

PERSPECTIVE

The Social Amplification of Risk Framework Revisited: Report From an Expert Workshop on Opportunities for Conceptual Advancement

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ABSTRACT

The Social Amplification of Risk Framework (SARF) is intended to facilitate the integration of studies about risk across natural, biological, physical, and social sciences. Researchers employing SARF have advanced understandings of the complex dynamic responses of social systems to hazards, the ways that risks are experienced and perceived, and the ways that consequences can ripple across social and governance systems, geographies, and economic sectors. In seeking to build on a Special Issue of *Risk Analysis* on SARF organized and edited by Kaspersen, et al. (2022), an international interdisciplinary group of scholars convened an invited expert Workshop on SARF at the Federal Institute of Technology in Zurich during April 2024. Here we report on the outcomes emerging from the workshop. First, we sought to clarify definitions of concepts, such as risk signals, risk amplification, and risk attenuation. Second, we sought to overcome the tendency in studies using SARF to focus on information processing by the public and neglect the ways that other social actors play roles in risk amplification and attenuation. Third, we propose a new metaphor, risk resonance, to focus attention on why certain risk signals gain traction and others do not, which has also been a topic that has to date received minimal attention. Fourth, our discussions led us to highlight the importance of better integration of context and history into analyses employing SARF. We conclude the paper with thoughts about how the framework can achieve its yet unmet potential to inform risk research, policy, and management.

1 | Introduction

The Social Amplification of Risk Framework (SARF) was proposed to highlight and overcome shortcomings in the field of risk

assessment, management, and policy in the 1980s. As described in its initial conceptualization the motivation for the SARF was two-fold (Kaspersen et al. 1988, 2022; Renn 1991). First, it arose from a desire to better integrate findings from a wide range of studies

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on risk from the natural, biological, physical, and social sciences. Second, and following from the first, SARF was intended to help account for perplexing observations that formal assessments of risk by technical experts were at times inconsistent with societal responses. What are characterized as relatively minor risks by experts may elicit strong reactions by other actors and groups in society and relatively major risks may remain under the radar of public attention with resulting significant social, economic, environmental, and political impacts.

Subsequently, researchers employing SARF have produced a large literature advancing understandings of the complex dynamic responses of social systems to risks and the ways that they are interpreted and experienced (see Kasperperson et al. 2022, Pidgeon et al. 2003). Their research has addressed why public perceptions can diverge from technical assessments of the nature and magnitudes of risks and the ways that impacts can ripple across social, economic, cultural, and political systems. They have made important steps in meeting the goal of integrating findings about risk with a wide range of studies and deeper connections among disciplinary fields and theories, as well as the scholars working in these areas (Pidgeon et al. 2003). Still, scholars and practitioners have highlighted shortcomings in the conceptualization and application of the framework, and they have observed its so far limited success in informing risk assessment, management, and policy (Bearth and Siegrist 2022; Busby and Onggo 2013; Fjaeran et al. 2024; Machlis and Rosa 1990; Pidgeon and Henwood 2010). In addition, social and technological changes since the 1990s have altered the dynamics of social processing of risk information and social responses to risk. For example, the growing use of large language models, the reach of influencers and podcasters, and the speed of information diffusion have changed the way people share and receive information (Kasperperson et al. 2022).

It was in this context that the special issue of *Risk Analysis* organized and edited by Kasperperson et al. (2022) initiated conversations among an international and interdisciplinary group of scholars about revisiting SARF and advancing its usefulness for informing risk research, management, and policy. Taking a cue from the special issue the authors of this article met at the Federal Institute of Technology in Zurich (ETH Zurich, organized and financed by the Consumer Behavior Professorship) during April 2024 for a three-day invitation-only workshop to discuss ways of advancing SARF as a tool for both understanding the complex social dynamics of risk and informing the management of risk. Prior to the workshop, we organized a series of opportunities to gather perspectives about SARF and its applications from other scholars.

In this paper, we present four ways of advancing the usefulness of SARF that emerged from these discussions and that we feel are particularly ripe for the attention of risk scholars:

1. First, the definitions of key components of SARF have been ambiguous, including “risk signals” and the core concepts of “risk amplification” and “risk attenuation.” This article offers definitions that will make these components more tangible and that will lead to more analytical rigor.
2. Second, development of the framework and a great deal of research employing SARF have focused on the processing of

information by the public. This tendency has led to a lack of attention to the diversity of perceptions, concerns, and values among the public and among other social actors and the complexity that brings to the dynamics of social processing of and responses to risk signals. Participants in the workshop highlighted the importance of this issue and emphasized the need for SARF to better account for diversity of social actors in future efforts.

3. Third, SARF’s representation of the ways in which certain risk signals gain traction and others do not are underdeveloped. Better conceptualization, operationalization, and description of the processes involved, including the dynamics of risk amplification and attenuation, can direct attention to and integrate research among scholars that can help predict social responses. To draw attention to these phenomena, we introduce a new metaphor of “risk resonance.”
4. Fourth, context and past events are critical in the social processing of risk, but the SARF does not include and clearly account for their roles. The social processing of risk does not necessarily start from a single instant isolated in time, although this has often been the starting point of much empirical research based on SARF. Our discussions led us to highlight the need for the framework to be better at integrating context, history, and the temporal dimensions of social processing of risk.

