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When Diagnosis Does Not Lead to Action: A Kafkaesque Process in Dam Safety

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Abstract

Dam safety management requires more than identifying technical deficiencies: it depends on the ability to translate evidence into timely decisions, effective controls, and verifiable action. This conceptual essay examines how a technically substantiated safety issue may remain open despite continuing studies, reports, and institutional activity, and asks when that loss of direction may constitute an organizational vulnerability. Using the Kafkaesque metaphor as an analytical heuristic, it distinguishes purposeful investigation and explicitly controlled deferral from an impasse in which no credible path toward a justified disposition is maintained. The discussion differentiates the condition of a dam, the process used to manage a particular issue, and the wider institutional system. Drawing on selected literature on path dependence, organizational learning, and escalation of commitment, it identifies mechanisms that may contribute to recurring recommendations, fragmented responsibility, and decisions repeatedly postponed. It also examines how elapsed time can affect physical conditions, the validity of technical knowledge, and institutional capacity without assuming that unresolved issues necessarily imply increasing risk. A set of proposed management elements emphasizes traceability, decision criteria, assigned authority, review points, interim controls, and explicit closure conditions. The essay additionally identifies insurance-related incentives as a possible topic for future research. Its conclusions are conceptual rather than statistical or causal: effective dam safety management requires a demonstrable connection between identified issues, justified decisions, and action or controlled continued oversight.

Keywords

Dam Safety, Risk-informed Decision-Making, Organizational Vulnerability, Issue Resolution, Critical Infrastructure Management

1. The Gap Between Diagnosis and Action

In countries such as Argentina, dam safety management operates through diverse technical and institutional arrangements. Depending on jurisdiction, ownership, and the characteristics of each dam, these arrangements are intended to identify potentially significant conditions, assess them, determine appropriate measures, and reduce risks associated with dam operation [1]. In many situations, this sequence functions effectively. In others, particular issues remain open for years or decades without a verifiable path toward resolution.

For the purposes of this essay, a safety issue is a technically

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substantiated condition, behavior, deficiency, or uncertainty that may affect dam safety, alter the risk assessment, or require verification, control measures, or intervention. A recommendation identifies an action proposed in response to such an issue; a potential failure mode describes a possible sequence leading to failure. These concepts are related, but they should not be treated as interchangeable. Several recommendations may concern one issue, and one issue may affect the assessment of more than one potential failure mode.

Issues may be identified through independent technical audits, special inspections, safety reviews, or specialist assessments. The resulting recommendations may call for measurements, geotechnical investigations, numerical modeling, hydraulic or structural analyses, or corrective measures [2]. Sometimes the studies are completed, but their findings do not lead to decisions or implementation. In other situations, the studies themselves are deferred because of technical difficulties, resource constraints, operational limitations, or coordination problems. The formal process continues while the condition that prompted it persists and, where an active deterioration mechanism exists, may worsen.

The adjective Kafkaesque provides a heuristic metaphor for this possible pattern: rules and procedures remain in place, individuals perform their duties, and activity continues, yet resolution is repeatedly deferred. The term characterizes neither the dam safety system as a whole nor the intentions of those involved. It draws attention to a process that may become self-referential, with successive activities sustaining its continuity without producing corresponding progress.

Technical complexity, uncertainty, and prudent investigation are integral to managing infrastructure whose failure could have severe consequences. An issue may therefore remain open for sound technical reasons. The concern arises when its continuation lacks explicit decisions, appropriate controls, assigned responsibilities, and evidence of progress [3]. In some institutional arrangements, limited capacity to establish enforceable requirements, verify compliance, or respond to delays may compound these difficulties.

This essay asks: can a persistent inability to advance and resolve a technically recognized issue contribute to changes in risk? Addressing that question requires examining both the condition of the asset and the capacity of the management process to translate knowledge into timely decisions and action. Here, the capacity to resolve issues includes achieving a justified disposition of a specific issue, whether through correction, mitigation, reassessment, or its explicit incorporation into continuing risk management.

2. Three Levels of Analysis

Three levels help distinguish the subject of the analysis from its institutional context:

1) Issue level: the specific condition, deficiency, or uncertainty requiring assessment or action, including its relationship to potential failure modes and consequences.
2) Management process level: the activities through which the issue is investigated, assessed, addressed, and brought to a justified disposition, with decisions and responsibilities documented.
3) System level: the actors, rules, resources, institutions, and relationships that shape dam safety management.

