/BAO themselves make an estimation about turmoil in society. Communication expert are present for the translation of decisions to the public. THE tool for measuring turmoil in society is not yet invented in my opinion. A: the better values and facts are synergized, the more people are triggered to take measures seriously. B: In general Yes because facts and values are more balanced then. C: with regard to the costs, measures can be more adjusted to the severity of the problem. D: more proportionate measures can be taken if there is a good idea on risk perception and scientific risk estimation.

5.6.4 Early Risk Communication contributed to acceptance

Interviewees were asked whether they thought if early communication about certainties and uncertainties to both direct and indirect stakeholders took place in case of SBV. Furthermore, they were asked whether they thought early communication would lead to a higher level of support (as a result of trust and acceptation) for the chosen policy (A). Additionally, some were asked whether they thought early communication about certainties and uncertainties would contribute to responsibility recognition of stakeholders (B).

The majority (8/10) argued that early risk communication about certainties and uncertainties took place and that it positively contributed to acceptance of the policy. Indications for the latter were: the low turmoil in society and the low number of Chamber of Deputies questions.

In short: eight out of ten interviewees argued that early risk communication about certainties and uncertainties took place in case of SBV. Interviewees considered this to have contributed to acceptance of risk governance.

Table 22: Results on feasibility and added value of early risk communication for SBV

Inter	**Early**	**A: Public support**	**Remarks**

viewee	(un)certainty communication took place?	(as a result of trust and acceptation) B: Responsibility recognition.	
S1	?	A: Yes B: Maybe	I do not know in detail which information is communicated during the SBV outbreak. A: Speaking for myself: I think it is always important to be honest (although I do not know if citizens think about this in the same way). B: Not my point of expertise, but I do think it could contribute. It is very important to be honest and transparent about what is known and unknown.
S2	?	A: Maybe B: ?	I am not sure what has been communicated to indirect stakeholders. One should not forget that we were caught by surprise by this many deformed lambs. A: Difficult to say in case of SBV. I think it is important to be honest about what is known and unknown. However, unnecessary panic should be prevented for. A balance between these two thus is they key. In case of SBV, still some citizens wanted to know all contaminated farms because of distrust with regard to the government (even when the risk was communicated to be very small). B: Do not know for indirect stakeholders. For direct stakeholders: Yes!
S3	Yes	A: Yes B: ?	A: This is however one of the most difficult dilemmas. Citizens can distrust the government in case of too little, too vague communication but they are not eager to hear statistical details. Interviewee focused on communication with direct stakeholders instead of indirect. B: I do not know.
S4	Yes	A: Yes B: ?	However, a letter to the Chamber of Deputies is seen as communication to the public. Maybe more is necessary, this is subject of research at the moment. A: An indication of this is the fact that the Chamber of Deputies was very satisfied about the intensity and transparency of communication: no citizen questions came in B: Missing
S5	Yes	A: Yes B: Maybe	Indications for this are the RIVM risk analysis being accessible for everyone, and specific (adjusted) communication to certain groups (e.g. general practitioners, vets). A: Yes it has contributed, both in general as for SBV. B: If responsibility recognition is part of the communication strategy, yes.
S6	Yes	A: Yes B: Yes	A: Many informational meetings (for farmers and vets) have been organized. But this is not something new, this has always been done. Indirect stakeholders are always eager to be updated about the situation, even if not much is known, it gives the feeling of controlling the situation. These informational meetings were open for everyone, that is positive. I think it does contribute to acceptance because you can prevent for possible anger. B: Because people know more what to be aware for and what they can expect from others.
S7	Yes	A: Yes B: ?	Maybe not before the notification obligation in particular, but in general early communication took place. Implicitly also about certainties and uncertainties. A: Because people knew what they could expect. B: Missing.
S8	Yes	A: Yes B: ?	Both RIVM (through Q&A sections on the website) as the ministries have communicated very transparent (also about certainties and uncertainties). SBV can be seen as an example case with regard to communication to the public. A: The low number of questions from the Chamber of Deputies can be an indication for this. Open, transparent communication about certainties and uncertainties is good, but it should be balanced (stay with the facts, no speculation). B: Difficult to say. Remarking was that people seem to be not worried about the SBV risk.
S9	Yes	A: Yes B: Maybe	Both by RIVM as the ministries. A: This is also proved by scientific studies and people/citizens expect institutions to do this. B: Though the primary reaction of citizens is looking what the government does.

S10	Yes	A: Yes B: ?	With Q&A sections on the RIVM website, GGD referred to those, RIVM has been in the news. A: Better than speculating and being wrong. B: Difficult. Possible actions to take in case of SBV were not really present for citizens. For pregnant women these were communicated, and I do think this influences responsibility recognition.

5.7 Conclusion

SBV was considered a possible threat for human health in December 2011. It did not result in human infections or deaths. The threat with regard to human health took less than six month and a risk assessment was made 3 days after the first contacts between GD and RIVM and serological research was performed within three months. A media analysis revealed few newspaper publications on SBV. Respectively, effectiveness, efficiency and acceptance were high with regard to risk governance for SBV. This suggests that risk governance during SBV could hardly have been improved by applying the IRGC-framework (this is possibly biased by the fact that SBV turned out to be non-zoonotic).

According to desk research, SBV with regard to human health could be classified as mainly being an uncertain risk. This was acknowledged by interviewees, though time bias in the research could have caused interviewees to tone down the level of uncertainty with regard to the SBV risk for human health. Intervention measures taken (notification obligation, serological research) suggest uncertainty had the overhand at the time.

In case of an uncertain risk, Renn (2005) advises to include the following stakeholders in risk governance: agency staff, external experts, industry and directly affected groups (i.e. reflective discourse). Desk research reveals these stakeholders were included into the process (i.e. actual risk management with regard to the involved stakeholders resembled the IRGC-ideas). Actual risk governance did not completely match with the suggested IRGC-approach in the sense that research to framing, existing conventions and concern assessment were absent IRGC-steps. The absence of these IRGC-framework steps could have left room for the occurrence of governance deficits, though desk research and the media analysis did not reveal any consequences (in terms of lower acceptance, effectiveness or efficiency) of these governance deficits. The analysis on absent and present IRGC-steps thus suggests there to be little room for added value with regard to effectiveness, efficiency and acceptance in this specific case in case of full appliance of all IRGC-steps.

An hypothetical situation was formed, in which research to framing would have taken place in early December 2011 and a concern assessment in late December 2011. This hypothetical situation served as the basis for questions to stakeholders. Semi-structured interviews served as a means to find out whether the hypothetical situation would have been possible (feasible) considering the time frame and whether the IRGC-steps could have contributed to the enhancement of effective, efficient and accepted infectious disease governance (hereby keeping in mind that there was little room for improvement). Additionally, questions were asked on the remaining IRGC-steps in order to confirm desk research findings. These additional questions furthermore served as a general exploration to the ideas of the IRGC, therefore no additional hypothetical moments were defined.

There was consensus on the feasibility of research to framing, a multi-disciplinary risk assessment and concern assessment with regard to time pressure. Again, interviewees had different ideas on how to perform research to existing conventions and according to two interviewees, research to existing conventions thoroughly took place before December 2011.

With regard to the added value of every separate IRGC-step, the following can be concluded: Interviewees did not consider research to existing conventions to be of added value with regard to SBV or found it difficult to say something with regard to the relation between such an analysis and an outcome criteria. Research to framing would not have contributed much in terms of acceptance for SBV, possible reasons for this were: acceptance during SBV already being high and the preference for actual contact over desk research.

In general, interviewees were positive towards the idea of the inclusion of multiple disciplines within risk governance, although it would not have contributed much for SBV (since acceptance, effectiveness and efficiency were already high). Among the reasons for the positive attitude towards multi-disciplinarity were: the focus of infectious disease control being too much on the short term and medical science at the moment, but also interaction between disciplines would help understanding the system. Since a broader variety of disciplines might lead to more inclusive argumentation, more

proportionate measures and better argumentation on decisions, interviewees argued higher effectiveness, efficiency and acceptation to be the possible result in general.
Interviewees were also positive towards the idea of performing a concern assessment in general, but argued it would not have contributed much to acceptance of SBV (a concern assessment was argued to have occurred (implicitly) and acceptance already was not high during SBV).
Nine out of ten interviewees argued that a weighing of facts and values does take place in infectious disease governance, though five of them argued it to take place implicitly. Many interviewees found it difficult to make statements concerning the specific added value in terms of the outcome variables with regard to SBV, but interviewees acknowledged the importance of this IRGC-step in general.
Eight out of ten interviewees argued that early risk communication about certainties and uncertainties took place in case of SBV. Interviewees considered this to have contributed to acceptance of risk governance.

Table 23: Hypotheses rejection/acceptation as a result of the SBV case study

#	**Hypothesis**	**SBV added value?**
H1a	*Research to how an infectious disease risk is framed, provides insight into how stakeholders approach a risk. This leads to mutual understanding which contributes to acceptance and efficiency (in case there are conflicts of values) in infectious disease governance.*	Not acknowledged by interviewees, but there was limited room for added value with regard to SBV.
H1b	*Acknowledgement on the existence of multiple frames and ones own constraints, contributes to effectiveness, acceptance and efficiency.*	Not acknowledged by interviewees, but there was limited room for added value with regard to SBV.
H2a	*The categorization of risk into the categories simple, uncertain, ambiguous and complex can help clarify the knowledge available and missing. This makes it possible to make a more inclusive risk estimation and thus contributes to effective, efficient and accepted infectious disease governance.*	Cannot be rejected or accepted by interviews only.
H2b	*Multiple disciplines should be involved into a risk assessment in case of systemic risks, because this fosters a systems view on the risk (leading to both short- and long term effectiveness).*	Not acknowledged with regard to SBV, acknowledged in general.
H2c	*Concern assessment should be integrated in risk governance of systemic risks because it leads to mutual understanding (and acceptance), resulting in a higher willingness to cooperate (and thus effectiveness).*	Not acknowledged with regard to SBV, acknowledged in general.
H3a	*A functional distinction should be made between risk characterization and risk evaluation, because it deliberately separates the weighing of facts and values. Besides, it clarifies the role division between risk assessors and risk managers. This enhances efficiency and acceptance in risk governance.*	Cannot be accepted or rejected by interviews only
H4a	*The categorization of risks, accompanying management strategy (and level of participation) and appropriate instruments for risk prevention and risk reduction lead to more effective, efficient and accepted risk management.*	Acknowledged by desk research.
H5a	*Early communication about certainties and uncertainties fosters acceptance about risk governance.*	Acknowledged by interviewees

6 Comparative Analysis

This chapter contains a comparison of the results of the study of two infectious diseases (Q-fever and SBV) in light of the IRGC-framework. Where Q-fever was selected because of its contested character and acute threat for human health at the time (outbreak), SBV was recognized by zero human infections but its potential zoonotic component in 2011 made it a possible threat for human health (threat). These two completely differing infectious diseases were thought to possibly reveal whether the IRGC-framework was more of use in case of an outbreak- or threat situation. The comparison of the two cases thus helps to draw general lessons on the usefulness of the IRGC-framework for Dutch infectious disease governance.