We conclude the paper with a reflection about how the framework can achieve its yet unmet potential. Human experiences can have profound effects on how risks develop and the resulting actions and consequences that emerge in response to them. These effects, actions, and consequences rarely receive deep attention in technical risk analyses, as tools are missing to structure and operationalize such an analysis. Through our on-going discussions and collaboration we are working to re-invigorate and encourage further discussions and use of SARF for research and applications that can better inform risk assessment, management, and policy.

2 | A Brief Primer on the SARF

In its initial formulation, SARF was used to describe “processes by which certain hazards and events that experts assess as relatively low in risk can become a particular focus of concern and socio-political activity within a society (risk amplification), whereas other hazards that experts judge to be more serious receive comparatively less attention from society (risk attenuation)” (Kasperperson et al. 2022, 1367). The processes have been commonly illustrated by versions of Figure 1. The elements of the process are:

- A risk or risk event gives rise to risk signals that are perceived, interpreted, and re-interpreted by actors at different levels of analysis (i.e., individual, group, institution, societal) through varied information channels;
- which results in the social amplification and social attenuation of risk;
- leading to changes in institutional and social behaviors, which may provide feedback to further iteration of risk amplification and risk attenuation;

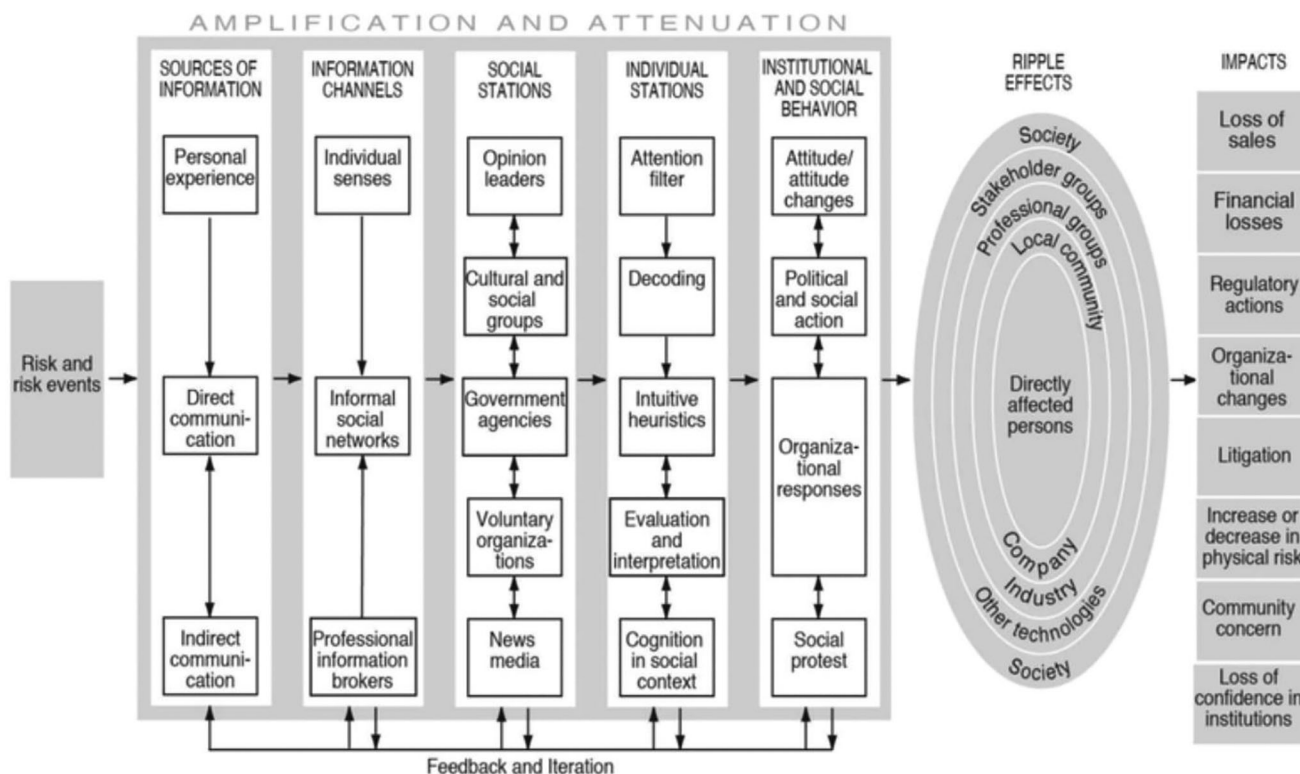


FIGURE 1 | A version of the original Social Amplification of Risk diagram (Kasperson and Kasperson, 1996).

- which give rise to ripple effects and impacts, meaning consequences for the initial risk or risk event and beyond.

