Risk, Hazards, and Crises in Research: What Risks Get Researched, Where, and How?

Sanneke Kuipers, Bob J. van Grieken, and Marjolein B. A. van Asselt

This review article maps the shifts and trends in the risk literature regarding particular risk types across the past 30+ years. Not only does it address which hazards and risks receive scholarly attention, but also from which perspective. A similar review on crisis literature (Kuipers & Welsh, 2017) reported that on average only 14 percent of the articles in three crisis and disaster journals pertained explicitly to risk research. Does risk research perhaps pay more attention to crises than the other way around? Our multivariate regression analysis of the different types and themes reveals how some risk types are researched and discussed almost exclusively from a particular angle. Also, the large majority of articles from some perspectives only take a limited variety of risks into account. Mapping risk research indicates not only which topics and themes have received increasing or structural attention but also which ones, or which combination of risk types and perspectives, perhaps deserve more study than they currently receive.

KEY WORDS: literature review, risk research, hazards, crises

研究中的风险，灾害和危机：被研究的风险有哪些？研究地点和手段是什么？

本篇综述将过去三十多年间研究特别风险类型的风险文章所呈现的转变和趋势进行了编排。本文不仅研究了哪些灾害和风险受到了学术关注， 同时还研究了这些学术关注的出发点有哪些。一项相似的危机文献综述(Kuipers & Welsh，2017)显示，在以危机和灾害为主题的三种期刊中，平均而言仅有14%的文章与风险研究明显相关。风险研究有可能将更多关注聚焦于危机，还是相反？本文针对不同风险类型和主题所进行的多变量回归分析显示：一些风险类型如何在一个特定视角下被研究和探讨。同时，从某些观点来看，大多数文章仅考虑了部分风险种类。通过将风险研究进行编排， 不仅能表明哪些主题受到了更多关注，同时还显示出哪些风险类型和观点(或二者的结合)有可能受到更多研究。

关键词: 文献综述，风险研究，灾害，危机

Riesgos, peligros y crisis en la investigación: ¿Qué riesgos se investigan, cómo y cuándo?

Este artículo de reseña mapea los cambios y las tendencias en la literatura de riesgo con respecto a tipos de riesgo particulares a través de los últimos 30 años y más. No solo aborda el tema de qué peligros y riesgos reciben atención académica, sino que también desde qué perspectiva. Una reseña similar de la literatura de crisis (Kuipers y Welsh, 2017) reportó que en promedio solo 14 percent de los artículos en tres revistas de crisis y desastre tenían que ver explícitamente con la investigación de los riesgos. ¿Acaso la investigación de riesgos presta más atención a las crisis que al revés? Nuestro análisis de regresión multivariable de los diferentes tipos y temas revela cómo algunos tipos de riesgo se investigan y discuten casi exclusivamente desde un ángulo particular. También, una

gran mayoría de artículos de algunas perspectivas solo toman en cuenta una variedad limitada de perspectivas. El mapeo de la investigación de riesgos revela no solo qué temas generales y específicos han recibido una atención creciente o estructural, sino también cuáles, o qué combinación de tipos de riesgos y perspectivas, tal vez merezcan más estudio del que reciben actualmente.

Introduction

The journal *Risk, Hazards and Crisis in Public Policy* (RHCPP) explicitly relates risk and crises in its title and mission. Although risk and crisis form an intuitively sensible combination, academic research shows a strong divide between the two. Scholars either seem to study risks, or crises. The fact that crises imply that a risk has materialized, and that many risks would be negligible if their potential impact would not constitute a crisis, does not seem to result in much dialogue between scholars from either side. This article aims to explore trends in the risk literature and to identify the potential for synergy with crisis research.