The analysis on present and absent IRGC-steps during the governance process of two recent infectious diseases (Q-fever and SBV) revealed that Dutch infectious disease control already covers many suggested risk governance elements. For example: screening and early warning are advised by the IRGC (Renn 2005) and are inherent into the structures of Dutch infectious disease control. An outbreak or threat situation often starts with a scientific risk estimation (risk assessment in DB or OMT), after which the results are weighed on managerial feasibility (including economic, political and juridical feasibility) in a BAO (risk characterization and evaluation). Finally, risk management and risk communication are fixed elements within Dutch infectious disease control.
Nevertheless, risk governance during Q-fever was contested, both because of the many infections as well as its perceived inefficient management (Van Dijk et al 2010). An accumulation of Dutch published newspaper articles during the Q-fever outbreak, revealed high peaks in turmoil in society and could be an indication of low acceptance of Q-fever risk governance. Low acceptance of Q-fever risk governance is furthermore indicated by civil society initiatives (Q'uestion) and evaluative researches (Van Dijk et al 2010, Van der Bijl et al 2012). Risk governance for SBV on the other hand was recognized by high acceptance (hardly any newspaper publications) and high efficiency (quickly intervention measures were pointed out and operationalized). The effectiveness criterium (as defined for this research) was not really applicable to SBV, since turned out to be a non-zoonotic infectious disease. Desk research and interviews resulted in an uncertain categorization for SBV and ambiguous for Q-fever.

Table 24: Comparative analysis of Q-fever and SBV results

		IRGC-step applied?		***Feasible?***	***Useful?***
		Q-fever	***SBV***		
Risk categorization		Ambiguous	Uncertain	X	X
IRGC-STEP	**1a Framing**	No	No	Yes	No
	1b Selection of conventions	No	Unclear	Dependent on operationalization	Unclear
	2a Risk assessment (multi-disciplinarity)	Yes No	Yes No	 Yes	 Possibly
	2b Concern assessment	No	No	Yes	Yes
	3 Characterization and evaluation	Implicit	Implicit	Yes	Unclear
	4 Risk management according to risk categorization	No	Yes	Possibly	Possibly
	5 Early risk communication about certainties and uncertainties	No	Yes	Yes	Yes

The analysis on absent and present IRGC-steps revealed that research to framing and concern assessment were the most clearly missing steps in both case studies (and thus in Dutch infectious disease governance). In theory, appliance of these steps would have led to better knowledge about values, beliefs and interests and therefore about how risks are perceived by stakeholders (IRGC 2009). This could have fostered acceptance in infectious disease governance through mutual understanding (cf. Van Egmond and De Vries 2011) and effectiveness and efficiency though willingness to cooperate (Williams et al 2010). Interviews with stakeholders acknowledged the added value of a concern assessment for infectious disease governance, especially during Q-fever and in general. The added value of research to framing was not acknowledged by interviewees for both cases. This contrasts with theory because research to framing and concern assessment are sub-sequent steps of the IRGC-framework. The reason for the occurrence of this contrasting result can be found in the method of questioning: research to framing was explained to interviewees as making a short overview of all involved stakeholders and their view on the problem by doing desk research only, while interviewees favoured actual contact. Besides, research to framing and concern assessment were deliberately separated in interviews for practical reasons, while in theory "the five IRGC-steps should not be seen as sequential steps but rather as closely interlinked elements" (cf. Renn 2005, p.26). In an attempt to operationalize research to framing, an exploration was done to the existence of multiple frames by which at least four frames were identified (see Table 5). One of the frames (frame 1) seemed to be closely interlinked with the discussion on industrial farming (Oppers 2010) and another (frame 2) seemed to be closely interlinked with the discussion on risk responsibility and acceptance in general (RIVM 2003, Helsloot et al 2010). This interlinkage suggests that some frames might reoccur during infectious disease outbreaks or threats. The reoccurrence of frames is acknowledged by AO (2012) in which the appearance of SBV is linked to industrial farming and also by Oppers (2010, p.49) who argue that industrial farming is a hidden theme, meaning that "people do not think about it on a daily basis but if subject of discussion, emotions can run high."

Although already partly or implicitly applied, the other IRGC-steps contain useful elements for Dutch infectious disease governance: the inclusion of multiple disciplines into risk assessment (Renn 2005, King et al 2006, Hoeijmakers et al 2007) and risk management adjusted to the type of risk. With regard to the inclusion of multiple disciplines, interviewees suggested the following: environmental experts, communication experts, lawyers, mathematicians, ethicists, socio-economists and psychologists. A broader variety of disciplines was considered to contribute to infectious disease governance in terms of effectiveness, efficiency and acceptance because a more inclusive risk estimation could be made, resulting in more proportionate measures, a better balance between short- and long term effectiveness and better argumentation on decisions. However, there was no consensus on when and where to involve multiple disciplines and the involvement of multiple disciplines was not always considered necessary (e.g. not during SBV since effectiveness, efficiency and acceptance were already high). Also, some interviewees doubted whether stakeholders would see the difference between the disciplines, thereby expressing their doubts about the added value with regard to acceptance and some argued that the inclusion of multiple disciplines would hamper efficiency (e.g. due to scientists always arguing for further research). That risk management adjusted to the type of risk would *possibly* foster effectiveness, efficiency and acceptance in infectious disease governance can be derived from interview answers and the case studies: SBV governance resembled the IRGC-approach to a larger extent and revealed a higher level of effectiveness, efficiency and acceptance than Q-fever which did resemble the IRGC-approach to a lesser extent. The emphasis is on possibly because one can argue that uncertain risks are more easy to manage than ambiguous risks, not only because with the latter the involvement of indirect stakeholders (the public) is advised. Besides, difficulties with regard to participatory management were mentioned by interviewees: possible delay due to lobbying interests and difficulty in organizing (or finding a representative for) 'the citizen'. Nevertheless, interviewees argued that participatory management could have contributed to acceptance (because stakeholders are heard and their opinion is taken into account) and measure variety (lay men may have interesting insights, thereby leading to more effectiveness and efficiency) during Q-fever or in general.

Finally, the importance of early risk communication with an emphasis on certainties and uncertainties was acknowledged by interviewees (this was argued to have occurred in case of SBV and argued to

have contributed to acceptance of risk governance). Early risk communication is a difficult subject though, since (among other difficulties, see paragraph 2.4.5) early involvement of the public can lead to overreaction (Pitrelli and Sturloni 2007) and the media can complicate risk communication in several ways (Drijver and Woudenberg 1999).
As mentioned above, for this research a difference was made between an outbreak (Q-fever) and a threat (SBV). The difference between an outbreak and a threat at RIVM-CIb turned out to be less evident: where SBV was a possible threat for human health, there was also urgency involved because risk assessors and risk managers had to decide upon intervention measures before the new midges season started. Hereby, the urgency component (by which an outbreak was recognized for this thesis) seemed to be present during the threat case (SBV) as well. Participatory observation furthermore revealed that there are no clear rules for when either an OMT or a DB takes place, but it seemed to be based on experience (or expert-judgement). Because of the fact that in practice the difference between an outbreak and a threat is difficult to recognize (or possibly non-existent), one of the above mentioned aims (revealing whether the IRGC-framework was more of use in case of an outbreak- or threat situation) could not be reached.
The two cases of study have revealed different results: whereas the indication on effectiveness, efficiency and acceptance was low for Q-fever, it was high for SBV. As mentioned above, the higher resemblance (see Table 24) with the IRGC-framework in the risk governance process of SBV can be a cause for this. However, there could be several other reasons for this occurrence: SBV not being zoonotic (no human infections or deaths occurred),[72] ambiguous risks being more difficult to manage than uncertain risks (also mentioned above), the duration of the outbreak and threat (Q-fever at least three years, SBV less than six months)[73] and finally the newly built zoonotic structures (which contributed to trust building and mutual understanding between direct stakeholders).[74] General lessons on the usefulness of the IRGC-framework for Dutch infectious disease governance have thus been drawn above, but one should keep in mind that other factors contribute to effectiveness, efficiency and acceptance in infectious disease governance as well.

[72] Interviewees were asked for the reason of low turmoil in society during SBV: six out of ten explicitly argued that the most prominent reason was no human infections or deaths. Addittionally, three others mentioned no human infections or deaths as a reason, in combination with some other factors (e.g. pro-active communication).
[73] The longer duration of Q-fever as an outbreak is furthermore one of the reasons for the less-detailed description of the timeline in comparison with SBV. The timeline of SBV is furthermore more detailed than the one of Q-fever, because of the fact that during SBV participatory observation was among the research methods.
[74] The newly built zoonotic structures are mentioned in interviews several times with regard to feasibility of particular IRGC-steps because e.g. during Q-fever the human and veterinary column were not on the same line. (see Table 10, interviewee Q7).

7 Discussion, Conclusion and Recommendations

This chapter is the final chapter of this research and contains a discussion, conclusion and recommendations paragraph. The discussion paragraph (7.1) is subdivided into discussion on methods (7.1.1) and discussion on the IRGC-framework (7.1.2). The conclusion follows (paragraph 7.2) in which an answer is given to the main question of this research. Finally, a recommendations paragraph follows (7.3).

7.1 Discussion

7.1.1 Discussion on methods

In this research is chosen for a qualitative approach. Qualitative, research has advantages (it can be more in-depth than a quantitative study) but a disadvantage is that it is difficult to generalize results (Verschuren and Doorewaardt 1999, p.23). When case study selection took place, two infectious diseases (Q-fever and SBV) were chosen for their comparability (both starting in animals). Nevertheless, the two case studies were far from comparable: the Q-fever outbreak took at least three years and resulted in many human infections and several human deaths. The SBV risk with regard to human health took less than half a year and turned out to be non-zoonotic. Where one risk (Q-fever) was looked at from an historical perspective, the other (SBV) was observed through participatory observation. Also, both infectious disease risks were categorized differently (Q-fever as an ambiguous risk and SBV as an uncertain risk). Nevertheless, this research has descriptive value: the usual state of affairs in infectious disease control is described by a researcher with a deviant background (social science) than common at RIVM-LCI (medical). Besides descriptive value, this research has exploratory value, since it served as a starting point for the further exploration of a risk governance approach in infectious disease control and it tried to verify whether risk assessors and risk managers were positive towards a more multidisciplinary[75] and/or participatory approach.

Another limitation of this study is the total number of interviewees not being high. This made the researcher decide to diversify the selection of interviewees. Because SBV is classified as uncertain risk, suggested involved stakeholders are agency staff (risk assessors and risk managers) external experts, industry stakeholders and directly affected groups. Q-fever is classified as ambiguous risk, which means that on top of the suggested involved stakeholders in case of an uncertain risk, the general public should be involved (Renn 2005, p.53). This categorization of groups of stakeholders turned out to be more difficult in practice than in theory, but an attempt is done to select at least one suggested representative from each stakeholder group in line with the suggested involved stakeholders differing per risk category. Even though the willingness to participate was high, not all selected interviewees could be interviewed due to time constraints (member of the Chamber of Deputies, VWS) or due to a sabbatical (CVI). Ongoing research to Q-fever (Van der Bijl et al 2012) and confidentiality of information might have caused interviewees to be careful on sharing their thoughts.

An assumption in this research is turmoil in society being related to acceptance. Turmoil in society is measured by accumulating all published national newspaper articles on the particular infectious disease per week. Although this method is used by others (Washer 2008), it is questionable whether the total number of published national newspaper articles truly reflects turmoil in society.