The ripple metaphor, applied in the initial conceptualization of SARF, is intended to convey how consequences can cascade through many different types of risk situations, sectors, and levels of social organization, like the effect of a stone thrown into a pond that results in ripples on the water emanating from the location of impact (Slovic et al. 1984). Examples of the ways that risk situations can give rise to different patterns of ripple effects are:

- Misinformation on social media about a food additives' carcinogenicity: a risk situation that predominantly generates social processing within individuals and impacts the risk itself, perceptions of the risk, and the risk assessment and management system, while the management system reacts to the public outrage over the food additive with additional risk assessments,; and potentially, a ban.
- Emerging reports of a local viral outbreak: a risk situation that generates social processing in a broader manner, with ripple effects and consequences spreading across individual, group, institutional, and societal levels of social organization.
- The change of a policy by a health insurance company to pay for insulin: a risk situation that is only processed by a specific group with ripple effects and consequences pertaining to this specific group.
- The release of guidance on chemical testing in a specific legal framework that relies on a more conservative test method or is rooted in a less conservative level of exposure: a risk situation

that pertains only to institutions but has several different types of consequences that might go beyond the institution and reach specific groups and societies (e.g., lower or higher risk for exposed communities, more restrictive market access for companies).

The impacts arising from social amplification of risk and social attenuation of risk may be viewed as positive or negative, although when discussing risk our attention generally turns towards negative, undesirable effects. Still, it is also important to consider reductions in risk and the attainment of benefits from mitigating risks. The benefits of mitigating risk, say from new policies and regulations, can lead to the generation of additional risk signals. New risks, in new domains, new areas, or among new social actors, might emerge from these consequences as well.

Figure 1 illuminates important aspects of the SARF. The identification of stations (i.e., information sources and channels) is a reminder that diverse sources of information partake in the directional and bidirectional exchange of information; that diversity has increased with the growth of the internet and social media. Furthermore, the identification of stations is a reminder that the refinement, (re)interpretation, and elaboration of information is both a matter of individual and social processing; information is processed through psychological and social “filters” that may interact, sometimes reinforcing and sometimes counteracting each other and this may stimulate behavioral changes among individuals, groups, institutions and societies. The feedback arrows are a reminder that information processing and behavioral responses to the risk event are dynamic and responsive to new information and action. The picture of ripples is a reminder that there can be influences across different levels of

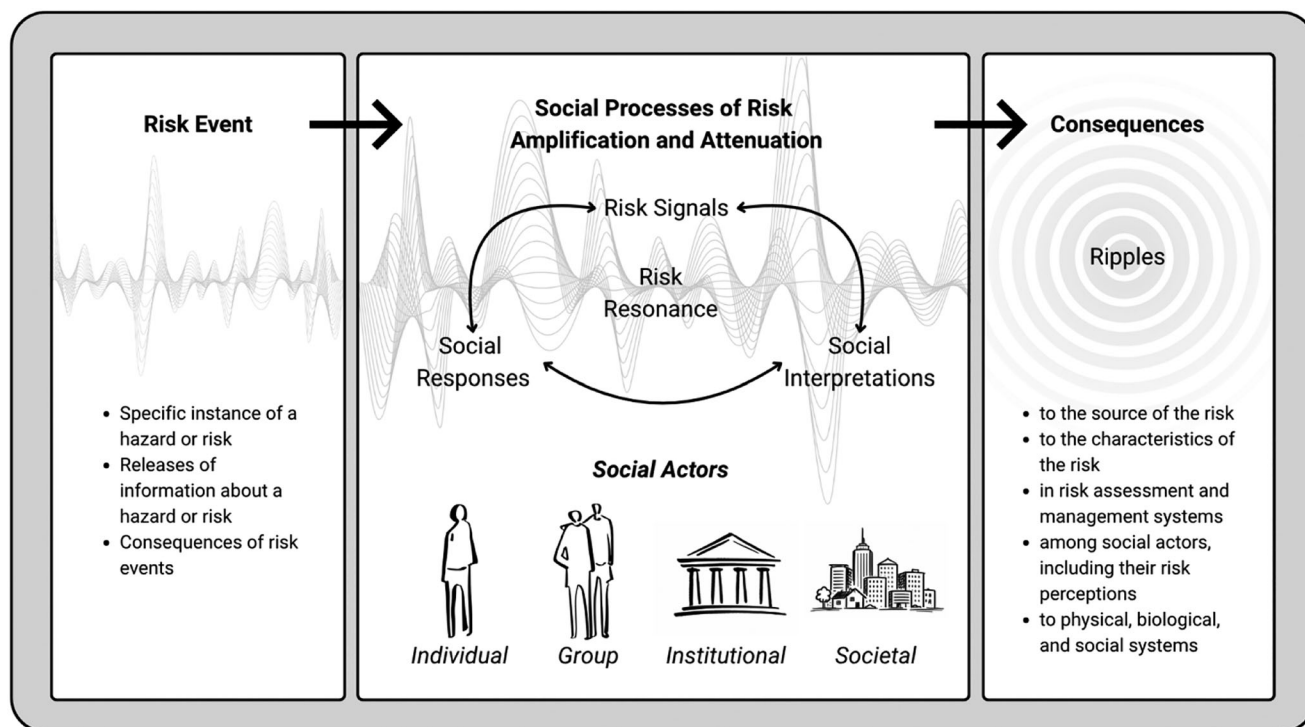


FIGURE 2 | A simplified high-level depiction of the basic structure and primary components of the Social Amplification of Risk Framework.

social organization, across different economic and technological sectors, and across different geographical scales. The impacts list is a reminder that many different types of effects and consequences are possible and should be considered.

