The Future of Sediments

Complexity, Competing Demands, and the Emerging Decision Challenge

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Written following the 14th International SedNet Conference, Madrid, October 2025. SedNet is the European Sediment Network.

SUMMARY

The commentary argues that future sediment governance will depend not only on advancing sediment literacy, but also on strengthening the capacity to navigate political weighing under uncertainty and competing claims. This indicates an emerging need for decision literacy: the ability to sustain decision-readiness when expertise alone cannot determine outcomes. Without such adaptation, sediment issues risk progressive marginalisation and growing difficulty in bringing sediment-related decisions to conclusion as pressures intensify.

This commentary builds on discussions within the sediment community and exchanges with practitioners during the 14th International SedNet Conference, where changes in everyday decision contexts became increasingly apparent. Across projects and sectors, related pressures surfaced in different forms and intensities, often addressed in isolation and described only in partial or diffuse terms. While individual sessions and conversations focused on specific challenges, taken together they pointed to a broader shift: sediment and water systems are being asked to absorb a rapidly expanding set of, often incompatible, demands — supporting navigation and economic activity, maintaining ecological integrity, providing flood and coastal protection, enabling energy transitions, securing water availability for agriculture and industry, among others.

What distinguishes the current situation is not the legitimacy of these demands, but their cumulative and accelerating nature — intensified by climate change — and the fact that they converge on the same physically bounded systems. Viewed through this lens, the developments discussed across the conference can be read not as isolated technical issues, but as early signals of a deeper transformation in how these decisions are increasingly prepared, weighed and contested.

At the same time, the conditions under which these demands are reconciled have shifted. Decisions that were once addressed primarily within technical or sectoral frameworks are

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now increasingly formed in political arenas, under heightened public visibility and compressed time horizons. Trade-offs surface earlier, positions harden faster, and additional claims enter the process before system-level implications can be fully explored. The result is a qualitative change in how these decisions are made — and in what they are expected to deliver.

This shift is already visible in practice. Complex dossiers move through administrative and political pathways that were never designed to absorb today's density of cross-sectoral claims, the speed of mediated public reactions, or the cumulative effects of parallel pressures acting on the same system (Pischke 2025). As a result, decision-making becomes less a matter of optimising individual measures and more a question of whether the system can still carry decisions to completion at all.

What is emerging is not simply a coordination problem. It reflects a growing mismatch between escalating societal demands, physically constrained sediment systems, and decision architectures that evolved for a far less interconnected and politicised reality. This structural diagnosis resonates with recent European policy assessments that explicitly identify fragmented governance structures, conflicting priorities and coordination challenges as barriers to delivering integrated environmental transformation (European Commission 2021; European Commission 2023).

What many practitioners working at the interface of sediment management and implementation encounter today is not simply a rise in complexity, but a shift in where and how decisions are actually resolved. Issues that were long treated as technical management tasks increasingly unfold as political decisions — not because expertise is lacking, but because the number of legitimate claims on the same system continues to grow, expanding beyond what sector-based optimisation can absorb.

Sediment-related decisions in riverine and coastal systems are inherently cross-sectoral, yet they are still approached through mandates designed to function largely in isolation. For a long time, this proved workable. Today, that logic breaks down. Cross-sectoral tensions are present from the outset, but they are rarely integrated early. They accumulate until they surface at the point where formal approval, public scrutiny and political responsibility converge.

At that moment, the nature of the decision changes. What is at stake is no longer the optimisation of a measure, but the weighting of competing societal priorities. Decisions move from technical domains into political arenas, where distributional effects, perceived winners and losers, and questions of responsibility become central. This is the point at which sediment management turns into sediment governance. Even well-developed sediment management concepts illustrate how such decisions depend on prioritisation processes and the political weighting of measures within broader policy frameworks (Brinke et al. 2025).

This shift has immediate consequences for implementability. Measures that are environmentally required, legally anchored and professionally supported can nonetheless stall once they enter this space of political weighing. Beneficial use offers a telling example: broadly recognised as necessary and sensible, yet repeatedly slowed down or deferred when multiple claims collide and no single actor can carry the decision alone. The issue is not

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disagreement about principles, but the difficulty of bringing a decision to conclusion under conditions of shared responsibility and heightened visibility. EU mission-level assessments similarly point to situations in which environmental actions, although widely supported in principle, lose momentum when political ownership is diffuse and national prioritisation varies across competing policy agendas (European Commission 2023).

Time exacerbates this tension. Physical systems change faster than decisions can be prepared, justified and stabilised. Legal windows close while positions are weighed, and conditions shift while processes are still underway. As a result, decisions are not necessarily rejected — they are postponed, reopened or quietly displaced. Problems continue to accumulate, while the capacity to bring decisions to completion erodes.