Another limitation of this research is that analysis of the interviews is done by a single researcher. The researcher wanted to refrain from (human medical) bias by analyzing the results of the interviews with someone from RIVM-LCI and therefore intended to analyze the interviews with a colleague from the master Environmental Policy Management. However, insufficient knowledge on either the IRGC-framework or infectious diseases would have made this a time consuming effort. The emphasis on interview results being confidential, in combination with the time consuming element of double analysis (which counted for anyone) made the researcher decide not to look further for a second analyst. Instead, the researcher chose to analyze the interview results as objectively as possible by filtering key words, summarizing answers, table plotting and showing as much as possible of the responses in the tables. In the end, the researcher was pointed at the fact that analysis on the interviews

[75] Besides human health experts, environmental (climatologists) and social/economic experts (statistics, mathematics, anthropologists) (IRGC 2008, King et al 2006).

could have been done with a colleague from RIVM-MEV, for which possibly time constraints would not have been an issue.
A final limitation of this study is the evaluation though *three* evaluation criteria (effectiveness, efficiency and acceptance). These three evaluation criteria were chosen based on existing literature and short interviews with risk assessors and risk managers (see Appendix 3). However, since "there remain important differences of opinion as to what should be taken into account in an assessment, how various parameters ought to be measured and what weight should be attached to particular aspects of the evaluation" (Sewel et al 1979, p.346) this choice remains arbitrary. In the IRGC-framework for example, evaluation of intervention options takes place in IRGC-step 4 (risk management) through eight evaluation criteria: effectiveness, efficiency, minimisation of external side effects, sustainability, fairness, political and legal implementability, ethical acceptability and public acceptance (Renn 2005). Also, Appendix 3 reveals that risk assessors and risk managers mentioned many other (although less often mentioned) possible evaluation criteria.

7.1.2 Discussion on the IRGC-framework

The IRGC-framework has three functions: theoretical (which theoretical concepts exist in risk governance), analytical (what are the interrelations between all elements of risk governance) and normative (what would ideal risk governance look like). The IRGC-framework therefore turned out to be a useful tool for this research since the cause for the occurrence of risk governance deficits in infectious disease governance could be traced back to missing IRGC-steps (or elements).
However, a description of the operationalization of the separate IRGC-steps is missing in Renn (2005), which means that every researcher can operationalize this framework in a different way but it also means that there is a gap between theory and practice.
The IRGC-framework is comprehensive in theory, and turned out to be too comprehensive to assess in eight months. Each IRGC-step (and even sub-steps) could separately be subject of (extended) research. This means that in this research a more general approach is taken, with less elaboration on each separate IRGC-step. With regard to desk research per IRGC-step, this meant that limited in depth research could be done. With regard to interviews this meant that, even though sufficient time per interview was scheduled (1.5 hours), at most two questions were devoted to each IRGC-step. There was little room for elaboration on the separate IRGC-steps, which was anticipated on by sending a summary of the IRGC-framework to interviewees in advance. Nevertheless, questions on the exact meaning of some IRGC-steps remained because of three reasons: 1) not every interviewee was familiar with the concept of risk governance and the separate IRGC-steps and 2) on every IRGC-step limited desk research was possible (or available), leaving room for abstraction and 3) the operationalization of each step was often asked for while this was not completely clear or figured out by the researcher either.
Renn (2005) advises early communication about certainties and uncertainties in risk governance. In practice of infectious disease governance however, every day many possible infectious disease outbreaks or threats are recognized by early warning and screening. This makes it impossible to communicate about all infectious disease risks and would besides spread unnecessary fear. A balance in early communication about certainties and uncertainties therefore seems the solution. But what exactly is the right balance in early communication about certainties and uncertainties seems a difficult question.
Finally, the risk categorization into simple, complex, uncertain and ambiguous risks (Renn 2005) does not capture the urgency or time pressure element which is often present in infectious disease governance. According to interviewees, time pressure might either foster the possibilities for the appliance of the IRGC-steps since there is a sense of urgency present with stakeholders, but it might also hamper the possibility to include stakeholders or multiple disciplines into the risk governance process since this takes time and priorities are set in case of outbreak situations. This raises the question whether a) the IRGC-framework is not meant for the governance of risks which are recognized by time pressure or b) a fifth risk categorization should be made.

7.2 Conclusion

This research aimed to give an answer to the following question: *To what extent is the IRGC-framework useful for Dutch infectious disease control and if applied, what is the added value in terms of effectiveness, efficiency and acceptance?*
It turned out this question is not easily answered, not only because further research is needed to the operationalization of the separate IRGC-steps, but also because time pressure (inherent in infectious disease governance) seems to add an extra dimension to risk governance for infectious diseases. Appliance of the complete IRGC-framework under time pressure does not seem to be feasible. However, this research does suggest several separate IRGC-steps to be useful for further strengthening Dutch infectious disease governance. Even though the character of this research (comparing actual risk governance with hypothetical IRGC-governance) does not allow for strong conclusions with regard to the particular outcome variables, some general statements with regard to the outcome variables and the separate IRGC-steps can be made.
First of all, research to framing and concern assessment were absent IRGC-steps and can mainly contribute to acceptance in risk governance. Risk assessment was not an absent IRGC-step, but the inclusion of multiple disciplines into risk assessment (as suggested by Renn 2005) might foster the effectiveness, efficiency and acceptance of infectious disease governance (as a result of more proportionate measures taken). It might be that risk governance adjusted to the type of risk fosters effectiveness, efficiency and acceptance in risk governance, but further research (an analysis of additional case studies) is needed in order to draw conclusions on this.
The theoretical, analytical and normative function of the IRGC-framework were useful for this research. However, in order to bridge the gap between theory and practice, further research is needed to the operationalization of the separate IRGC-steps. Finally, infectious disease risks are often recognized by time pressure but the IRGC-framework does not seem to address this extra dimension into its risk categorization. This raises the question whether an extra risk category (urgent risks) should be made.

7.3 Recommendations

The timeline of both SBV and Q-fever show that many stakeholders are involved into infectious disease governance. Each group of stakeholders seems to walk his own path and only sometimes the paths of stakeholders seem to cross.[76] Since RIVM-CIb has a coordinating role in infectious disease governance, it is important to have a view on which stakeholders are and should be involved in each outbreak or threat situation. The first recommendation thus is: *developing a structure for making an overview of all (in)direct stakeholders in every outbreak or threat.*
Besides knowing who stakeholders are, it is important to know how stakeholders perceive an infectious disease risk. This refers to the inclusion of a concern assessment into infectious disease governance. The importance of the inclusion of a concern assessment into risk governance for infectious diseases is acknowledged by interviewees. A concern assessment should be proportionally adjusted to the infectious disease outbreak or threat, since many interviewees do not think a concern assessment always contributes to the acceptance of a particular infectious disease (e.g. during SBV acceptance was already high). Since the operationalization of a concern assessment is not elaborated on in Renn (2005), the second recommendation is to *find out how and when to do a rapid concern assessment.* A concern assessment can mainly take place within the existing network structure of infectious disease governance: GD, LTO, CVI and NVWA are the link to farmers, vets and the industry for gaining knowledge on the perceptions with regard to a particular zoonotic infectious disease risk. GGD and RIVM are the link to citizens, patient groups and general practitioners. Many interviewees suggested means to include concerns into infectious disease governance (see Table 11 and Table 20). Suggestions range from literally asking for concerns on meetings (placing concerns explicitly on the agenda) to random sampling by telephone interviews.
Since research to framing and concern assessment are sub-sequent IRGC-steps, it seems straightforward that a recommendation on research to framing follows. However, interviewees did not consider research to framing to be of added value for infectious disease governance. As argued in chapter six, this contrasting result might be due to the method of questioning. It thus might be useful to

[76] E.g. in OMT, DB or BAO many stakeholders come together, as well as in basic meetings (e.g. timeline SBV December 23rd 2011).

make an overview of 'common frames' reoccurring during the governance of infectious diseases, so that anticipation on them can take place. Since in this research only an exploration was done to the operationalization of research to framing, a structural *method should be developed* for being able to perform this recommendation. Besides, the usefulness of research to framing still needs to be proven.
Finally, the inclusion of multiple scientific disciplines in risk assessment during a situation of time pressure was not considered feasible nor necessary by the interviewees. In a situation of time pressure (controlling an outbreak or threat), priorities are set and the focus on medical science is approved of (and needed). However, many interviewees were positive towards the idea of the inclusion of multiple scientific disciplines into the governance process, mainly with regard to the prevention for infectious diseases (long term effectiveness). This also hold for Q-fever: interviewees did not consider it of added value to include multiple disciplines within the risk assessment in 2007, but they were positive towards the inclusion of multiple scientific disciplines in later years (2008, 2009: interviewees mentioned environmental experts, communication experts, lawyers, mathematicians, ethic, socio-economists). A final recommendation is thus to *explicitly consider which other (besides medical) scientific disciplines are of additional value* during outbreak or threat situations. Many of these scientific disciplines are present at RIVM, meaning that there is not necessarily a need for searching outside of the existing institutions. The newly built zoonotic structures accounted for a link between the human and veterinary column (RIVM-LZO), which was a recommendation of Van Dijk et al (2010) and acknowledged by scientific literature (Cáceres 2011). However, it might be useful to *reconsider whether such a linkage is needed between other columns* as well (e.g. an environmental linkage, Leach et al 2010).