At the same time, Figure 1 is complex and unwieldy. It does not show the idea of social amplification and attenuation of risk or draw attention to what is amplified. Nor does it clearly convey that it is the combination of individual perceptions and social and cultural processes that shape the social processing of risk. Furthermore, it obscures and misses critical features of social processing of risk that SARF represents, including what denotes a risk event, which mechanisms underlie risk amplification and attenuation, which social actors are involved in and affected by risk amplification and attenuation, and categories of consequences.

Figure 2 shows a simplified high-level depiction of the basic structure of the SARF with its primary components. The three panels are suggestive of an unfolding dynamic that involves a risk event, the social processing of information and behavioral responses to the event and risk signals, and the consequences that emerge. Categories of consequences are listed rather than examples of consequences. While both Figures 1 and 2 illustrate a linear progression, the dynamics of social amplification of risk are not linear; we return to this point in Section 3.3 to illustrate the significance of context, history and, generally, time-dependence in social processing. Still, there is a temporal dimension to how risks are perceived and interpreted, which is illustrated by the faded waves in panels 1 and 2; the rise and fall of the wave is intended to convey the amplification and attenuation of risk.

3 | Results of the Workshop: Clarifications and Extensions of SARF

By necessity—the workshop was only 3 days—we chose to focus our attention on four topics. In Section 3.1, we provide clearer definitions of core concepts in the framework. We continue with Section 3.2 in which we propose a way to conceptualize why and how certain risk signals gain traction and others do not and Section 3.3 in which we highlight an approach to better integrate context and history into the framework. We address the importance of considering multiple, diverse social actors in the dynamics of social risk amplification and risk attenuation in each of these sections.

3.1 | Clarifying Definitions of Key Concepts

Core concepts of SARF have lacked clear definitions that support consistent use in research and practice. During the workshop we re-visited the ways that risk events, risk signals, risk amplification, and risk attenuation have been used in different studies. This complicates the ability to learn across different studies and diminishes the potential practical application of SARF to inform risk assessment, policy, and management. We sought to clarify these concepts in keeping with the original intention of SARF.

3.1.1 | Differentiating Risk Events and Risk Signals

Risk events and risk signals are conceptually different in SARF. Importantly, a *risk event* is an analytical starting point for describing social dynamics that can arise in response to a wide spectrum

of stimuli associated with hazards and risks. The original article (Kasperson et al. 1988, 178) only included a footnote to define risk events as:

“...occurrences that are manifestations of the risk and that initiate signals pertaining to the risk. Risk events thus include routine or unexpected releases, accidents (large and small), discoveries of pollution incidents, reports of exposures, or adverse consequences.”

To be more precise, *risk events* should be understood as intermediary or final outcomes of causal processes which create or potentially create harms or that signify something about risk. They are things that happen and gain meaning in the world. These include:

1. a specific instance of a hazard or risk,
2. releases of information about a hazard or risk, and
3. consequences of risk events.

For example, risk events can include a rail accident involving the transportation of hazardous chemicals, the ramming of a bridge by a ship, a cyberattack on a hospital, the emergence of a new, potentially disruptive technology, or wildfires (e.g., Brenkert-Smith et al. 2013). In addition, it is possible to start analysis of social dynamics in response to events such as the release of a report about a risk, a vote on legislation that will affect management of risk, a statement from a person of interest in any media about a risk, or a story, picture, or video about a risk that goes viral on social media (e.g., Fellenor et al. 2018). A risk event can also be represented by the implementation of a risk reduction strategy, scientific research claiming to demonstrate no harmful effects of exposure to a certain chemical, or a report showing a decline in injuries in an organization (e.g., Fjaeran et al. 2024). Notably, a risk event can also include the gaining of positive outcomes or benefits related to a perceived risk, such as a community benefits agreement for siting a wind farm or compensation for hosting a hazardous facility (e.g., Ram and Webler 2025); these also signify the existence of a risk.

The concept of a *risk signal* refers to messages that convey meanings to social actors about a risk event, including factual, inferential, value-related, and symbolic meanings (Slovic et al. 1984; Slovic 1992; Kasperson et al. 1988; Pidgeon et al. 2003; Renn 2017). Risk events lead to the generation of risk signals and risk signals become parts of complex processes where social actors at multiple levels (i.e., individual, group, institution, society) detect, interpret, share, and re-interpret meanings via varied information channels. Because there can be considerable diversity among social actors—in their roles, their group identification, their interests, and their concerns—a variety of responses to a noticed risk event or risk signal may result, including the generation of new risk signals.