Over the years, crisis research has moved from a focus on the emergency management of accidents and disasters, to the "politics" of managing affairs, social unrest and scandals that are marked by profound uncertainties regarding risks and threats (Boin, 't Hart, Stern, & Sundelius, 2016; Gilbert, 2007). Risks, particularly ignored or neglected ones in public policymaking, can provide fertile ground for both large-scale accidents and political crises. In turn, the manifestation of extreme events with low probability and high impact significantly affect policy decisions and the multi-year allocation of public resources for mitigating and regulating risks. Vos (2000) showed how high-impact risks such as veterinary diseases and food safety risks gained policy prominence after the BSE crisis in the mid-1990s, and led to a drastic revision of EU food safety policy by the European Commission. The nuclear policy responses in Germany and Switzerland after the Fukushima disaster in Japan, 2011, are also a case in point, as well as the major changes in foreign affairs, counterterrorism and immigration policies worldwide after the September 11 attacks in the United States (Brandt, 2014).

The question arises what shifts and trends we see in the risk literature regarding particular risk types. Which hazards and risks receive scholarly attention, and from which perspective? This study sets out to report the shifts and patterns in risk research across the past 30+ years. A similar exercise previously in RHCPP (Kuipers & Welsh, 2017) for the crisis and disaster literature, reported that on average only 14 percent of the articles in three crisis and disaster journals pertained explicitly to risk research. Does risk research perhaps pay more attention to crises than the other way around? Mapping risk research reveals not only which topics and themes have received increasing or structural attention but also which ones perhaps deserve more study than they currently receive.

A review of the risk literature as published in three of the main specialized journals over the years will tell us which risk types and theoretical themes

received most attention and allows us to visualize shifts and trends. Our concluding section therefore has an agenda-setting character, suggesting avenues for further research both within the interdisciplinary risk field and for collaboration between risk and crises scholars.

Design

The analysis will include the results of codification of three independent specialized academic journals in the risk research field: *RISK ANALYSIS*, the *Journal of Risk Research* and the *European Journal of Risk and Regulation*.[1] The journal *RISK ANALYSIS* (RA) has existed since 1981 and has a strong focus on risk assessment. RA is published on behalf of the Society for Risk Analysis and appeared four times per year in its first decade, six times per year in volumes 13–28 and twelve times per year in volumes 29–37. The *Journal of Risk Research* (JRR), established in 1998, shows a similar expansion: from four issues in its first six volumes, rapidly moving to seven issues (volumes 7–8), to eight (volumes 9–13), to 10 (volumes 14–19) to its current 12 (since volume 20 in 2017). JRR casts its net widely, aiming to include both conceptual and empirical contributions 'at the forefront of the communication, regulation and management of risk'. The *European Journal of Risk and Regulation* (EJRR), established in 2010, has a different focus both in terms of thematic interest (governance and regulation) as well as a more specific geographic area (mainly the European Union). The expansion of the journals as well as the number of issues shows the explosive growth of the research field and its output in the past two decades. In total, we have coded 5,351 articles in 426 issues over a time span of 37 years.

Method

In order to illustrate the shifts in academic attention within the field of risk research, we chose to take a "broad-brush" approach, counting the frequency of key terms within the titles of all articles of each journal from their inception through to 2018. To do so, we first developed umbrella categories, under which to organize the codes for specific search terms. These were separated into "types" and "themes," each with its own set of umbrella categories (Table 1).

We studied the collective bibliographies of all three journals, picking out common terms and key words from both a thematic and risk type perspective. The general pattern of these terms allowed us to create the categories above inductively, and as each term appeared it was organized under the most fitting umbrella category, resulting in a collection of 134 codes under risk types and 131 under risk themes. After the first round of coding, the categories were re-examined, with some being merged to solidify into the 18 in Table 1.

Then the article titles of all three journals were searched for each term, with the frequencies recorded by year. If any one article title contained multiple key terms that fell under a single umbrella term (e.g., *seismic* and *hurricane* both of which fall under *Natural hazards*), then only one was recorded, so as not to skew

Table 1. Umbrella Categories

Risk Types (10)	Risk Themes (8)
Natural hazards	Risk governance (policy)
Transport	Citizen engagement
Corporate/economic risks	Risk communication
Hazardous materials/toxicity	Risk regulation
Environment	Risk perception
Food	Risk assessment
Health	Risk management
Technological	Risk materialization
Security/critical infra/terrorism	
Occupational	

the overall results by coding a single article multiple times for the same theme or risk type. However, if an article title contained four key terms, all four falling under different umbrella terms, all four were coded.