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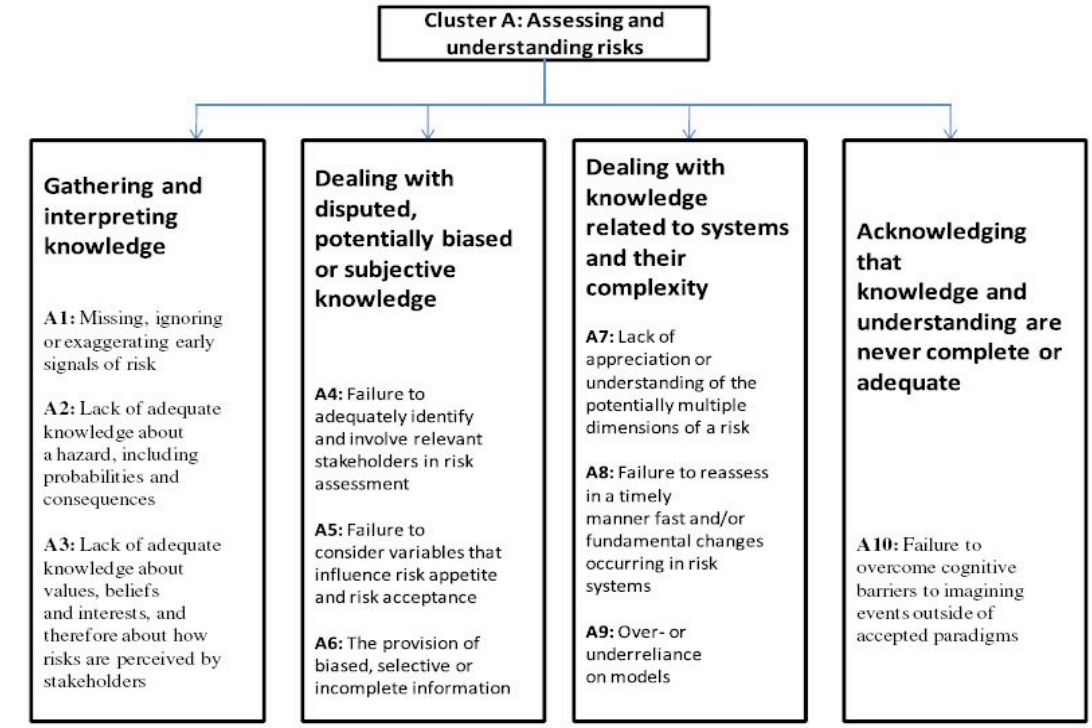
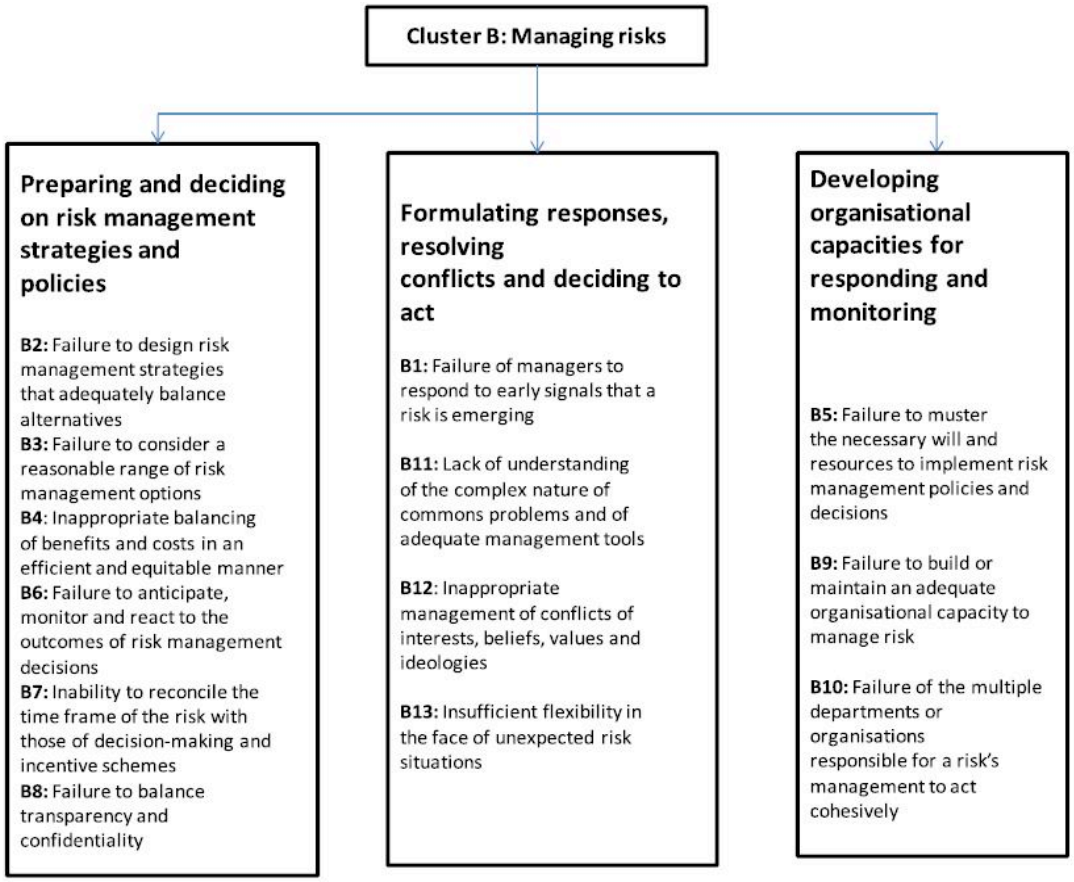
Appendices

Appendix 1 – Risk governance deficits (IRGC 2009)





Appendix 2 – Risk governance deficits linked to IRGC-steps

IRGC-step	Linked risk governance deficit according to Todd (2011)
1 Pre-assessment	1) the signals of a known risk have not been detected or recognized, or the risk is perceived as having only local consequences when it may in fact be much broader 2) no awareness by the managers of a hazard or possible risk, sometimes called the Black Swan effect 3) different stakeholders may have conflicting views on the issue
2 Interdisciplinary risk estimation	4) lack of scientific data about the risk and/or about people's concerns, or if there is sufficient information there is a failure to accept it 5) there is a low confidence level in the data used; the modeling approach or the interpretation of the model's results 6) lack of understanding or attention to the potential interactions between the different actors and between actors and the risk target 7) inadequate attention is given to the concerns of stakeholders
3 Risk characterization and evaluation	8) (deliberate) exclusion of some stakeholders and their views 9) indecision or lack of responsiveness 10) lack of transparency 11) overlooking values to consider social needs, environmental impacts, cost-benefit analyses and risk-benefit balances 12) timing is wrong for the issue to be properly addressed.
4 Risk management	13) unclear responsibility division 14) inadequate/ignored information leading to inappropriate decisions 15) no appropriate regulatory structure or process in place to manage the issue, 16) short-term expedient decisions lead to secondary problems 17) failure to revisit a risk decision (after new knowledge being available) 18) indecision 19) unequal allotting of risks and benefits 20) managers are isolated from the impact of their decisions and not accountable for them 21) decisions are ignored or poorly implemented
5 Risk communication	22) one-way instead of two-way communication 23) the communication strategy is not adjusted to the situation (i.e. type of risk) 24) communication does not account for how different stakeholders receive and accept information 25) some stakeholders are alienated because their concerns are treated as irrational or irrelevant 26) because of a low level of trust in the decision-making process, the information communicated has limited value to some stakeholders that the whole governance process is weakened

Appendix 3 – Exploration to success criteria

A successful outcome of infectious disease governance according to risk assessors and risk managers
In order to arrive at a more inclusive and specific overview of what is meant by successful infectious disease governance, 30 minute interviews were held with 13 infectious disease experts. Most mentioned as successful outcome criteria was effectiveness, followed by acceptance
What is a successful outcome? VWS / EL&I (n=8) vs RIVM (n=5)
- Effectiveness: Prevention of health risk, prevention and control of death people/contaminations, know who contaminated ones and contacts are ** * ********** - Perceived legitimacy of citizen: Low turmoil in society, perceived effective control of a risk * ** ** - Stakeholder involvement: If stakeholders are involved into the decision making process *** - Timeliness (both decision wise as implementation wise) ** - Flexibility/Continuous alertness: Continuous evaluation on the feasibility and effectiveness of measures ** - Satisfaction of the ministries ** - Transparency ** - Accuracy: Making the right decision with best available knowledge * - Communication: Effective communication * - Clear role division * - Good cooperation * - Honest cost/benefit division between stakeholders * - Insight in the transmission route * - Change of behaviour of citizen *

! Note: the stars behind the answers represent the number of times this outcome variable being mentioned by respectively VWS/EL&I (yellow marked) or RIVM (blue marked).

Appendix 4 – Desk research justification

Literature search (Scopus, Web of Science, Google Scholar), N=246		
- included after abstract reading, N=36		
- included after full reading		12
IRGC website		13
Suggested in interviews/during internship		22
Other websites		4
Master programme		11
Reference list searches		21
Singular searches		23
Total	**N=**	**106**

Other sources	**Documents**	#
Included because on IRGC-website	Bonneck 2006, Cleeland 2009, IRGC 2008, IRGC 2009, IRGC 2011, Knight et al 2006, Kuenzi and McNeely 2006, Löfstedt and van Asselt 2008, Okada et al 2006, Renn 2005, Tait 2006, Warner North 2006, Fineberg and Wilson 2010	13
Included because suggested in interviews/during internship	Helsloot et al 2010, Krommendijk 2011, Van Dijk et al 2010, Breakwell et al 2001, Braks et al 2011, Bults et al 2010, Van der Weerd et al 2011, Kasperson et al 1988, Algemeen Overleg 2012, Keesing et al 2010, RIVM 2003, 2009, 2011, 2011a, Timen 2010, Van der Giessen 2010, Washer et al 2008, Camp 2011, Post 2010, GGD HvB 2008, WRR 2008, Health Council of the Netherlands 2008.	22
Included because on relevant websites	United Nations 2011, CDC 1999, ECDC 2010, ECDC 2011	4
Included because used in Sustainable Development master programme	Meadowcroft 2004, 2007, Stoker 1998, Jordan et al 2005, Verschuren and Doorewaard 1999, Hubbard 2009, Rossi et al 2004, Smith 2003, Van Egmond and De Vries 2011, Runhaar et al 2011, Aven 2011	11
Included from reference list search	National Research Council 1989, Slovic 2000, Forsythe 1993, Renn 2008, Mack et al 2000, Stohlgren and Schnase 2006, Rothman 1997, Kahneman and Tversky 1979, Keeney 1992, Leiss 1996, Morgan 1990, Scoones and Foster 2008, Hammond et al 1990, Aven & Renn 2009, Coglianese 1999, Cross 1998, Liberatore and Funtowicz 2003, Kasperson and Kasperson 2005, Woudenberg and Kuijper 1995	21
Singular Searches 1) IRGC-steps - A Framing - B Risk Characterization and evaluation - C Risk Communication - D Concern Assessment 2) Dutch relevance 3) Q-fever 4) Causes for infectious disease outbreaks 5) Evaluation criteria, effectiveness 6) Other	1A) Entman 1993/2007, Lechuga et al 2011 1B) Bouder et al 2007 1C) Drijver et al 1999, Hance et al 1990, Merkelsen 2011 1D) Glik 2007 2) Schippers and Bleker 2010, 2011, Cramer 2009, Ale 2002, Hoeijmakers et al 2007 3) Van der Bijl et al 2012, Oppers 2010, Ministry of EL&I 2009 4) Cavirani 2008, King et al 2006, Pysek 2010, Graham et al 2008 5) Thacker et al 2011, Sewel 1979 6) Needleman 1997	23

Search engine (s)	**Item**	**Item combined with**	**Item further combined with**	**Item further combined with**	**Results**	**Included after abstract reading**	**Included after full reading**
Scopus, *Web of Science*	Risk governance OR risk management OR governance OR management	Infectious disease OR infectious disease threat	**X**	**X**	5970, *12849*	**X**	**X**
Scopus, Web of Science	Risk governance OR risk management OR governance OR management	Infectious disease OR infectious disease threat	IRGC framework	X	1	0	0
Scopus	Risk governance OR risk management	Infectious disease OR infectious disease threat	(relevance until 50)	**X**	148	13	2
Scopus	Infectious disease governance	(relevance until 50)	X	X	87	15	2
Scopus	Risk governance OR risk management	IRGC framework	**X**	**X**	7	5	5 Brass et al 2011, Steen et al 2009, Renn and Roco 2006, Renn et al 2011, Todd 2011
Scopus	Risk governance OR risk management	Infectious disease OR infectious disease threat OR public health	Evaluation OR successful policy OR success factors OR evaluation criteria	X	0	0	0
Google Scholar	public opinion on infectious diseases	+ relevance (meaning only looking at the first 20 results)	X	X	2	2	2 Pitrelli and Sturloni 2007, Lashley and Durham 2007
Web of Science	causes for infectious disease outbreaks	+ relevance (meaning only looking at the first 20 results)	X	X	1	1	1 Hui 2006

Appendix 5 – Letter sent to interviewees before interview

Toelichting op vragenlijst en onderzoek

Vele risico's van tegenwoordig hebben een link naar technologische ontwikkeling, klimaatverandering, globalisatie en verhoogde mobiliteit. Hiermee is de scope van een risico groot en veelomvattend. Tegelijkertijd beleeft ieder mens risico's op een andere manier. Zo ook is dit van toepassing op de Nederlandse infectieziektebestrijding: de oorzaak van infectieziekten kan gevonden worden in onze huidige manier van produceren, klimaatverandering, verre reizen, handel en verstedelijking. De Nederlandse infectieziektebestrijding heeft aanzien in de wereld, maar toch kunnen er felle discussies over de aanpak ontstaan wat relateert aan de beleving van een risico (denk aan Q-koorts, de mexicaanse griep).
Volgens de wetenschappelijke literatuur zouden hierdoor veel risico's niet meer volgens de formule van Gebeurtenis **x** Kans **x** Consequentie berekend kunnen worden. De vraag is hoe dan wel. Zou een model waarin anders omgegaan wordt met risico's bijdragen aan efficiënt, effectief en acceptabel management van infectieziekten? Dit is de vraag die centraal staat in dit onderzoek.