While risk events and risk signals are distinct concepts, a single phenomenon can be defined as either. It depends on the analytical starting point of a study or assessment applying the SARF. What might be treated as a risk signal in one context (e.g., a viral social media post on experienced side-effects after vaccination) may

be treated analytically as a risk event in another context. In the latter case, an inquiry can begin with the communicative act of the social media post and proceed by analyzing how the post generates social responses that create harm or the possibility of harm (e.g., a viral social media posts initiates political acts to ban all vaccinations). We return to this in Section 3.3 when discussing the importance of context and history in the social amplification and attenuation of risk.

3.1.2 | Focusing the Definitions of Risk Amplification and Risk Attenuation

The literature on SARF has not maintained a clear conceptual focus for the metaphors of risk amplification and risk attenuation. For example, they have been used to refer to changes in individual perceptions of risk, social interpretations of risk, and the character of impacts that arise from a risk event. They have also referred to discrepancies between lay and expert views about risk. In association with this last point, risk amplification and risk attenuation have been used to refer to differences between some sort of objective measure of risk and subjective assessments of risk. The initial intent of the concepts was to describe changes in how risks are defined and represented as a result of the reciprocal and dynamic interplay of social interpretive processes and social responses involved in the processing of risk signals (see Figure 2). Specifically, the following definitions can help bring clarity to analyses by differentiating these core concepts from others in the framework, such as ripple effects and direct and indirect consequences:

- *Risk amplification* conveys the idea that the risk signals circulating among social actors convey meanings that the risks are more significant (e.g., larger, more probable, or more severe) compared to earlier judgments.
- *Risk attenuation* describes the opposite: risk signals circulating among social actors convey meanings that the risks are smaller, less probable, or less severe compared to earlier judgments.

3.2 | Why Some Risk Signals Gain Traction and Others Do Not: Introducing the Metaphor of Risk Resonance

The cognitive and affective processes and behaviors involved in making sense of risk signals are induced when social actors notice and pay attention to a perceived discrepancy between a previous state and a new state (Gaspar et al. 2015, 2021). The discrepancy can reflect a change in understanding or a change in the strength of that understanding (e.g., when a signal is felt to confirm a prior understanding or belief). The change may be, for example, perception of additional danger or perception of improved safety.

Many theories and empirical findings from fields of psychology, sociology, communication studies, political science, cultural studies, economics, and more provide insights into why some risk signals capture greater attention by social actors while others are ignored. In part, this has to do with their “signal value” (Kasperson et al. 1988). The original SARF publications

pointed to “informational attributes.” These included the volume of information, the degree of expert dispute, the dramatization of facts and consequences, symbolic connotations, and “fright factors” (Pidgeon and Barnett 2013; Oreskes and Conway 2010; Michaels 2008; Renn 2008; Slovic et al. 2007). Other research finds that people pay attention to signals that relate to their goals, identities, and values while discounting signals that are less personally relevant (Kahan et al. 2011; Barnett and Vasileiou 2014; Breakwell 2007). Furthermore, the meanings assigned to risk signals can be informed by beliefs social actors have about the sources of risk signals, such as whether they are viewed as credible and trustworthy (Bearth and Siegrist 2022; Fjaeran et al. 2025; Siegrist 2021). In addition, meanings can be linked to social and cultural traditions (Renn 2017), organizational factors (Gould 2021), and political ideology (Kahan 2013).

These questions of why and how risk signals gain traction at the social scale and contribute to social risk amplification or attenuation (and others do not) were not a focus of early presentations and discussions of SARF, which led to some past criticisms (e.g., Murdock et al. 2003; Busby and Onggo 2013; Hilgartner 1992). During the workshop, we discussed the potential for the metaphor of “risk resonance” to focus attention on these central questions, just as the metaphors of amplification, attenuation, and ripples helped focus on other features of processing of and responses to risk. While the metaphor was not universally viewed as a helpful addition to SARF among those of us at the workshop, we believe it is worth sharing.

Our invocation of this metaphor draws on two sources:

- The physics of acoustics, specifically acoustic waves, which can trigger or influence vibrations in other bodies. In extreme cases, small vibrations can propagate and cause great damage across a larger system.
- The work of Hartmut Rosa (2018, 2019) who links the concept of resonance to harmony and discord with one’s own identity. Rosa characterizes resonance with two qualities relevant to our use of the metaphor: (1) a person feels touched or moved by an encounter (it “strikes a nerve”), including encounters with information (e.g., risk signals) and (2) a response occurs.

The metaphor, in keeping with the spirit that originally motivated SARF, is intended to encourage further integration of theories and empirical findings and a more socially-oriented and systems-oriented way of framing analyses in SARF. Here too multiple theories and empirical findings can be used to shed light, such as those related to agenda setting, social movement theory, social representation theory, and marketing (e.g., Berger 2013; Pressgrove et al. 2018; Buechler 1995; Renn 1992; Murdock et al. 2003; McCombs et al. 2018; Joffe 2003; Barnett and Vasileiou 2014; Lemée et al. 2019). For example, the concept of anchoring (Joffe 2003) can provide insight into how certain framings of risk may align with existing cultural categories and values—and thus, resonate—with particular social actors, and not others.