The essay focuses on the second level and considers the third as the context in which it operates. A difficulty affecting one issue does not, by itself, establish a failure of the system as a whole. Conversely, examining individual issues may reveal recurring organizational conditions that warrant broader investigation.

3. When an Issue Reaches an Impasse

Some issues require long observation periods, complex investigation campaigns, specialized modeling, difficult interventions, or substantial investment. Time remains part of a purposeful technical process when responsibilities, decision criteria, and means of assessing progress are retained. An impasse emerges when that trajectory weakens and the issue ceases to move toward an identifiable resolution.

The causes may include technical uncertainty, changing institutional priorities, budget constraints, contractual difficulties, disagreements among specialists, discontinuity in professional teams, or uncertainty about who is responsible for the next step. These factors may interact, and their significance must be assessed in the circumstances of each issue.

3.1. Possible Organizational Mechanisms

Organizational theory offers perspectives through which to examine these interactions. Path dependence draws attention to how earlier choices and reinforcing processes can constrain subsequent options and increase the costs of changing course [4]. In dam safety management, this perspective may help explain why an established sequence of studies or procedures persists after its usefulness has weakened. It does not imply that every long-standing arrangement is ineffective or that change is necessarily preferable.

Research on organizational learning provides a framework for considering how experience becomes knowledge and how organizational context affects that process [5]. Applied here, it raises questions about the retention and transfer of technical knowledge when personnel or organizations change. Loss of the reasoning behind earlier assessments may contribute to repeated investigations or recommendations, although that relationship requires examination in specific cases.

Escalation of commitment describes circumstances in which decision makers continue or increase investment in a chosen course despite unfavorable outcomes [6]. Repeated commissioning of studies could reflect this mechanism where prior commitments sustain a trajectory whose results no longer justify it. Repetition alone, however, is insufficient to establish escalation: further studies may be necessary and

technically well founded. Together, these perspectives suggest possible organizational mechanisms; they do not demonstrate the cause of any particular impasse.

3.2. Distinguishing Progress from Continued Activity

Reports may be prepared, recommendations repeated, meetings held, study scopes revised, and schedules updated without a corresponding change in the issue. These activities show that it continues to receive attention. The safety question is more specific: *what has changed in the condition, the available knowledge, the effectiveness of controls, or the basis for a decision?*

Progress may involve reducing a significant uncertainty, implementing a measure, revising a risk assessment, or making a justified decision about how to proceed. A study contributes to progress when its purpose and its relationship to a subsequent decision are clear. Risk-informed dam safety approaches similarly link analysis and assessment to decisions intended to better understand, control, or reduce risk [7].

Three descriptive situations can help organize the assessment. The first two are compatible forms of active management rather than mutually exclusive administrative categories:

1) An issue progressing toward resolution. The next steps are defined, responsibilities are assigned, time frames reflect the issue's significance, and substantive progress is reviewed. Resolution may take time, but the process retains direction.
2) An issue under controlled deferral. A definitive measure cannot yet be implemented. The deferral is explicitly assessed and justified, with appropriate monitoring, operational restrictions, compensatory measures, or other controls, together with a date or condition for reconsideration.
3) An issue at an impasse. The issue remains open without a clearly defined next step, a verifiable path toward resolution, or an explicit decision about how risk will be managed during the delay. Activities may continue while the basis for advancing the issue remains unclear.

An impasse is not established by elapsed time or an isolated indicator. Warning signs include:

1) The same recommendation recurring without a substantive change in the issue's status.
2) Study scopes repeatedly redefined without decisions based on available findings.
3) Missing deadlines, review dates, or criteria for determining completion.
4) Personnel changes without effective transfer of technical knowledge.
5) Decisions repeatedly deferred and responsibility for the next step unclear.
6) Reports, measurements, or modeling results accumulating without a defined use in decision-making.
7) Persistent technical, financial, or institutional obstacles whose implications have not been explicitly assessed.

These signs warrant greater attention when several persist together. Their interpretation requires technical judgment and consideration of criticality, existing controls, and the reasons for delay.

A useful question is: *what action should be taken next, by whom, and by when, to change the state of knowledge, control risk, or support a decision?*

An identifiable next step is necessary, but its existence alone does not demonstrate effective management. It must be relevant to the issue, proportionate to its urgency, and capable of supporting a substantive decision. Otherwise, another formally completed activity may simply extend the impasse.