In dit nieuw bedachte model:

1) worden risico's ingedeeld in de categorieën simpel, complex, onzeker en ambigu. Iedere categorie van risico gaat gepaard met een bepaalde management aanpak, en zekere mate van betrokkenheid van stakeholders.
2) wordt rekening gehouden met de sociale context van een risico. Dit gebeurt door bewust onderzoek te doen naar hoe verschillende stakeholders aankijken tegen een risico en hier rekening mee te houden in risico management.

In chronologische volgorde van de gebeurtenissen van een recente casus (of Q-koorts, of Schmallenberg virus), ga ik u bevragen of een hypothetische aanpak volgens dit nieuwe model had geleid tot ander beleid/andere uitkomsten. Aan de hand van de publicatie van krantenartikelen in nationale kranten en analyses op bestaande documenten heb ik 3 a 4 momenten gekozen waarop ik met u wil inzoomen. Had de toepassing van dit model op dit bepaalde moment geleid tot een efficiënte, effectieve, acceptabele uitkomst?[77]

Om bijgaande vragenlijst goed te begrijpen, worden enkele begrippen verder toegelicht:

- **Simpel risico**: de gebeurtenis, de kans en de consequentie van een risico zijn bekend. Een standaard/routine aanpak is dus mogelijk.
- **Complex risico**: het is moeilijk om een verband te vinden tussen een bepaalde gebeurtenis en de oorzaak hiervoor. Dit kan bijvoorbeeld doordat het lang duurt voordat het risico zichtbaar wordt, of omdat er meerdere oorzaken zijn.
- **Onzeker risico**: het gevolg van incomplete/inadequate kennis op het gebied van gebeurtenis en oorzaak (dus een gevolg van weinig kennis over complexe systemen).
- **Ambigu risico**: er zijn meningsverschillen over de ernst/grootte van het risico. Ambigue risico's zijn er in twee soorten: 1) interpretatief, hierin zorgt de uitkomst van eenzelfde assessment voor een verschillende interpretatie en 2) normatief: mensen hebben andere ideeën over wat tolereerbaar is als risico. Dit hangt samen met normen, waarden, cultuur, geloof en levensopvatting.

Verder worden de volgende standaard gehanteerde definities gebruikt:[78]

- **Efficiëntie:** een doel met zo weinig mogelijk resources (geld, tijd, arbeid etc.) weten te bereiken.
- **Effectiviteit**: de mate waarin doelen zijn bereikt en de mate waarin problemen opgelost zijn. Voor dit onderzoek wordt zowel gedoeld op effectiviteit op de korte termijn (bestrijding) als effectiviteit op de lange termijn (preventie). Effectiviteit verwijst in dit onderzoek naar het aantal humane zieken en doden.
- **Draagvlak:** stakeholders zijn tevreden met beslissingen die worden genomen door risico managers en hebben vertrouwen in beslissingen die worden genomen door risico inschatters en managers; zij steunen de beslissingen. Voor dit onderzoek is aangenomen dat draagvlak nauw samenhangt met de mate van onrust in de maatschappij.
- **Stakeholder**: ieder persoon, groep of organisatie die een direct of indirect belang heeft bij beslissingen, doelen of gevoerd beleid over het risico omdat het hierdoor aangetast wordt of zou kunnen worden.

[77] Dit onderzoek is dus een hypothetische verkenning naar de mogelijkheden van dit nieuwe model in de praktijk, het is geen beleidsevaluatie en dus geen replicatie van het rapport van de Commissie van Dijk (2010) of de Nationale Ombudsman (2012).
[78] Gebaseerd op definities vanuit http://www.businessdictionary.com en http://www.encyclo.nl/.

Appendix 6 – Interview Q-fever

Vragenlijst IRGC en Q-koorts

Moment 1: Begin Juli 2007 (voor het eerst worden de mycoplasma-casussen gelinkt aan de Q-koorts casussen door de GGD).

1 Wat waren de kenmerken van het risico voor de volksgezondheid op eerste gezicht naar uw idee?(i.e. was de oorzaak van het risico toe te schrijven aan één factor, waren er veel meningsverschillen omtrent de ernst of grootte van het risico, veel onzekerheden)?

2 Hoe denkt u dat andere stakeholders over de kenmerken van het risico voor de volksgezondheid dachten?

3 Heeft u het idee dat de kenmerken van het risico voor de volksgezondheid gedurende de tijd voor u en andere stakeholders veranderd zijn?

In de hypothetische situatie zouden in Juli 2007 d.m.v. **desk research** stakeholders expliciet gedefinieerd worden door risico assessors/managers. Eveneens zou een eerste inschatting over de perceptie van het risico bij stakeholders worden gemaakt (risico assessors/managers maken een schema van welke stakeholders een aandeel hebben in het risico, en proberen in te schatten hoe iedere stakeholder over het risico zou denken).

4 Denkt u dat een dergelijke quick scan naar hoe stakeholders een bepaald risico plaatsen haalbaar was geweest?

5 Denkt u dat een dergelijke quick scan in Juli 2007 zou hebben bijgedragen aan:
a) de balans tussen de korte- en de lange termijn effectiviteit?
b) meer draagvlak?
c) inzet van minder middelen (tijd/geld) en een voorspoedige samenwerking tussen stakeholders?
d) het aantal/variëteit aan gekozen maatregelen?

Ook zou in de hypothetische situatie onderzoek naar bestaande regels en gebruiken nodig voor een wetenschappelijke goedkeuring van de risico-inschatting plaatsvinden in Juli 2007. Hierbij zouden de volgende vragen behandeld kunnen worden: Wat is onze definitie van risico? In hoeverre is hierin sprake van subjectiviteit? Wat zijn aannames over de blootstelling van het risico? Wat zijn de reken-tools waarmee korte termijn en lange termijn risico's en kwantitatieve waarde krijgen? Een analyse hierop zou een zelfreflectie betekenen en de mogelijkheid om buiten hokjes te denken.

6 Denkt u dat een analyse op bestaande regels en gebruiken haalbaar was geweest?

7) Denkt u dat een analyse op bestaande regels en gebruiken zou hebben bijgedragen aan:
a) de balans tussen de korte- en de lange termijn effectiviteit?
b) meer draagvlak?
c) inzet van minder middelen (tijd/geld) en een voorspoedige samenwerking tussen stakeholders?
d) het aantal/variëteit aan gekozen maatregelen?

Moment 2: Eind Juli 2007
Het eerste RIVM OMT#40 vind plaats. Aanwezig waren RIVM-LCI, GGD Amsterdam, AMC, NVMM, Longarts, Microbioloog (ziekenhuis Oss/Tilburg), VWA, GD, GGD HvB, NHG, Sanquin.

8 Was het gezien de kenmerken van het risico destijds eenduidig te bepalen welke kennis er nodig was?

In de hypothetische situatie zou een risico inschatting hebben plaatsgevonden waarin een grote verscheidenheid aan disciplines betrokken zou zijn: gezondheidswetenschappers (medici), sociaal/economische wetenschappers (antropologen), klimatologen en wiskundigen.

9 Denkt u dat de verscheidenheid van disciplines bijgedragen zou hebben aan:
a) de balans tussen de korte- en de lange termijn effectiviteit?
b) meer draagvlak?
c) inzet van minder middelen (tijd/geld) en een voorspoedige samenwerking tussen stakeholders?

d) het aantal/variëteit aan gekozen maatregelen?

10 Was het haalbaar geweest?

In de hypothetische situatie zou gelijktijdig (en herhaaldelijk in tijd) een onderzoek gedaan zijn naar de zorgen die stakeholders zich maakten zodat hierop geanticipeerd zou kunnen worden (concern assessment). Stakeholders zouden gevraagd worden naar hoe zij een risico ***beleven.***

11 Denkt u dat een concern assessment haalbaar was geweest in Juli 2007? Indien ja: waarom? Indien nee: wanneer dan wel?

12 Wat denkt u dat een concern assessment opgeleverd zou hebben voor het draagvlak van het Q-koorts beleid?

Weging van feiten en waarden

Na de verzameling aan gegevens uit de risico- en concern assessment, vind in de hypothetische situatie een weging van feiten en waarden plaats door risico-assessors en risico-managers. Er wordt gekeken of een risico door stakeholders wordt gezien als intolerabel, tolerabel of acceptabel gezien zowel het wetenschappelijke bewijs als de risicobeleving.

- intolerabel (een activiteit is het niet waard om uit te voeren omdat er te grote nadelen aan hangen)
- tolerabel (een activiteit is het waard om uit te voeren omdat er voordelen aan hangen, desalniettemin moet het risico verkleind worden)
- acceptabel (een activiteit waarbij de risico's zo klein zijn dat risico reductie niet nodig is) zou zijn vanuit het perspectief van verschillende stakeholders.

13 Denkt u dat een weging van waarden en feiten zou hebben bijgedragen aan meer draagvlak?

14 Heeft u het idee dat een dergelijke afweging van risicobeleving (waarden) en kwantitatieve risico inschatting (feiten) al gemaakt wordt in de OMT/BAO constructie?

Moment 3: Februari 2009

Aan de hand van de analyse van nationale krantenartikelen, lijkt er vanaf Februari 2009 onrust in de maatschappij te ontstaan met een piek in December 2009. Dit zou kunnen duiden op meningsverschillen tussen stakeholders over het risico. In de hypothetische situatie zouden in dit geval naast de directe, ook indirecte stakeholders betrokken worden in het risico proces.

15 Denkt u dat betrokkenheid van stakeholders zou hebben bijgedragen aan:
a) de balans tussen de korte- en de lange termijn effectiviteit?
b) meer draagvlak?
c) inzet van minder middelen (tijd/geld) en een voorspoedige samenwerking tussen stakeholders?
d) het aantal/variëteit aan gekozen maatregelen?
e) verantwoordelijkheidserkenning ten opzichte van het risico?

16 Denkt u dat het haalbaar zou zijn in februari 2009 om stakeholders te betrekken? Waarom wel/niet? Hoe ziet u dit concreet voor zich?

Communicatie over zekerheden en onzekerheden

17 Zou naar uw idee vroegtijdige communicatie over zekerheden en onzekerheden leiden tot:
a) vertrouwen, b) acceptatie, c) verantwoordelijkheids erkenning van het risico en denkt u dat dit zal resulteren in minder onrust in de maatschappij?

18 Is er naar uw idee bij Q-koorts vroegtijdig gecommuniceerd over de zeker- en onzekerheden wat betreft het risico?

Appendix 7 – Interview SBV

SJABLOON Vragenlijst IRGC en Schmallenberg Virus (SBV)

Note: in dit interview ligt de focus op het infectieziekte risico voor de mens.