The relationship between the metaphor of risk resonance and the metaphors of risk amplification and risk attenuation is bi-directional. On the one side, risk amplification and risk attenuation can affect risk resonance among individuals and

groups by leading to the generation of new risk signals that continue or intensify social processing of risk signals. Risk signals spark interest and more sharing that lead to more attention at the social scale; there is on-going and increasing “vibration in other bodies.” However, risk attenuation may, at times, dampen risk resonance. In this case, the risk signals cease to strike a collective nerve or elicit a collective response. On the other side of the relationship risk resonance, the continued or intensified social processing of risk signals, can lead to risk amplification and to risk attenuation. Risk resonance is not about agreement or positive association with the meaning conveyed. Resonance may reinforce prior beliefs and ideology or create dissonance by highlighting contradictions, conflict, and the like (Rosa 2019). Resonance with risk signals that convey a strong sense of danger, fear, or anger can reinforce the iterative processes of social interpretation and response such that social perception of risk is amplified. In contrast, resonance with risk signals that convey a strong sense of safety can have the effect of attenuating earlier risk perceptions. If something does not resonate, social actors ignore it or prioritize other risk signals.

Risk signals may resonate with different social actors at different scales and in different contexts for different reasons. Risk signals that do not resonate with one set of social actors (e.g., members of the public, elected officials) might still resonate strongly with other social actors (e.g., regulatory agency, scientists of a specific discipline). While risk signals that do not generate resonance may diminish, they will not necessarily disappear completely from social processing because they may still resonate with some individuals, groups, and institutions. They may remain dormant for a time, only to re-emerge again later. Thus, context and timing also play a role. Which risk signals resonate might sometimes be incidental but more often it is mediated by the context in which these processes take place, and context is related to past events and experiences (e.g., prior conversations among friends about the risk, information gained from reading articles online or posts on social media, participation in public meetings).

3.3 | Accounting for Contextual and Temporal Dimensions in Social Amplification and Attenuation of Risk

Early descriptions and visualizations of SARF paid weak attention to the role of context, collective memories, and history in the social processing of risk. For instance, the degree of risk amplification generated by a risk event may be partly explained by previous risk attenuation in a given context and vice versa (Poumadere and Mays 2003; Fjaeran and Aven 2019; Gould and Fjaeran 2019; Fjaeran et al. 2024; Cox et al. 2022). Following events that signal safety or control of a risk, risks can be seen as attenuated over long periods of time before something happens and they enter a period of increased attention during which some social actors highlight signals downplayed by others leading to increased amplification of risk, before they again are put to aside, forgotten, or ignored—until a new risk event puts them on the agenda again and so on (Fjaeran and Aven 2019). The dynamics of these continuously ongoing processes challenge the linear structure of the SARF as initially depicted. In later versions, as shown in Figure 1, the ideas of feedback and iteration were indicated, but not elaborated in detail. Thus, SARF can be