Once the frequencies of all key terms had been searched for the *Journal of Risk Research* (the first journal coded), we re-examined its bibliography to see if any articles appeared that had not been covered by our search terms. A number of uncoded articles also provided us with additional key terms, and any new key terms were also retroactively searched for in those journals already examined. Once the collective bibliographies of all three journals had been searched for all key terms, these were collected into an aggregate count per year under each umbrella term. Two coders conducted all coding manually. We had two reasons for manual coding: we included for instance specific diseases such as BSE or tuberculosis under health as risk type, but it was impossible to specify all possible diseases, all possible toxic substances or hazardous materials (mercury, lead, LPG, etc.), all possible foods and beverages, companies or brands (Google, Monsanto, Volkswagen) and so on in advance whereas it was no problem identifying these as subject to specific risk types in the articles by manual coding. At the same time the inter coder-reliability was high (resulting in a Cohen's kappa of 0.89 for risk types and 0.88 for risk themes) while we realized a more specific and deliberate coding result.

Results

In the following section, we will show the variation of risks and perspectives researched in each journal and the trends over time. Figure 1 shows how often particular risk types as part of the article titles were coded for each of the three journals in the period 1981–2017.

Overall, we see that *Risk Analysis* has a strong focus on the assessment of risks relating to toxic, microbial, or viral agents and their effects on human health, sanitation, food safety, and ecological environment. Almost three quarters of all articles between 1981 and 2017 address these particular risk types. Surprisingly
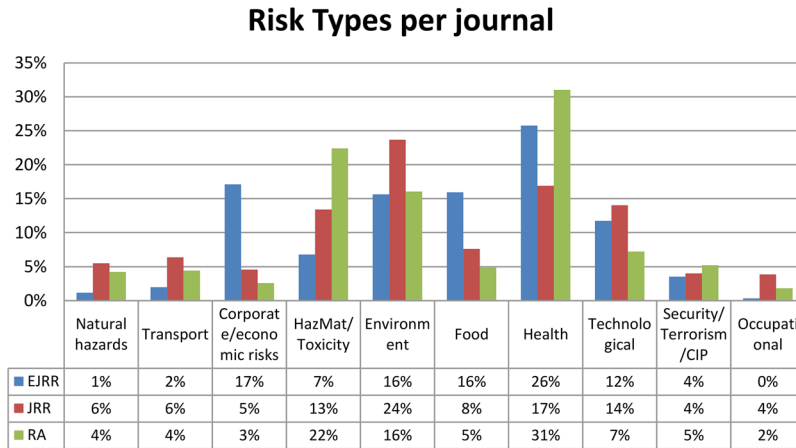
Risk Types per journal

	Natural hazards	Transport	Corporate/economic risks	HazMat/Toxicity	Environment	Food	Health	Technological	Security/Terrorism/CIP	Occupational
EJRR	1%	2%	17%	7%	16%	16%	26%	12%	4%	0%
JRR	6%	6%	5%	13%	24%	8%	17%	14%	4%	4%
RA	4%	4%	3%	22%	16%	5%	31%	7%	5%	2%

Figure 1. Risk Types per Journal (In Percentages, Based on Article Titles).

little attention is paid to technological or industrial accident risks, security-related risks (such as terrorism), natural hazards, or logistics (crashes, collisions, traffic incidents). The *Journal of Risk Research* takes up more technological risks in its academic discussions but shows a similar neglect of the other risks. The *European Journal of Risk Regulation* has more eye for corporate, financial, and economic risks but also ignores occupational hazards. Figure 1 visualizes the attention for each risk type per journal.