Moment 1: Early december 2011 (begin uitbraak SBV bij dieren)

1 Wat waren de kenmerken van het risico op eerste gezicht naar uw idee?(i.e. was de oorzaak van het risico toe te schrijven aan één factor, waren er veel meningsverschillen omtrent de ernst of grootte van het risico, veel onzekerheden)?

2 Hoe denkt u dat andere stakeholders over de kenmerken van het risico dachten?

3 Heeft u het idee dat de kenmerken van het risico gedurende de tijd voor u en andere stakeholders veranderd zijn?

In de hypothetische situatie zou onderzoek naar bestaande regels en gebruiken nodig voor een wetenschappelijke goedkeuring van de risico-inschatting plaatsvinden in December 2011. Hierbij zouden de volgende vragen behandeld kunnen worden: Wat is onze definitie van risico? In hoeverre is hierin sprake van subjectiviteit? Wat zijn aannames over de blootstelling van het risico? Wat zijn de reken-tools waarmee korte termijn en lange termijn risico's en kwantitatieve waarde krijgen? Een analyse hierop zou een zelfreflectie betekenen en de mogelijkheid om buiten hokjes te denken.

4 Denkt u dat een analyse op bestaande regels en gebruiken in het geval van SBV zou hebben bijgedragen aan:
a) de balans tussen de korte- en de lange termijn effectiviteit?
b) meer draagvlak?
c) inzet van minder middelen (tijd/geld) en een voorspoedige samenwerking tussen stakeholders?
d) het aantal/variëteit aan gekozen maatregelen?

5 Was het haalbaar geweest?

In de hypothetische situatie zouden in December 2011 d.m.v. **desk research** stakeholders expliciet gedefinieerd worden door risico assessors/managers. Eveneens zou een eerste inschatting over de perceptie van het risico bij stakeholders worden gemaakt (risico assessors/managers maken een schema van welke stakeholders een aandeel hebben in het risico, en proberen in te schatten hoe iedere stakeholder over het risico zou denken).

6 Denkt u dat een quick scan naar hoe stakeholders een bepaald risico plaatsten in deze fase zou hebben bijgedragen aan meer draagvlak?

7 Was het haalbaar geweest?

8 Heeft u het idee dat er vroegtijdig over zeker- en onzekerheden is gecommuniceerd met en naar directe en indirecte stakeholders? Waarom wel/niet?

9 Denkt u dat vroegtijdige communicatie met en naar (in)directe stakeholders in het geval van SBV zou bijdragen/bijgedragen heeft aan meer draagvlak (als gevolg van vertrouwen/acceptatie)?

Moment 2: 21 December 2011 wordt er expliciet een risico-assessment gedaan door het RIVM.

10 Was het gezien de kenmerken van het risico destijds eenduidig te bepalen welke kennis er nodig was?

Een risico-assessment zou tevens gebeuren in de hypothetische situatie, maar met een grote verscheidenheid aan disciplines: gezondheidswetenschappers (medici), sociaal/economische wetenschappers (antropologen), klimatologen en wiskundigen.

11 Denkt u dat de verscheidenheid en gelijke verdeling van disciplines in het geval van SBV bijgedragen zou hebben aan:

a) de balans tussen de korte- en de lange termijn effectiviteit?
b) meer draagvlak?
c) inzet van minder middelen (tijd/geld) en een voorspoedige samenwerking tussen stakeholders?
d) het aantal/variëteit aan gekozen maatregelen?

12 Was het haalbaar geweest?

Tevens zou er een inschatting gedaan worden naar de zorgen/perceptie/beleving omtrent het risico bij verschillende stakeholders (concern assessment). Dit laatste lijkt nu niet expliciet gebeurd te zijn. De analyse op nationale krantenartikelen, evenals het geringe aantal vragen omtrent het SBV risico wat binnenkomt bij GGD'en zou erop kunnen duiden dat er een lage mate van onrust in de maatschappij is.

13 Wat denkt u dat de reden van is voor deze lagere mate van onrust in de maatschappij?

14 Denkt u dat een concern assessment haalbaar was geweest in December 2011? Indien ja: waarom? Indien nee: wanneer dan wel?

15 Wat denkt u dat een concern assessment opgeleverd zou hebben voor het draagvlak van het SBV-beleid?

Moment 3: Weging van feiten en waarden
Vanwege het feit dat er veel onzekerheden waren omtrent het SBV risico was het moeilijk te kwantificeren en is de kans groter dat er bij risico-inschatting subjectiviteit 'insluipt'.*

16 * Bent u het hier mee eens?

De risico afweging wordt gedaan door beleidsmakers, wetenschappers en vertegenwoordigers van directe stakeholders. Er wordt gekeken of een risico door stakeholders wordt gezien als intolerabel, tolerabel of acceptabel gezien zowel het wetenschappelijke bewijs als de risicobeleving.

- intolerabel (een activiteit is het niet waard om uit te voeren omdat er te grote nadelen aan hangen)
- tolerabel (een activiteit is het waard om uit te voeren omdat er voordelen aan hangen, desalniettemin moet het risico verkleind worden)
- acceptabel (een activiteit waarbij de risico's zo klein zijn dat risico reductie niet nodig is) zou zijn vanuit het perspectief van verschillende stakeholders.

17 Hoe denkt u dat burgers/boeren/overheid het humane risico inschatten gezien het kwantitatieve (cijfermatige) en kwalitatieve (normen/waarden) bewijs?
Boeren: tolerabel/intolerabel/acceptabel
Burgers: tolerabel/intolerabel/acceptabel
Overheid: tolerabel/intolerabel/acceptabel
Andere partij, namelijk……: tolerabel/intolerabel/acceptabel

18 Denkt u dat een weging van waarden en feiten in het geval van SBV op de manier als genoemd hierboven zou hebben bijgedragen aan:
a) de balans tussen de korte- en de lange termijn effectiviteit?
b) meer draagvlak?
c) inzet van minder middelen (tijd/geld) en een voorspoedige samenwerking tussen stakeholders?
d) het aantal/variëteit aan gekozen maatregelen?

19 Heeft u het idee dat een dergelijke afweging al gemaakt wordt in de OMT/BAO constructie?

Appendix 8 – Timeline Q-fever

Date	Event	Involved stakeholders	IRGC -step	Categorization of risk
2003	Human abortion on a goat farm after which the GD proposes to do further research (#1) with funding of EL&I (Van Dijk et al 2010, p.34)	Farmers, GD, EL&I	1	GD: *uncertain*
2005	Research (#1) results in knowledge that abortion problems with goats appeared on 3 large goat farms, and that it is caused by bacteria *Coxiella Burnetti* (Van Dijk et al 2010, p.34)		1	
2006 - April 6th - April 20th	Discussions on research #1 with several parties. Request for further research is rejected by the ministry of EL&I, considered of lesser relevance (Van Dijk et al 2010, p.35).	EL&I, GD, NVWA, RIVM, LTO etc.	1/5	EL&I: *simple*
2006	GD announcement: 9 farms with goat abortion problems (Brabant province), family members of contaminated farms became ill. It is not sure whether this knowledge is present due to better diagnostics or due to an increase in contamination (Van Dijk et al 2010, p.35)	GD and farmers to GGD HvB	1	
May 25th and 29th 2007	Hospital doctor and general practitioner in Herpen announce a high number of patients with lung disease to GGD HvB (Van Dijk et al 2010, p.35, GGD HvB 2008, p.47)	Hospital, general practitioner, GGD HvB	1	
May 30th 2007	GGD HvB tries to find out whether there is a relation between the hospital and general practitioner cases (GGD HvB 2008, p.48). Symptoms seem to refer to Mycoplasma.	GGD HvB	2a	
June 11th 2007	GGD HvB notifies Q-fever to RIVM-LCI (Van Dijk et al 2010, p.35). Number of notifications is within yearly normal marges, so according to GGD HvB (2008, p.49) RIVM-LCI less worried. GGD HvB starts source detection research in cooperation with NVWA (GGD HvB 2008, p.49)	GGD HvB, RIVM-LCI, NVWA	1/5	NVWA, GGD HvB: *uncertain* vs. RIVM-LCI: *ambiguous (interpretative)*
June 21st 2007	GGD HvB and general practitioner decide to unify their press communications (Van Dijk et al 2010, p.35). Main message: no denial, further research is ongoing, several patients are confirmed with other bacteria (mycoplasma). Doctor in Herpen calls the situation an epidemic in press (GGD HvB 2008, p.50-1).	GGD HvB, general practitioner, RIVM-LCI, newspaper	5	
June 22nd 2007	GGD HvB is approached by press (newspaper, TV, radio). In local newspapers, the case is framed as: mysterious epidemic, Herpen fever etc. (cf. GGD HvB 2008, p.52). Because of this press release, it is expected that more people will notify their symptoms to GGD HvB.	GGD HvB, local newspapers	5	Local newspaper: *systemic*
June 25th 2007	GGD HvB notifies 5th case of Q-fever to RIVM-LCI, source is unknown (GGD HvB 2008, p.53). So far, the cases of mycoplasma and Q-fever are not linked with each other.	GGD HvB, RIVM-LCI	2a	
June 28th 2007	Q-fever notifications are communicated on weekly signalling meeting (RIVM-CIb), the same for Mycoplasma cases. GGD HvB and NVWA decide to organize a regional Q-fever meeting (GGD HvB 2008, p.54)	GGD HvB, RIVM-LCI, NVWA	5	RIVM-LCI vs NVWA and GGD HvB *ambiguous (interpretative)*
July 2nd – 5th, 13th 2007	GGD HvB starts with systematic data gathering by making a questionnaire for Q-fever symptoms. Focus questionnaire: finding the common source (GGD HvB 2008, p.58-60). GGD HvB links the mycoplasma cases with the Q-fever ones (GGD HvB 2008, p.55)	Hospital, GGD HvB	2a	
July 11th 2007	Regional Q-fever meeting aiming at improving cooperation human/veterinary (Van Dijk et al 2010, p.36). A patient information leaflet is published (GGD HvB 2008, p.56).	RIVM-LCI, NVWA, GGD HvB, GD, GGD Eindhoven, hospital doctors	4/5	
July 23rd 2007	OMT #40 (RIVM-LCI). Advice: - estimating scope of outbreak - early detection of contaminations - transparency from veterinary side - structural monitoring (Van Dijk et al 2010, p.37) BAO: first three advice points agreed on, last one not. No early informing of the public because Q-fever is a normal illness, the outbreak	OMT participants, see Table 8	2a	OMT: *systemic*