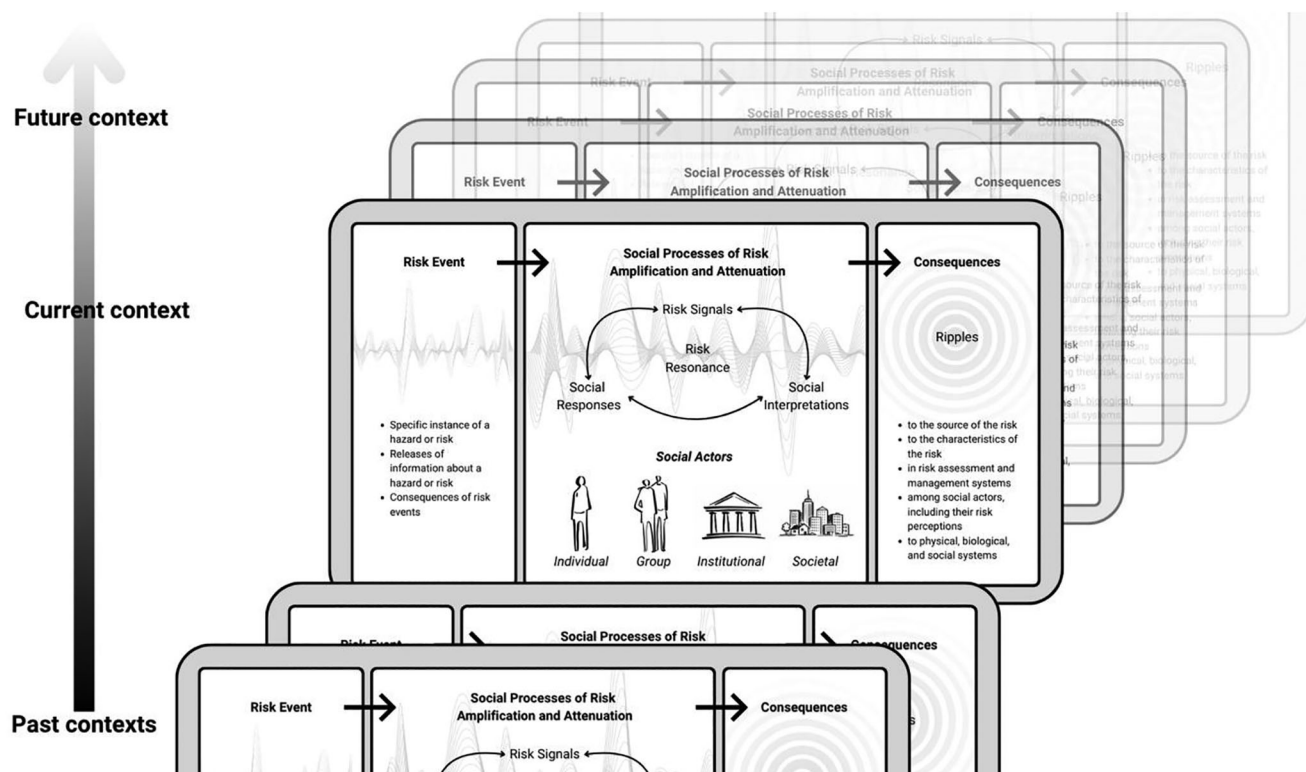


FIGURE 3 | Importance of past, current, and future contexts for the Social Amplification of Risk Framework.

viewed as ahistorical—an event happens, but in isolation from previous events and the contexts they create. This shortcoming was explicitly addressed by Fjaeran and colleagues (Fjaeran et al. 2024, 219) who noted:

“the original SARF offered no explicit guidance for interpreting events prior to or in addition to the triggering event, what led to that event, and how to view the event as occurring amidst other developments over time.”

However, social interpretations and responses are conditioned on prior experience (Breakwell 2007). While a risk event is an analytical starting point for study, it might not be the starting point for social risk amplification and risk attenuation processes because previous contexts may have influenced social interpretations and responses in the current context. Fjaeran et al. (2024) demonstrated this in their study of the dynamics of risk management surrounding the Norwegian chicken industry’s routine use of a poultry feed additive. In our view, risk signals, the social interpretations and responses, ripple effects, and consequences need to be interpreted within a continuum of contexts linking the past and unfolding and emergent presents.

Figure 3 aims to draw attention to the temporal dimension of risk amplification and attenuation. Any given current context is preceded by past contexts, half-visible at the bottom of the figure. Moving forward in time, the social interpretations of a risk event, the social responses that arise from them, ripple effects, and consequences of amplification and attenuation form new contexts (blurred in the figure), and so on.

4 | Achieving SARF’s Potential for Informing Risk Assessment, Management, and Policy

It is already broadly recognized that individual and social phenomena, such as those described in SARF, can have major consequences for risks and for how those risks are managed. Risk management is improved when these insights are integrated into planning. It was always the goal among those who articulated the initial formulation of the SARF that the framework would inform the practical risk assessments that inform risk management. While the SARF is not perfect, there are no alternative broad and integrative approaches that links hazards and risk events with processes of social interpretation, processes of social response, and consequences. As with the immediate material consequences of an accident or disaster, the consequences that result from the wider social processing of risks are no less real and in need of appropriate assessment and management.

SARF is a thinking tool that can inform the understanding of social interpretations and responses to risk events in ways that can further inform assessments, management, and policy. It creates a structure and incorporates metaphors that can help focus analyses that identify the ways that interacting social actors link risk events and risk signals with social interpretations, responses, and consequences. It can suggest questions that should be asked and dynamics that should be considered. Figures 2 and 3 offer a basic structure of first analyzing the current situation (Figure 2) and then moving on to a consideration of events that have led up to the current situation and anticipating what might occur in the future if certain actions are taken (Figure 3).

As a thinking tool SARF remains a framework, not a theory, just as was true in its original form. It is not a theory in that it does not specify the nature of the relationships, nor does it offer detailed explanations of them. From this perspective, while SARF is not directly “falsifiable” it can be useful in supporting empirical testing and useful in structuring available information, as well as the questions to be asked over a range of possible risk situations.

Based on the proposed advancements, the workshop identified the following ways that SARF can better support the practice of risk assessment, management, and policy:

- Suggest possible choices for the scope of a risk assessment, particularly with regards to specifying and selecting elements in the social processing of risk.
- Identify warning signals for possible challenges, consequences, and ripple effects arising from the context and history of a particular risk.
- Identify relevant variables related to interpretation of risks and social response to risks that would inform assessments of how risks develop over time.
- Develop taxonomies of risk situations and dynamics of social processing of information that can be used to explore possible scenarios to help draw parallels or qualitatively make predictions about risk amplification and risk attenuation in similar risk situations.
- Assess strengths of connections to predict conditional likelihoods of consequences within a given context.
- Identify and assess possible interventions by risk managers, either reactive or proactive, in communication and information systems.
- Improve practitioners’ communication strategies with social actor groups in contexts with complex risk and benefit trade-offs.
- Improve choices and designs of incentives and regulations that do not simply move risks from one arena to another.