If we look at the trends per risk type, for all journals combined, we see a rise in the share of articles addressing food safety and environment-related risks. Food safety in our coding includes all references in titles to food and drinks products, production, preferences and consumption and ingredients (gluten, sugar) or traits (addictive, high calorie) of food. Environment-related means we coded title words such as climate, ecology, earth, organic, species, but also references to agriculture or land use and planning. Interest to risks pertaining to these categories was clearly increasing in academic risk literature.

Meanwhile the attention for hazardous materials/toxicity risks, and for health risks shows a relative decline. These risks have a continued presence in the research published in the oldest journal of the pack (*Risk Analysis*), but got competition from risks that receive more attention in the newer journals such as the *European Journal of Risk and Regulation* (much on food safety regulation, for instance) and the *Journal of Risk Research* which includes also risks that are increasingly subject to societal debate such as environmental risks and food-related lifestyle risks, see Figure 2.

Figure 3 shows the share of specific themes or approaches that were identified from the articles for each of the three journals in the period 1981–2017, with 1981 being the year of conception for the journal RA, the JRR appearing since 1998 and the EJRR since 2010.
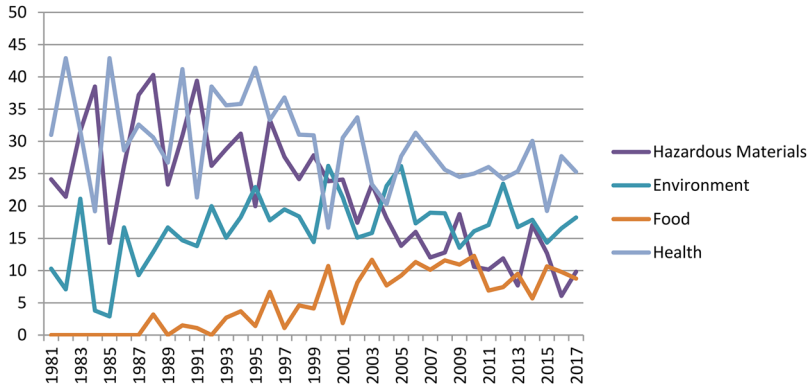
Figure 2. Trends in Attention for Specific Risk Types for All Three Journals Combined.

The majority of articles in the *European Journal of Risk and Regulation* covers governance (28 percent) and/or regulation (39 percent). Governance as a category pertains to all titles including reference to policy, administration, legislation, politics or political, reform and the public sector. The journal *Risk Analysis* does exactly what it promises: analyzing or assessing risks (47 percent). In the category risk assessment, we coded all title references to probability, evaluation, computation and analysis, measurements and tests, statistics, predictions and so on. The *Journal of Risk Research* spreads its attention most evenly over the different risk themes, with more attention for risk perception (including all references to social construction, amplification, attitude, awareness) and communication (references to media, transparency, marketing, warning, labelling but also representation, trust, framing) in particular. Figure 3 visualizes the attention for each theme per journal.

If we look at the attention for particular themes by the journals in total, it becomes visible how the number of articles on regulation and governance
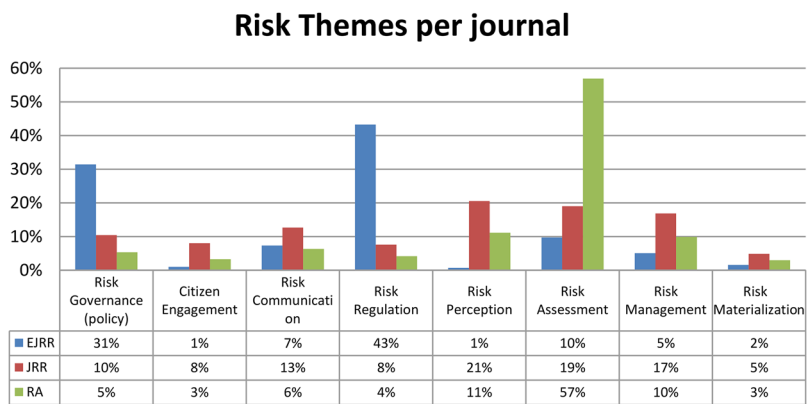