	seams over her peak, preventing for unnecessary turmoil in society (consequences are unknown) (Van Dijk et al 2010, p.37-8) - possible source detected: a goat farm in Brabant province (GGD HvB 2008, p.70)			
July 24th / 25th 2007	RIVM-LCI asks a professor to support pneumonia research (GGD HvB 2008, p.70).	GGD HvB, RIVM-LCI, professor	2a	
July 30th 2007	Farmers and vets receive an information letter from RIVM-LCI/LZO and GD (GGD HvB 2008, p.73)	RIVM-LCI, LZO, GD, farmers, vets	5	
August 8th 2007	Inf@ct about Q-fever in Brabant province. RIVM-LCI and GGD HvB also discuss their cooperation and role division (GGD HvB 2008, p.76)	RIVM-LCI, GGD HvB	4/5	
August 10th 2007	Screening for pregnant women (n=14). All fill in a questionnaire and blood samples are taken. In total this accounts for about 60% of the pregnant women in the region. 3 women (15%) turn out positive on the 22nd of August (GGD HvB 2008, p.78, 80 and p.81).	GGD HvB	2a	
August 31st 2007	Possible cluster in Oss (GGD HvB 2008, p.83)	GGD HvB	2a	
October 3rd 2007	OMT #41 due to new contaminations in September, a new outbreak is expected in 2008. Advice: - increase knowledge on Q-fever, source detection (Research # 2) - notification obligation (van Dijk et al 2010, p.39, GGD HvB 2008, p.90).	OMT participants, see Table 8	2a/4	OMT: *uncertain*
October 4th 2007	BAO: - thinking of possible hygienic measures - within five days proposal on how to collect information on contaminations (with or without notification obligation) - communication to the public will be prepared by GGD HvB (van Dijk et al 2010, p.39)	RIVM-LCI	4/5	
October 25th 2007	EL&I decides: no notification obligation because of a lack of information (Van Dijk et al 2010, p.39)	EL&I	4	EL&I: *ambiguous (normative)*
December 11th 2007	According to Van Dijk et al (2010, p.40) GD does not communicate all contaminated farms to RIVM-LCI because of privacy reasons	GD, RIVM-LCI	5	
March 2008	Results of research # 2: - source is detected: east-Herpen (Dutch village) - bacteria spreads through the air (Van Dijk et al 2010, p.40)		2a	
March 6th 2008	RIVM-LCI and VWS accuse EL&I about insufficient communication to the public about hygienic measures (Van Dijk et al 2010, p.41)	EL&I, VWS, RIVM-LCI	5	
May 23rd 2008	Chamber of Deputies questions PvdD. Media frame Q-fever as a new, severe problem in industrial farming. EL&I argues that RIVM-LCI does not support this framing (Van Dijk et al 2010, p.42)	EL&I, PvdD, RIVM-LCI	2b	EL&I: *ambiguous (normative)*
May 29th 2008	Meeting. Measures in public farming are needed. Proposal: ban on transport of manure, notification obligation (Van Dijk et al 2010, p.42)	EL&I, RIVM-LCI, GGD, VWA, VWS	4	
June 3rd 2008	OMT #42 Advice: - notification obligation for animals (if abortions take place, June 13th) - unified communication (Van Dijk et al 2010, p.43)	OMT participants, see Table 8	2a/3/4	
June 5th 2008	BAO - concludes that research so far does not provide enough information on transmission from animal to human, however discussion on measures take place - communication point OMT is approved of (Van Dijk et al 2011, p.43).		3/4/5	
June 12th 2008	**Notification obligation** Ministers EL&I and VWS decided upon this on June 9th 2008 (Van Dijk et al 2010, p.44)	EL&I, VWS	4	
July 22nd 2008	Round table conversation organized by RIVM-LCI, GD. Present: international/national experts. Farmers are not present. Conclusions: - Q-fever is an unique situation in the Netherlands - assumed transmission by air from infected goat farm to human (Van Dijk et al 2010, p.45)	RIVM-LCI, GD, (inter)national experts	2a/5	
July 30th 2008	OMT # 43, advice (Van Dijk et al 2010, p.46): - visit goat farms to see whether hygienic advice is lived by - only cleaning out (of manure) of sheep/goat folds if transmission trough the air is impossible - vaccination of animals	OMT-participants, see Table 8	3/4	
July 31st 2008	BAO: All proposed advices of OMT are approved of, however only voluntary vaccination because vaccine is not officially registered (Van Dijk et al 2010, p.46)		3/4	

November 19th 2008 (communicated on December 4th)	Several hygienic measures are not lived by, several hygienic measures are in practice not feasible (Van Dijk et al 2010, p.47). Therefore advice DB: - better communicate hygienic measures - improve feasibility of hygienic measures - extension of hygienic measures - VWA should make a hygiene protocol together with LTO - continue with vaccination campaign	DB participants, see Table 8	4/5	
January 14th 2009	BAO decisions: - Obligatory vaccination (for farms >50 animals), within determined range or with known previous contaminations - Voluntary vaccination for small farmers (Van Dijk et al 2010, p.49)		4	
May 11th 2009	OMT #46, advice: - information should be equal to all farms which have obligatory vaccination - research to transport ban - abroad there are rules for the minimal distance of industrial farming practices and living areas - communication VWS and EL&I should be attuned (Van Dijk et al 2010, p.51)	OMT participants, see Table 8	3/4/5	
May 12th 2009	BAO: first two advices are approved, third causes heavy discussion but no measures, fourth should be a long term thing (Van Dijk et al 2010, p.51)		4	
May 29th 2009	EL&I and VWS both approve starting with research #3 (Van Dijk et al 2010, p.48). This research started in the end of 2009 (o.l.v. IRAS)		4	
June 2009	On VWA website appears advice about how to handle manure from animals (Van Dijk et al 2010, p.52)	NVWA, EL&I	5	
June/July 2009	Several parties express their worries about the increasing number of patients with Q-fever. Requested for are concrete/additional measures and better communication with the region. Also, the relation of Q-fever with intensive farming is pointed out (Van Dijk et al 2010, p.53-54). EL&I sees the scientific evidence increasing.	RIVM-LCI, VWS, GGD HvB, EL&I	2b/4/5	
July 2009	Civil society initiative against industrial farming: Megastallen-Nee offers 33.234 signatures to Maij-Weggen, Commissaris of the Queen Derived March 7th, from: http://www.megastallen-nee.nl/?page_id=2.	Civil Society Initiative (mainly regional)	4/5	Civil Society: *ambiguous (normative)*
August 2009	There are more suggestions that the cause for Q-fever are intensive farming practices. Also, Chamber of Deputies questions PvdD are answered by minister EL&I (Van Dijk et al 2010, p.54)		2a/2b	
October 10th 2009	New measures: - research on large milk tanks, once in two months - ban on transport/visitors for contaminated farms (Van Dijk et al 2010, p.55)		2a/4	
November 3rd 2009	Request of EL&I and VWS for an independent DB, with equal representation of human/veterinary side. Aim: discussion on measures and request for prospects (Van Dijk et al 2010, p.55-6)	VWS, EL&I	3/4	
Early November 2009	Q-uestion, foundation for patients of Q-fever is founded. The foundation organizes meetings, aims at agenda setting of the issue, informs patients, civil society and experts about the activities of the foundation. Derived on March 29th 2012, from: http://stichtingquestion.nl/.	Civil society initiative	2b/5	
November 11th and 30th 2009	Two times DB. Experts are asked to weigh measures: breeding ban in combination with bulk milk testing, and culling (Van Dijk et al 2010, p.56).	DB participants, see Table 8.	3	
December 5th and 6th 2009	NRC article 5 dec and Zembla 6 dec, radio-interview with Gerda Verburg (EL&I). "There were too many unnecessary Q-fever patients due to the prevailing of economic interests above health interests" (Van Dijk et al 2010, p.57)	Media, EL&I	5	EL&I: *ambiguous (normative)*
December 9th 2009	- Website launched by the government with all relevant information about Q-fever - ban on breeding or increase of # animals on farm (Van Dijk et al 2010, p.57-8)	VWS, EL&I, RIVM-LCI, NVWA	5/4	
December 10th 2009	Advice DB about individual testings: non-contaminated pregnant animals on contaminated farms also have to be killed, to prevail for unnecessary risk (Van Dijk et al 2010, p.58)	DB participants, see Table 8	3/4/5	
December	Addittional DB advice:		4	

14th 2009	- Increase frequency on bulk milk monitoring: once in two weeks - Scope for obligatory vaccination is enlarged (Van Dijk et al 2010, p.58)			
December 16th 2009	Decision VWS/EL&I: - All pregnant animals on contaminated farms are killed, either contaminated or not. Starting from December 21st 2009. - Obligatory vaccination continues to be a crucial policy instrument. (Van Dijk et al 2010, p.58) - Twitter@qkoorts exists (website EL&I)	VWS and EL&I to the Chamber of Deputies	4/5	
December 18th 2009	- Ban on increasing # of sheep/goats on farm - Ban on transport of non-vaccinated animals - Breeding ban enlarged (Van Dijk et al 2010, p.58)		4	
December 21st 2009	Start of culling (Van Dijk et al 2010, p.59)		4	
January 5th 2010	Advise from DB with regard to children's farms. No scientific signs that all sorts of farms are a threat to public health (Van Dijk et al 2010, p.59-60)	DB participants, see Table 8	2a	
January 14th / 15th 2010	Chamber of Deputies questions PvdD to ministry of EL&I (Van Dijk et al 2010, p.60)	PvdD, EL&I	2b	
January 19th 2010	Commission Van Dijk is assigned to evaluate the process of Q-fever (Van Dijk et al et al 2010, p.4)		4	
February 15th 2010	DB discussion points: - Direct contact with industrial farming animals can cause contamination - Continuous visitors ban for farms during 2010 - Experts expect that culling will result in a large reduction of contaminations - Type of vegetation and soil humidity seem to be important factors for transmission (Van Dijk et al 2010, p.61-2)	DB participants, see Table 8	2a	
March 1st 2010	Severe critics on policy with regard to Q-fever, urgent discussion in Chamber of Deputies (Van Dijk et al 2010, p.62-3) resulting in 13 resolutions	Chamber of Deputies	5	
March 5th 2010	DB with regard to the effectiveness of the token measures. Vaccination reduces a) the risk for abortions with goats, b) the transmission from the bacteria in case of abortions and c) the risk for contamination. Nevertheless, the bacteria has an increased presence in the environment (Van Dijk et al 2010, p.63)	DB participants, see Table 8	4	
March 6th 2010	BAO decides: - all animals on milk producing farms have to be vaccinated before June 2010 - new information is no reason for changing the strategy (Van Dijk et al 2010, p.63)		4	
May 28th 2010	Obligatory vaccination rule is extended. Frequency of bulk milk monitoring is limited to once per two months (Van Dijk et al 2010, p.64)		4	
December 2010	- Q-fever vaccination for humans is made available for specific risk groups. Derived from: www.rijksoverheid.nl. - Van Dijk et al (2010) released at http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2010/12/20/rapport-van-verwerping-tot-verheffing.html		4	
December 20th 2010	Acknowledgement that measures with regard to Q-fever in the first phase were unsufficiently adequate. Communication and cooperation between human and veterinary column should be more effective and efficient. Early communication towards the public about uncertainties should be integrated into the process (Schippers and Bleker 2010).	VWS, EL&I	4/5	
June 2011	DB. State of affairs with regard to Q-fever with regard to risks for public health and measures are discussed. Advice is complete vaccination on industrial goat/sheep farms. Derived March 7th 2012, from: http://rivm.nl/Bibliotheek/Algemeen_Actueel/Nieuwsberichten/2011/Samenvatting_en_advies_deskundigenberaad_Q_koorts.	DB participants, see Table 8	2a/4/5	
November 17th 2011	The restructuring fund, to which harmed farmers could claim compensation for damages as a result of Q-fever is closed. PvdD asks for transparency with regard to expanding industrial farms (Schippers and Bleker 2011).	VWS, EL&I, Chamber of Deputies	5	
January 2012	The Dutch ombudsman starts a research to Q-fever (resulting in Van der Bijl et al 2012)			*ambiguity*

February 10th 2012	Foundation for Q-fever patients is founded, aiming at claiming money from farmers. Derived March 7th 2012, from: http://www.qkoortsclaim.nl/over-qkoortsclaim.php	Civil society initiative	2b	Civil society versus farmers: *ambiguous (normative)*
March 27th 2012	Q-fever guidelines (cooperation between civil society organization Q-uestion and RIVM). This will be offered to the Ministry of VWS on March 27th 2012.		4/5	

! To refrain from confusion, in the above only the present names of the ministries (VWS and EL&I) are used.
! Rather than referring to concern assessment, 2b often refers to missed signs on concerns from the public/stakeholders.
! Due to time constraints, the following are not (or not all) included: letters to the Chamber of Deputies, Chamber of Deputies questions, letters from stakeholders (e.g. LTO and GGD NL) and AO's. Instead, as mentioned in paragraph 3.2.2 this timeline is based mainly on van Dijk et al (2010) and GGD HvB (2008). This means that this timeline includes those letters, (Chamber of Deputies) questions and discussions used in van Dijk et al (2010) and GGD HvB (2008), or those suggested during the time of internship.
! The IRGC-step column reflects that risk governance for infectious diseases does not happen in chronological order, which was claimed by Renn (2005). Furthermore, the involved stakeholders column reflects that many stakeholders are involved during risk governance for infectious diseases. All follow their own path, and only sometimes their paths seem to cross.