The potential for achieving these practical applications will depend on expanding and deepening research applying SARF. During the workshop, we identified opportunities for research that can inform the practice of risk assessment, management, and policy; other scholars and managers of risk are certain to have additional interests and suggestions.

First, more complete assessments about the dynamics of risk signals through time and across contexts will be important to informing practice. The variables of time and context will influence social interpretation of and behavioral responses to risk events and risk signals—and thus, risk resonance and social amplification and attenuation of risk. There is more to be learned about how social processes work in practice and how different social variables may change over time, at different levels of analysis (individual, group, and organizational). Regarding context, there are many aspects included in the term. Among these are what has particular salience to whom and what incentive structures drive social actor responses. In addition, the promise

of risk assessment and management will be unfulfilled if risks are addressed in isolation from each other or discretely in time.

Second, we need a better understanding of the ways that different social interpretations of risk and behavioral responses can arise among multiple social actors, and how and why a particular process of risk amplification or risk attenuation becomes more dominate over others. How might risk amplification and risk attenuation associated with different social actor groups affect the distribution or magnitude of consequences? In addition, there is still much to be learned about why different social actors beyond the non-descriptive “public” act as they do, including their sharing and interpretation of misinformation (Balog-Way and McComas 2025) and the ways they may seek to leverage risk amplification and attenuation strategically to achieve goals (Dow and Tuler 2022).

Third, the role of benefits and perceptions of benefits in the dynamics of risk amplification and attenuation are, as yet, insufficiently studied. In many applications of risk analysis the benefits of a technology or a policy are assumed to exist and relate to risks in some form of a balance. However, when considering the diversity of players and their perspectives, together with the changing dynamics wrought by risk events and social processes, it is apparent that benefits, like risks, will be subjected to social processes (Ram and Webler 2022). What are the implications for risk resonance, risk amplification, and risk attenuation?

Fourth, deeper insights about the ways that social networks, governance networks, and trust—topics of extensive research in the risk context—play a role in risk resonance will be helpful in risk assessment and management. For example, research on social networks (Larson et al. 2022; Slaughter 2017) may contribute insights about the spread and resonance of risk signals. In addition, it can be helpful to better understand the dynamics created by multiple overlapping networks in a single context that can lead to multiple interpretations of risk signals and behavioral responses.

Ensuring that diverse research efforts will result in expanding knowledge that can inform practice will depend on operationalizing and measuring core concepts, such as risk amplification, risk attenuation, and risk resonance. Research and practice will benefit by continuing to promote inclusion and integration of different social theories for understanding the complex dynamics that link social processing of risk events and signals, behavioral responses, and consequences. The framework is explicit in recognizing that multiple theories can contribute to understanding the dynamics of amplification and attenuation of risks, as well as the metaphors of risk resonance and ripples. These may facilitate testing various relationships, as well as using well-founded theories to deepen understanding and even make careful near-term predictions.

5 | Conclusion

We chose four topics discussed in the workshop to highlight as potential opportunities for facilitating and extending the applications of SARF: (1) clarification of SARF components, (2) attention to the multiplicity of actors engaged in social processing, (3) risk resonance, and (4) attention to contextual and temporal

dimensions of social dynamics. The life cycle of technical risk assessment is very often circumscribed: it is performed, often, because of a social or legal mandate to inform a particular decision; the issue is narrowly defined; a great amount of detail is developed within the narrowly defined scope; the findings are presented to social actors; the decision gets made; the assessment gets filed (Goble and Bier 2013). A similar fate befalls many assessments of risk perception processes, including studies of a particular case of social risk amplification and attenuation. The study asks and answers questions about the particular case, it is published in some form, but too often there are few opportunities taken to build on it. Fortunately, the original presentation of SARF (Kasperson et al. 1988) did not suffer such a fate. Although extended and adapted in various ways it is still cited and used extensively. However, its continued use and the use of studies following it has been haphazard. Valuable information and experience are not consistently turning into cumulative gains in knowledge or practice

The original article from 1988 concluded: “The conceptualization needs scrutiny, elaboration, and competing views.” In that spirit, we have been engaging in conversations with scholars and practitioners interested in the strengths and limitations of SARF. The culmination of that effort took the form of a workshop with an international set of scholars. The result, shared here, is an effort to further develop SARF. The proposed clarifications and extensions account for many changes in the circumstances in which social processes occur, such as social media, and for the considerable new knowledge that we have about social processes. We expect that circumstances will continue to change and new knowledge will appear. Thus, we expect this version to be part of an ever-evolving process of understanding risk amplification and attenuation, and that further discussions and adaptations of SARF will benefit the practice of risk assessment and management.

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Conflicts of Interest

The authors declare no conflicts of interest.

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