Risk Themes per journal

	Risk Governance (policy)	Citizen Engagement	Risk Communication	Risk Regulation	Risk Perception	Risk Assessment	Risk Management	Risk Materialization
EJRR	31%	1%	7%	43%	1%	10%	5%	2%
JRR	10%	8%	13%	8%	21%	19%	17%	5%
RA	5%	3%	6%	4%	11%	57%	10%	3%

Figure 3. Themes per Journal (In Percentages).

increased over time, partly because of the creation of extra journals with that particular focus (EJRR). The perspective "Risk Assessment" receives continued and even increasing attention in absolute numbers of articles but its share of the total themes discussed decreased over time. Figure 4 shows the most prominent trends per theme over the years.

Now that trends and frequencies have been mapped for the three journals, the next section will discuss how the themes and types relate. The regression analysis reveals that articles address specific combinations of themes and risk types. The theme or perspective (for instance, citizen engagement, or regulation) that particular articles address, goes together with some risk types rather than others.

Analysis

In the introduction we raised the question which hazards and risks receive scholarly attention, and from which perspective? Also, we wondered whether risk researchers perhaps pay more attention to crises than the other way around? In fact, within the risk literature, we see little interest in crises and disasters as materializations of risks. We only found a mere 22 titles explicitly relating to crises out of a total 5,351, and only 175 titles (3 percent) pertaining to a specific accident or incident (type) or crisis case. A focus on crises in risk research, if any, often pertains to the common combination of "risk-and-crisis-communication," a metaphorical crisis of governance or regulation, and in only a small number of articles to a more conceptual or theoretical contribution. Of the crisis cases discussed, almost 20 percent pertain to two specific nuclear accidents (Fukushima
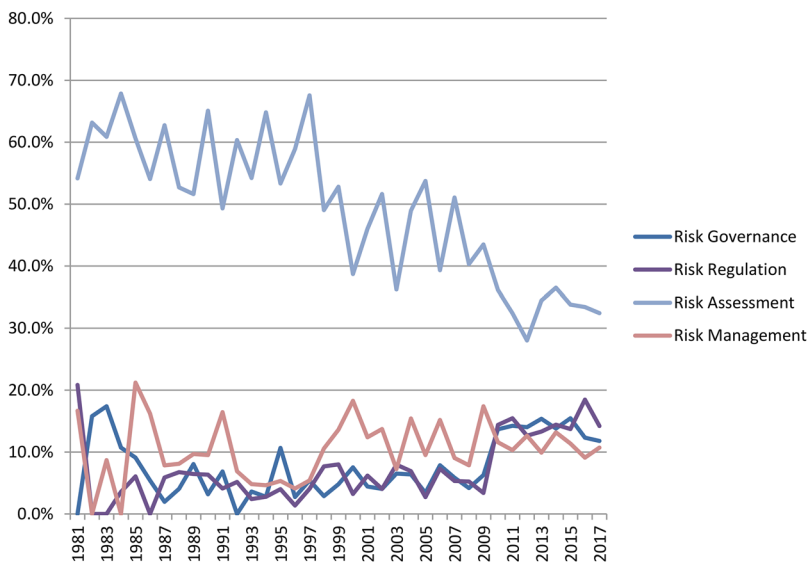

Figure 4. Trends in Attention for Specific Risk Themes for All Three Journals Combined.

and Chernobyl), the so-called extreme high-impact cases with arguably low probability, more than the titles on all natural disaster cases combined. The attention for specific crises does not seem to relate to the frequency and probability of their occurrence. By contrast, food safety and health risks, such as infectious diseases, that constitute a large share of the risk assessment articles, are only studied hypothetically ("if exposure X then effect Y") in spite of the fact that they seem to materialize more regularly. In fact, these risks produced some major crises of the past decades, such as BSE, SARS, Swine Flu, and various dioxin scandals.