Appendix 9 – Timeline SBV

Date	Event	Involved Stakeholders	IRGC-step	Categorization of Risk (with regard to human health)
August/ September 2011	- GD has notifications of 80 farms with diarrhea symptoms.	Farmers, GD	1	
November 2011	- Friedrich Loefller Institut (FLI) performs metagenomic sequencing, finds DNA strains with Akabane family. New virus is named Schmallenberg virus (SBV). - 18 nov: first ProMED notification of SBV. - 19 nov: transfer of developed test FLI to CVI, diarrhea cows are tested. Positive for SBV.	FLI,CVI, GD	1/2a/5	
Week 49 - 2011	- GD receives notifications about malformed lambs - GD sends samples of malformed lambs to CVI, SBV found. - GD contacts ministries EL&I, RIVM etc.	GD, CVI, EL&I, RIVM	1/2a/5	
Week 50 - 2011	- 13 dec: GD First notification malformed calves. GD contacts RIVM on this. - 15 dec: RIVM-LZO contacts RIVM-LCI. - 15 dec: SBV proven to be positive for sheep/lambs. - 16 dec: News message on SBV on www.agd.nl which states that a new virus is found, but much (transmission route, spread) is unknown. Therefore measures and notification obligation are not possible and necessary. - 16 dec: SBV discussed in weekly case meeting RIVM-LCI - 16 dec: first letter from EL&I to Chamber of Deputies in which Dutch infections are announced. - 16 dec: Schiphol meeting RIVM-LZO, CVI, EL&I, VWS. LCI-CIb not present because chance for zoonotic risk is close to zero. Results in RIVM (2011a).	GD, RIVM-LZO, CVI, EL&I, VWS, Chamber of Deputies	1/2a/3/ 4/5	RIVM: *uncertain/simple.* GD: *uncertain.*
Week 51 - 2011	- Belgium and Germany notify malformed lambs. SBV has spread throughout the whole country (Netherlands), there are no clusters. Not yet clear whether there is a relationship with the diarrhea from cows (August/September 2011) and SBV. - RIVM-LCI and GGD decide on monitoring symptoms, further research with regard to risk for humans, communication to vets, notification on RIVM website, no serological research (because 1) the very low zoonotic potential and probable unnecessary turmoil in society, 2) one does not know what to look for in the blood and 3) time reasons). **- 20 dec 23.00: EL&I decides upon a national obligation to notify newborn malformed animals for farmers to NVWA** - 20 dec: inf@ct sent to all GGDs to notify them on SBV and request for research on all humans who were in contact with infected animals. **- 21 dec: Risk assessment: Risk Profile SBV human implications RIVM (2011a)** - 21 dec: EWRS message (early warning and response message, to all European national health authorities) - 21 dec: second letter from EL&I to Chamber of Deputies. Questions and answers page made public at www.rijksoverheid.nl. - 22 dec: ECDC risk assessment on possible human implications of SBV. - 22 dec: first Belgian SBV infection found. - 23 dec: Meeting The Hague on basic issues concerning SBV. Attendants: RIVM, ministries, farmer. - 23 dec: Vetinf@ct sent to all veterinary surgeons to notify them on SBV and request for research on all humans who were in contact with infected animals.	Belgium, Germany, RIVM-LCI, CVI, GGD, NVWA, farmers, doctors, GGD, hospitals, European national health authorities, EL&I	1/2a/4/ 5	RIVM: *uncertain.* EL&I: *uncertain.*
Week 52 - 2011	- RIVM-LCI, GGD and nVWA decide upon passive surveillance: people who were in contact with infected animals can contact regional public health offices (GGD), which have a questionnaire prepared. This is made known on website NVWA. On website RIVM/GGD are Q&A-sections.	RIVM-LCI, GGD, NVWA, LTO, company	1/5	

	- 27 dec: LTO is positive about the transparency with regard to information sharing on the SBV (www.agd.nl). - 28 dec: samples of sheep (58) and cows (26) and goats (1) subject of testing for SBV. - 30 dec: Arboinf@ct sent to all company doctors to notify them on SBV and request for research on all humans who were in contact with infected animals. In particular emphasis on prevention measures to take for pregnant employees.	doctors		
Week 1 - 2012	- 2 jan: Willem Takken argues in agd.nl (public) that it is absolutely not sure that SBV is caused by midges. - 3 jan: first goat farm in the Netherlands confirmed SBV positive. The notification obligation seems effective (ProMED) - 5 jan: third letter EL&I to Chamber of Deputies.	RIVM, farmers, EL&I, Chamber of Deputies	1/5	Scientist: *uncertain*
Week 2 – 2012	- 9 jan: first SBV positive lambs in GE (ProMED) - 10 jan: The method to detect the virus (by FLI) has been distributed to Belgium, France, UK, Netherlands and Italy (FLI, ProMED) - 11/12 jan: Standing Committee on the Food Chain and Animal Health (SCFCAH) discusses information from GE to NL and exchange of views on SBV (ProMED). Also, a map of GE SBV situation is publicly available on the internet from the 11th on, as well as photos of malformed lambs at: www.tierseucheninfo.niedersachsen.de (ProMED). - 13 jan: fourth letter EL&I to Chamber of Deputies. An update on the Dutch SBV situation is publicly available at: www.rijksoverheid.nl (ProMED).	Germany (GE), Italy, UK, Netherlands, France, Belgium (BE), FLI, SCFCAH, EL&I, Chamber of Deputies	1/2a/5	
Week 3 – 2012	- jan 17: Russia temporarily places restrictions on the import of live small ruminants from NL, GE, BE (ProMED).	Russia, NL, GE, BE	1/2a/5	Abroad: *uncertain*
Week 4 – 2012	- 23jan: fifth letter EL&I to Chamber of Deputies. First sheep in UK tested positive on SBV. - 26 jan: Olde Loohuis interview in Medisch Contact: "pregnant women should avoid coming at farms". This contrasts with the RIVM advice of pregnant women staying away from farms during births of animals and national notification. The interview is one of the reasons for the DB of feb 15th. - 27 jan: first sheep confirmed SBV positive in France.	EL&I, UK, Chamber of Deputies, RIVM-LCI, general practitioner.	5	Doctor: *uncertain.*
Week 5 – 2012	- 30 jan: SBV and Q-fever gave rise to the discussion on antibiotic resistence in industrial farming (AO 2012). - 31 jan: VWS organizes worst-case scenario exercise in The Hague for 12 persons (among them: EL&I, NVWA, RIVM). - 2 feb: Egypt, Mexico and Ukraine temporarily stopped imports of cattle, semen and embryos. This is one reason for the need for serological tests. Another reason is the estimation of the scale/severity of SBV and the final proof of SBV not being zoonotic (ProMED).	Chamber of Deputies, VWS, Egypt, Mexico, Ukraine, NVWA, RIVM.	1/2a/2b /5	
Week 6 – 2012	- 6 feb: Modeling has been done by EFSA (to prospect the SBV situation) with a Bluetongue model (ProMED) - 7 feb: Belgium, France, Germany, UK and the Netherlands and SCFCAH come together in Brussels and discuss the situation, exchange of views, surveillance and research activities (ProMED). On feb 11th a statement is released: field investigation remains necessary (because midgets could survive the winter). Decision: a guidance document on surveillance as a matter of urgency will be developed (ProMED).	RIVM, ECDC, EFSA, BE, GE, UK, NL.	4/5	
Week 7 – 2012	- 15 feb: DB SBV on RIVM-LCI. Advice: performing serological research to define whether SBV is zoonotic. Derived from: http://www.rivm.nl/Bibliotheek/Algemeen_Actueel/Nieuwsberichten/2012/Advies_deskundigenberaad_Schmallenbergvirus. - 15 feb: "countries have been very proactive and transparent in notifying the appearance of SBV on their territories. Disease surveillance and control has proven to work very well" (The World Organization for Animal Health on ProMED). - 17 feb: first suspected SBV contamination in Italy (ProMED)	DB participants, World Org for Animal Health, Italy (IT).	1/5	
Week 8 – 2012	- 20 feb: Italy and Luxembourg (LUX) notify their first confirmed SBV contamination (ProMED)	IT, LUX.	1/5	
Week 9 –	- 29 feb: serological tests with farmers in Germany (performed by	Farmers,	2a/5	

2012	Robert Koch Institute, RKI) (communicated by ProMED on the 5th of march) - 3 mrch: mr. Calisher Ph.D. questions why no research has taken place to the cause of SBV (Why Europe? For how long? Where did it come from?). Russia is to close its borders for cattle from **all** EU cattle. So far, the following countries have (partly) closed borders, discontinued contracts or doubt about closing borders: Russia, Ukraine, Marocco, Egypt, Jordan, Algeria, USA, Japan, Kazakhstan, Argentina (ProMED)	RKI.		
Week 10 - 2012	- 5 mrch: Dr. Roeder is concerned about the imprecise explanation of SBV epidemiology in press and argues that the public should be better informed. Now The Telegraph quotes: SBV is spreading while it is not at the moment, but it has been (ProMED) - 10 mrch: tests with midges strongly confirm them as being the cause for spread/transmission of SBV. Transparency of the scientific community is appraised (ProMED)		2a/5	
Week 11 – 2012	- 12 mrch: Danish herds might be affected (as announced byThe Danish National Veterinary Institute (www.vet.dtu.dk) on ProMED) - 13 mrch: first SBV contamination announced in Spain (ProMED)	Denmark, farmers, Spain.	1/5	
Week 14 - 2012	- 3 april: German serological research results indicate that SBV is not a zoonotic disease (ProMED)	GE	2a	
May 2012	Dutch serological research reveal SBV is not zoonotic. Derived from: http://www.rivm.nl/Bibliotheek/Algemeen_Actueel/Nieuwsberichten/2012/Infectie_met_Schmallenbergvirus_niet_aangetoond_bij_mensen.	NL	2a	

! ProMED mails are published on the date as mentioned in the table.

! With regard to the reliability of ProMED: information is from all kinds of sources and not always scientific. ProMED releases many updates of the situation, these are not reflected in the timeline.

! Internal meetings on SBV at RIVM are not mentioned in the timeline. These meetings are held every other week. These meetings took place on December 22nd 2011, January 5th, 24th, February 7th, 23rd.

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