4. Time as a Safety Variable

Time in dam safety management is commonly associated with inspections, study schedules, interventions, and periodic reviews. When an issue remains unresolved, it also affects the context in which the original assessment and subsequent decisions must be considered. Three dimensions are particularly relevant.

The first concerns the asset and its surroundings. Materials age, deterioration mechanisms may evolve, loading cycles accumulate, operating conditions change, and extreme events may occur. Downstream exposure may also change, altering potential consequences. Risk assessments describe conditions and knowledge at a particular time; subsequent changes may require their reassessment [8]. This does not mean that every unresolved issue deteriorates or that its risk necessarily increases.

The second concerns the continued validity of knowledge. Measurements, investigations, models, and hypotheses developed years earlier may become less representative as the structure, operating conditions, or surroundings change. An issue can retain its administrative classification while relying on information and assumptions whose applicability requires review. Updating a study may then be necessary, even though the need for an update may itself reflect the consequences of an earlier delay.

The third concerns institutional capacity. Authorities, technical teams, operators, consultants, and priorities change. Turnover may fragment technical memory and make it difficult to reconstruct the basis of previous decisions. The physical condition, the available information, and the capacity to interpret and act on that information thus evolve within the same sociotechnical system [9, 10].

A justified delay can remain part of an appropriate strategy when accompanied by controls, monitoring, periodic reassessment, or an observation program directed at a significant uncertainty. Its duration should be evaluated against the issue's criticality and the effectiveness of those arrangements. When these conditions are absent, delay may change both the technical problem and the institutional capacity available to address it.

The time an issue has remained open should therefore be considered alongside changes in its condition, outstanding uncertainties, existing controls, and substantive progress. Elapsed time is a reason to ask whether the assessment and management strategy remain valid, rather than a stand-alone measure of risk.

The relevant question is: *what has changed during that period, and under what conditions is continued deferral justified?*

5. How the Management Process Can Influence Risk

The risk associated with a dam and the capacity to manage that risk are analytically distinct, although closely related. The first concerns physical conditions, potential failure modes, and consequences. The second concerns how organizations interpret information, establish priorities, assign responsibilities, make decisions, and verify implementation. This distinction helps explain the limited sense in which a management process may become an additional risk factor.

A persistent loss of capacity to resolve issues is understood here as an organizational vulnerability that may weaken risk control or allow an adverse condition to persist or worsen [11]. It is not a new physical hazard or a separate dam failure mode. Its significance depends on a connection to the unresolved issue: for example, delayed control of an active deterioration mechanism, failure to respond to changing conditions, or ineffective implementation of an agreed measure. The existence and magnitude of such effects require assessment in each case.

Fragmented responsibilities, weak continuity between technical teams, coordination difficulties, unclear decision authority, and repeated studies without decision criteria may undermine the process [12]. These outcomes can arise even when individual actions are reasonable and technically substantiated. Sound actions need coordination and a clear relationship to the decisions they are intended to support; their accumulation does not guarantee progress in the overall process.

Recommendations also reflect disciplinary frameworks, professional experience, and methodological choices. Different specialists may assess the same issue differently. Each significant recommendation should therefore identify its rationale, objective, priority, urgency, relevant alternatives, and criteria for implementation or completion. This makes it easier to distinguish a measure needed to control risk from an exploratory line of inquiry or one technically feasible option among several.

Additional knowledge adds value when it addresses a significant uncertainty, revises the understanding of risk, or supports a decision [13]. The concern is greatest when studies accumulate while their contribution to these purposes becomes unclear. Requesting further information may be prudent, but decisions about complex systems inevitably involve uncertainty. Risk management requires deciding how to proceed on the available evidence and revisiting that decision as information or conditions change [8].

The question is therefore not simply whether more information could be obtained. It is whether that information could materially affect the decision, whether it can be obtained within a relevant time frame, and how risk will be managed in the meantime. Premature intervention may be inappropriate, while deferral also has consequences. Both trajectories require assessment.

This perspective places the capacity to resolve issues within safety management itself. Where that capacity weakens persistently, it is necessary to investigate how the process affects the control of the identified risk and which decision could restore progress. The organizational vulnerability should be examined through that connection, rather than inferred solely from the duration or administrative complexity of the process.

6. Restoring the Capacity to Resolve Issues

From identification onward, managing a safety issue should retain a recognizable direction and a documented basis for decisions. Possible outcomes include correcting a condition, reducing a significant uncertainty, implementing controls, modifying operations, or explicitly accepting residual risk under defined conditions through the applicable decision and approval arrangements. These outcomes need not eliminate all uncertainty, but they should establish why the selected course is justified.