Not do only articles on particular crisis-prone risk types lack attention for the possibility of these risks becoming reality and manifesting themselves as crises. Additionally, the risk themes discerned do not often combine with a focus on crises. For instance, articles on citizen engagement focus primarily on how the introduction or development of environmental and technological risks have influenced and engaged citizens, communities and societies at large. The share of articles on citizen engagement does not include attention for what happens to such communities when they suffer from the consequences of these risks and experience a real crisis.

In this section, we will discuss the most striking findings on how the attention for different types and themes relates in more detail. The results of the multivariate regression analysis of the different types and themes teach us how some risk types are researched and discussed almost exclusively from a particular angle. Also, the large majority of articles on some themes or perspectives only take a limited variety of risks into account. The insight into these patterns helps to detect avenues for future research on topics that seem as of yet understudied, or on themes that are currently not addressed to a particular audience through these risk journals. Figure 5 depicts the positive and negative associations between the themes and types. A positive relation means that for instance articles on natural hazards are most likely to address this risk type by looking at risk perception, management or materialization. The negative relation between natural hazards and regulation indicates that this risk type is unlikely to feature in an article on risk regulation. In the annex of this article you will find the results of the regression analysis.

If an article addresses risk governance, it is most likely to empirically pertain to corporate and financial risks. A possible driver for this association is the high number of EU policy related articles regarding financial system and banking risks. To a lesser extent (but still significant at a 0.05 level), we found that articles with a focus on governance mainly pertain to environmental and food safety risks. By contrast, if an article is about risk governance, it is very unlikely to look into hazardous materials, or health issues and most unlikely to look at transportation risks.

If articles focus on how, or why, or to what effect citizens or stakeholders are engaged, these academic contributions are most likely to address risk types related to environment, food safety or technology, but not transportation risks, hazardous materials (including subs codes such as siting of chemical plants,

	Risk Governance	Citizen Engagement	Risk Communication	Risk Regulation	Risk Perception	Risk Assessment	Risk Management	Risk Materialization
Natural Hazards	/	/	/	−	+	/	+	+
Transport	−	−	−	−	/	+	+	+
Corporate/Economic Risks	+	/	−	+	−	−	/	/
Hazardous Materials/Toxicity	−	−	−	−	/	+	/	+
Environment	+	+	−	/	/	/	/	−
Food Safety	+	+	+	+	/	/	−	/
Health	−	−	−	−	−	+	−	−
Technological	/	+	/	/	+	−	/	/
Security/Critical Infra/Terrorism	/	−	/	−	−	+	/	+
Occupational	/	/	/	/	/	/	/	/

Figure 5. Associations Between Risk Types and Risk Themes. In this Table "/" Refers to Inconclusive (Insignificant at 0.05 Level), "+" Refers to a Significant Positive Association and "−" Refers to a Significant Negative Association.

transportation of nuclear waste, exploitation of shale gas) or security related risks such as terrorism. This neglect of the latter is surprising since citizens tend to get upset about the siting of a new hazardous plant (in policy sciences, the NIMBY or "not in my backyard" studies abound-starting as early as 1985 with Matheny & Williams; cf. Kraft & Clary, 1991; Fisscher, 1993) and they do express fear of terrorism (Liu et al., 2018). Apparently, the fact that risks upset communities does not lead to more studies on how to engage them to address such risks.

The majority of articles on risk communication concerns food safety as risk type. Risk communication is negatively related to other risk types, even health risks, which is surprising given the preoccupation with food safety. It is also very interesting to look into associations starting from the particular risk type. Food safety is studied both from the angles of communication and citizen engagement (clearly involving consumers and stakeholders, and how to reach or inform them), and from the perspective of governance and regulation.

Risk regulation is strongly associated with food safety as well as with corporate and financial risks in the literature ($p < 0.001$). This finding can be explained by the high number of articles on specific EU regulations, standards, procedures, court cases and principles related to food, and to banking risks. More surprising is the negative relationship between regulation and transportation risks, and risks pertaining to hazardous materials. Sectors dealing with the latter risks are subject to stringent regulation but are much less studied from that perspective in the three journals examined here.