What emerges is an implementability gap that cannot be closed by better communication alone. Explaining measures more clearly does not resolve the fact that many sediment-related choices have become politically charged judgements rather than technical solutions. The challenge lies not in producing knowledge, but in sustaining decision-readiness when responsibility is distributed, stakes are visible, and time works against the process.

At this point, the limitations of existing approaches become visible. The growing difficulty of carrying processes to completion is not primarily a matter of insufficient expertise or inadequate communication. It reflects a structural gap in decision-making capacity under conditions that have fundamentally changed.

This is where decision literacy matters. Not as a rebranding of communication, and not as a call for perfect consensus, but as a necessary capacity to keep decisions possible under conditions of accelerating complexity. As demands multiply and interdependencies deepen, the burden placed on individual decision-makers and institutions increases beyond what can reasonably be carried through expertise alone. Decision literacy addresses this gap by making explicit what decisions now require: cross-sectoral consequences, uncertainty, limits of knowledge, time constraints, and trade-offs that cannot be resolved technically or wished away.

In sediment governance, this capacity becomes critical because decisions increasingly move beyond the realm of technical optimisation into arenas of political judgement. Sediment literacy remains foundational in this context; without system understanding, sound decisions are impossible. Yet knowledge alone no longer suffices once legitimate but incompatible objectives must be weighed, responsibilities are distributed across institutions, and outcomes are subject to public scrutiny. Decision literacy does not replace domain expertise — it builds on it by enabling decisions to be formed and justified when expertise alone cannot determine the outcome.

Without this capacity, decisions do not simply slow down. They become increasingly difficult to conclude at all. Measures are deferred, reopened or displaced as contexts shift, not because they are flawed, but because the conditions for deciding have become untenable. Over time, this creates a situation in which not deciding becomes the default response to complexity.

Decision literacy responds to this condition by focusing on decision-readiness rather than decision content. It is concerned less with prescribing outcomes than with preparing institutions and actors to take responsibility under uncertainty, to articulate why certain

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priorities are chosen, and to make decisions defensible even when they remain contested. In this sense, decision literacy marks a shift from optimising measures to sustaining the capacity to decide.

What is becoming visible in sediment-related work today is not a failure of science or commitment, but a growing strain at the interface between expertise and decision-making. Measures that were once routine are increasingly difficult to carry through, not because their technical or ecological rationale has weakened, but because the contexts in which they must be addressed have become denser, faster and more contested. This erosion does not begin at the level of political conflict; it begins much earlier, in how problems are framed, understood and prepared.

For the sediment community, this points to a practical shift in everyday work rather than a change in mandate. Deep system knowledge and analytical rigour remain fundamental. Yet experience increasingly shows that established approaches centred on scientific explanation and outreach, while indispensable, do not by themselves prepare decisions for implementation. Explaining sediment dynamics does not resolve the fact that decisions must be taken under time pressure, limited attention and competing claims — often by actors with little technical background.

One immediate point of leverage lies in practising structured perspective shifts. Testing how sediment-related issues are perceived outside expert circles — in other sectors, administrative contexts or everyday language — often reveals how little shared understanding can be assumed. These encounters are not about persuasion or simplification, but about identifying where meanings diverge early, before positions harden and decisions become symbolically charged. Such perspective shifts function as a form of early diagnosis, highlighting where future decision processes are likely to strain.

A second, closely related shift concerns how language and decision formats are adapted beyond the expert bubble. Here, emerging analytical tools, including AI, can play a constructive role if used deliberately — not to generate ever more scenarios, but to reduce complexity to what is decision-relevant. As data density and analytical capabilities grow, the paradox becomes evident: the more comprehensively systems are understood, the harder decisions can become to conclude. Without conscious efforts to translate complexity into manageable frames, additional knowledge risks eroding decisiveness rather than strengthening it.

These adjustments do not transfer responsibility for political trade-offs to the sediment community. Rather, they help ensure that expertise remains actionable once decisions move beyond technical domains. Small shifts in how issues are framed, how uncertainty is handled, and how complexity is communicated can significantly affect whether measures remain implementable when they enter formal decision arenas.

The broader implication is straightforward. Complexity does not disappear; it becomes harder to carry. No individual or institution can reasonably hold all relevant perspectives at once, and expecting this capacity is no longer realistic. What erodes at the margins today will, if left unaddressed, become a systemic challenge tomorrow. Recognising these limits is essential if sediment-related knowledge is to remain actionable in a future that will not slow

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down. Under such pressure, the way decisions are prepared increasingly determines whether even well-founded measures are carried forward or quietly set aside.

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SUGGESTED CITATION

Pischke B (2026) The Future of Sediments: Complexity, Competing Demands, and the Emerging Decision Challenge. Unpublished commentary. beconpe Consulting, Hamburg. Available at: beconpe.de/en/einblicke

LICENCE

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