Traceability should cover the evidence, assumptions, analyses, criteria, decisions, responsibilities, and outstanding uncertainties. As a practical proposal arising from this essay, Table 1 sets out elements that can help maintain that continuity. They are offered for consideration and empirical evaluation, rather than as a validated assessment instrument or a universal procedural requirement.

Table 1. *Proposed element for managing a significant safety issue.*

Element	Description	Purpose
Definition of the issue	State the condition, evidence, potential consequences, and significant uncertainties.	Maintain a common technical basis and a clear scope.

Element	Description	Purpose
Responsibilities and authority	Identify who performs the action, makes the decision, and escalates unresolved obstacles.	Keep accountability explicit across organizational boundaries.
Relevant next step	Specify an action that addresses the issue and the decision it will support.	Connect activity to substantive progress.
Timing and review point	Set a completion date or review condition proportionate to criticality and urgency.	Assess whether the pace of progress remains appropriate.
Expected outcome	Identify the information, risk control, or decision expected from the action.	Provide a verifiable basis for evaluating its contribution.
Decision criteria	State the conditions for proceeding, changing course, deferring, or closing the item.	Make the use of findings and the basis for decisions explicit.
Risk management during deferral	Document justification, interim controls, responsible parties, and reassessment triggers.	Keep risk under active management while a measure is deferred.
Completion and continuing obligations	Define completion criteria and any continuing controls, review duties, or reopening triggers.	Support justified closure without losing oversight of residual risk.

Complexity may alter the nature and duration of each stage. The connection between an activity and the decision it supports should nevertheless remain visible. Reclamation's Safety of Dams process provides a relevant example: issue evaluation may lead to a corrective action study and, where justified, design and modification. This illustrates the progressive relationship between assessment and action; it does not establish the proposed table as a formal part of that process [14].

For a complex issue, the definitive solution may be unclear at the outset. It should still be possible to identify a next step capable of changing the state of knowledge, controlling risk, or enabling a decision. Examples include completing an investigation, testing a hypothesis, refining a model, expanding instrumentation, implementing a compensatory measure, modifying an operating condition, or making an interim decision. Further investigation constitutes effective action when the uncertainty being addressed and the use of its findings are explicit.

Responsibility for advancing the issue must also be clear. Owners or concessionaires, regulatory authorities, water management agencies, consultants, and specialists have different roles and powers. The allocation should identify who performs each action, who makes the corresponding decision, and who escalates obstacles that exceed the authority or resources available at that level. Transfers of responsibility and escalation arrangements should be documented.

Safety measures may affect river regulation, power generation, water supply, or other dam functions. The process must identify who evaluates these tensions and on what basis. Where potential consequences are severe, risk reduction may justify operating restrictions that temporarily reduce the services provided. The associated tradeoffs and decision authority require explicit treatment.

Follow-up should record both the technical condition and the status of the management process: how long the issue has remained open, the most recent substantive action and its result, the next step, the responsible parties, and obstacles to progress. A prolonged period without advancement, high criticality, ineffective controls, or recurring obstacles may justify review or escalation. The principal barrier may be organizational, contractual, financial, or regulatory rather than strictly technical.

Closure requires particular care. Closing a recommendation or a specific issue means documenting that its defined completion criteria have been met or that its remaining requirements have been explicitly transferred into a continuing management arrangement. Mitigation, reclassification, or formal acceptance of residual risk must have a technical basis. Reclassification alone does not demonstrate that a condition has changed or that risk has been controlled.

Where closure depends on continuing controls, the record should identify those controls, their responsible parties, review intervals, and conditions that would trigger reassessment or reopening. Closing a specific item does not terminate surveillance of the dam or continuing management of residual risk. A justified decision to maintain an issue under controlled review can therefore be an appropriate outcome, without forcing administrative closure.

The practical principle is that every significant issue should have either a relevant, timely next step or an explicit decision governing its continued management. Both require a defined review point. This preserves continuity between technical understanding, responsibility, and the action or decision needed to address the issue.

7. Not Deciding Also Has Consequences

Significant decisions should be documented, including

commissioning a study, implementing a measure, modifying operations, establishing controls, or temporarily accepting residual risk under defined conditions. When a decision is repeatedly deferred, the existing condition continues de facto, even if that continuation has not been deliberately selected or assessed.