The way people perceive risks is studied mostly in relation to natural hazards and technology-related risks. Risk perception studies are unlikely to pertain to corporate risks, hazardous materials, health issues and security risks. When it comes to assessing these risks, we find the opposite. Risk assessment studies mainly pertain to health, transport, hazardous materials and security. They are unlikely to address natural disaster risks or technological risks (i.e., risks related to automation, robotics, engineering, electricity, telecom and cybertechnology). It is striking how academics study perception regarding some types of risks, while devoting much less attention to the assessment of these risks, and vice versa.

Risk management seems to pertain mostly to natural hazards in the literature. Other types of centuries-old risks, such as food and health risks, are however most unlikely to get attention from a risk management perspective. Health risks are extensively assessed, food safety is significantly communicated and regulated, but neither of these risks are studied often as risk management issues.

Materialization of risks, the starting point of this analysis, is primarily related to natural hazards and transportation risks. Apart from the two specific nuclear accidents (Fukushima and Chernobyl), mentioned earlier, the cases of past crises discussed in the three journals are usually natural disasters (hurricane Katrina tops the list) or plane and train crashes, followed by terrorist attacks (security risks) and toxic spills (hazardous materials).

Conclusion and Avenues for Further Research

Not so much the types of crises (natural hazards-, transportation-, security-, and toxicity-related crises) that risk scholars look into give rise to surprise, but the infrequency by which such crises are studied. In addition, the types of risks that receive scholarly attention when materialized in real-life devastating cases, are exactly the risk types that get least attention from the perspective of governance, citizen engagement, communication, and regulation (see Figure 5).

By contrast, the themes governance, citizen engagement, communication and regulation are the ones that get most attention in the crisis literature. Kuipers and Welsh (2017) show in their review of the crisis and disaster literature that most attention goes to crisis preparedness (covering subthemes and codes that in this study resort under "risk governance," such as policy making and implementa-tion). Next in line in the crisis literature is community resilience (covering subthemes here coded under "citizen engagement") after crises and disasters. The high politics of crisis management (think of accountability and blaming) and crisis communication are also prominent themes in the crisis and disaster literature. However, in the risk literature, the risk types that are studied in relation to their disastrous consequences, are hardly studied from a perspective that pertains to government responsibilities and citizen expectations regarding. Meanwhile, as Ansell and Bauer (2018) argue, risk regulation regimes in practice

shifted from a narrow-based forensic focus to a much wider and societal concern about what constitutes risk.

Both risk and crisis studies are likely to gain by looking into each other's strongholds. Learning from the mitigation and consequences of risks that materialize as crises, could inform studies on risk analysis and risk governance. Crises produce shifts in problem framing, and these shifts in turn "lead to new techniques of risk control" (Ansell & Bauer, 2018, p. 21). Also, crisis studies highlight the human and organizational causes of crises, a factor that is often overlooked in risk assessments because it is more difficult to quantify with the existing approaches.

Crisis studies are still criticized for being too much event-focused, and often fail to include the accumulation of deficiencies that produced the negative event at hand (Roux-Dufort, 2016). Crisis researchers could learn from the risk field to see the broader patterns and bigger picture of recurrent events. The Journal *Risk, Hazards & Crisis in Public Policy* recognizes the importance of bridging between the crisis and the risk fields of research. Mapping what is out there is a first step to convening the future roads of research.

Sanneke Kuipers is the editor-in-chief of RHCPP. [s.l.kuipers@fgga.leidenuniv.nl]
Bob J. van Grieken is editorial assistant of RHCPP.
Marjolein B. A. van Asselt is an editorial board member of RHCPP.

Notes

1. This is only a selection of the existing risk journals. Others such as the journals *Health, Risk & Society*; *Risk and Decision Analysis*; and the *Journal of Risk and Uncertainty*, to name a few, cover similar scholarly work, similar topics, and similar years. Many academic journals cover more specific risk areas, such as the *Journal of Healthcare Risk Management*; *Journal of Hazardous Materials*; *Journal of Risk and Financial Management*, or *the International Journal of Disaster Risk Science*.