An explicit decision to defer should identify its technical basis, duration or review condition, applicable controls, and responsible authority. U.S. federal dam safety guidelines recognize risk-informed decisions and interim risk reduction measures while more comprehensive solutions are developed [8]. The relevant principle is that deferring a definitive measure can be legitimate when the conditions of that deferral and the means of managing risk are explicit and verifiable.

Technical, financial, contractual, and coordination constraints are part of infrastructure management. They explain why an action may be difficult, but their consequences also require assessment. A constraint that reasonably justifies delay at one point may need reconsideration if it persists, the condition changes, or controls become less effective. Explanations for delay should therefore be reviewed alongside the implications of continuing it.

What are the consequences of maintaining the current situation for another period?. Answering this question allows action on the available information to be compared with a justified period of continued operation or investigation. Both may involve uncertainty, cost, and risk. The comparison should identify the basis for the decision and the conditions under which it will be reconsidered.

Taking action may mean an investigation crucial to a decision, a compensatory measure, an operating restriction, resource allocation, clarification of responsibility, or escalation to another authority. It may also mean an explicit, time-limited decision to continue existing arrangements. What matters is that continuation rests on a defensible decision with effective controls and review, rather than on the uninterrupted passage of time.

8. The Insurance Market as a Research Direction

The insurance market offers one possible direction for research into external incentives to overcome an impasse [15]. Where dams are insured, underwriting and renewal assessments may connect aspects of their risk profiles to premiums, deductibles, coverage conditions, or exclusions. An unresolved safety issue could influence those assessments. Whether such signals promote appropriate decisions, and under what conditions, remains a hypothesis to be investigated.

Insurance concerns financial risk transfer within the scope of a contract. The interests and losses reflected in coverage may differ from the full range of technically and socially significant consequences, including those affecting human life, the environment, and cultural heritage. Changes in insurance terms therefore cannot be assumed to indicate either a comprehensive assessment of safety or an improvement in it.

Research would need to distinguish the effects on coverage from the effects on actual decisions and risk control. It should also examine circumstances in which financial pressure supports timely measures, has little influence, or creates competing incentives. Such analysis would complement technical assessment and the responsibilities of the parties charged with dam safety. Developing and testing these relationships lies beyond the scope of this essay.

9. Limitations of the Analysis

This essay develops a conceptual interpretation informed by professional experience and selected literature. It does not present a systematic sample of cases, estimate the prevalence of impasses, or demonstrate causal relationships between particular organizational conditions and changes in dam risk. The categories and proposed management elements require empirical examination, including their ability to distinguish justified delays from persistent loss of direction.

Time, repeated studies, unresolved recommendations, and organizational complexity are not sufficient individually to identify an impasse. Their interpretation depends on the issue's significance, available evidence, existing controls, and decision context. Likewise, an identified organizational vulnerability does not establish that failure probability or consequences have increased. That connection requires a technically supported account of how risk management has been affected.

Application to other critical infrastructure requires attention to differences in regulation, ownership, operation, and potential consequences. The analytical focus remains the same: whether activities retain a verifiable connection to decisions and effective management of the identified issue.

10. Final Reflection

Dam safety benefits from increasingly sophisticated capabilities for observing, analyzing, and interpreting dam behavior. The value of that knowledge also depends on the capacity to use it: to reduce significant uncertainties, make justified decisions, implement measures, and verify their effects.

The analysis suggests that a specific issue may remain under follow-up while losing its path toward resolution. Activities can continue as physical conditions, the relevance of information, and institutional capacity change. Where those changes weaken risk control, the management process warrants examination as a possible contributor to the persistence or worsening of an adverse condition.

Assessing the capacity to resolve issues means asking what has changed since identification, what decision is needed, what action will support it, who is responsible, and whether the proposed timing is appropriate. If a definitive measure is

deferred, the justification, controls, authority, and review conditions should be explicit. If an issue is closed, the basis for closure and any continuing obligations should remain traceable.

An issue that cannot be resolved today should retain a relevant next step or a justified arrangement for continued management, with a defined point for review. This is where the Kafkaesque metaphor becomes useful: difficulties may be unavoidable, yet they should not become the enduring substitute for a decision about how to address them. The practical challenge is to preserve a demonstrable connection between knowing that a problem exists and taking responsibility for what happens next.

Author Contributions

Fabian Restelli: Conceptualization, Investigation, Methodology

Conflicts of Interest

The author declares no conflicts of interest.

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