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APPENDIX

Table A1. Logistic Regression Models of Risk Themes and Risk Types

	Model 1	Model 2	Model 3
	Risk Governance (Policy)	Citizen Engagement	Risk Communication
Natural hazards	−0.452 (0.266)	0.474 (0.260)	−0.279 (0.254)
Transport	−0.912 (0.345)**	−1.194 (0.587)*	−1.668 (0.509)**
Corporate/economic risks	0.706 (0.187)***	−0.679 (0.459)	−0.975 (0.366)**
Hazardous materials	−0.305 (0.145)*	−0.248 (0.214)	−0.899 (0.192)***
Environment	0.262 (0.122)*	0.362 (0.170)*	−0.552 (0.164)***
Food	0.374 (1.71)*	−0.843 (0.420)*	0.636 (0.166)***
Health	−0.441 (0.123)***	−0.959 (0.221)***	−0.644 (0.138)***
Technological	0.236 (0.165)	0.537 (0.210)*	0.0404 (0.184)
Security/critical infra/ terrorism	−0.256 (0.241)	−0.902 (0.460)*	−1.173 (0.365)**
Occupational	−1.054 (0.591)	−0.185 (0.595)	−0.160 (0.430)
Constant	−2.165 (0.069)***	−2.952 (0.099)***	−2.069 (0.070)***
N	5,352	5,352	5,352
LR Chi^2 (10)	62.51	63.62	114.35
Pseudo-R^2	0.0184	0.0340	0.0380

Note: Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table A2. Logistic Regression Models of Risk Themes and Risk Types

	Model 4	Model 5	Model 6
	Risk Regulation	Risk Perception	Risk Assessment
Natural hazards	−2.061 (0.508)***	0.572 (0.170)***	0.0276 (0.143)
Transport	−0.565 (0.283)*	−0.308 (0.241)	0.398 (0.142)**
Corporate/economic risks	0.860 (0.176)***	−0.747 (0.281)**	−0.558 (0.158)***
Hazardous materials	−0.494 (0.149)***	−0.320 (0.131)*	0.542 (0.079)***
Environment	−0.193 (0.133)	0.213 (0.112)	0.110 (0.080)
Food	0.333 (0.166)*	0.304 (0.162)	−0.0575 (0.118)
Health	−0.552 (0.122)***	−0.583 (0.115)***	0.870 (0.068)***
Technological	0.133 (0.166)	0.575 (0.136)***	−0.414 (0.117)***
Security/critical infra/terrorism	−1.567 (0.388)***	−0.743 (0.257)**	0.338 (0.134)*
Occupational	−0.879 (0.517)	0.462 (0.291)	0.302 (0.224)
Constant	−1.945 (0.065)***	−1.878 (0.062)***	−0.589 (0.043)***
N	5,352	5,352	5,352
LR Chi^2 (10)	124.65	98.37	281.04
Pseudo-R^2	0.0356	0.0245	0.0385

Note: Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table A3. Logistic Regression Models of Risk Themes and Risk Types

	Model 7	Model 8
	Risk Management	Risk Materialization
Natural hazards	0.916 (0.161)***	1.730 (0.217)***
Transport	0.384 (0.193)*	0.984 (0.265)***
Corporate/economic risks	0.179 (0.207)	0.142 (0.374)
Hazardous materials	−0.205 (0.134)	0.469 (0.198)*
Environment	0.00487 (0.125)	−1.100 (0.347)**
Food	−0.535 (0.232)*	−1.143 (0.588)
Health	−0.858 (0.134)***	−0.484 (0.229)*
Technological	−0.258 (0.179)	−0.122 (0.309)
Security/critical infra/terrorism	0.174 (0.189)	0.635 (0.278)*
Occupational	−0.00660 (0.358)	0.798 (0.436)
Constant	−1.946 (0.065)***	−3.486 (0.122)***
N	5,352	5,352
LR Chi^2 (10)	110.36	107.58
Pseudo-R^2	0.0295	0.0680

Note: Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.