



## Dam Dynamics - A Systems Thinking Look

Complex topics are often portrayed as one-sided in mainstream media. Here, we'll demonstrate how Systems Thinking can provide insight and understanding.

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Dams constitute a significant presence in the United States' historical and cultural landscape and have begun to attract substantial media attention in recent years. Over hundreds of years, dams have been constructed to control water resources, prevent destructive flooding, and provide non-carbon based energy. Today, with 80,000 dams in existence, conversations presented in the media often show one-sided arguments supporting or opposing the building and existence of these structures.<sup>1,2,3</sup>

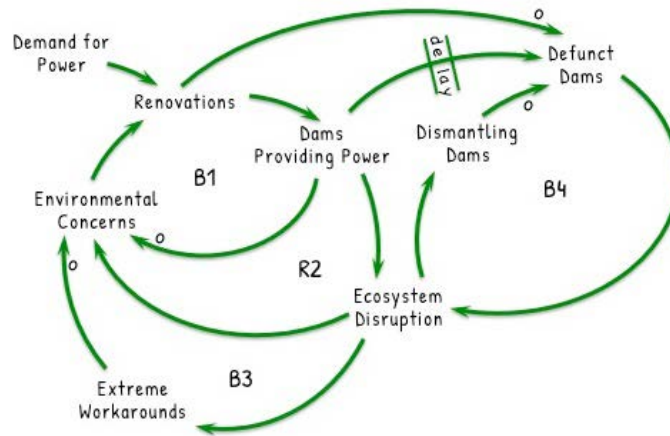
The construction, repair, or dismantling of dams often presents extreme stances and arguments on both sides of the matter. In an effort to encourage the expansion of hydropower, two federal laws were passed within the last year to "streamline bureaucracy and eliminate red tape" for dam building projects.<sup>3,4</sup> In contrast, the founder of Patagonia, Yvon Chouinard, wrote a prominent op-ed published in the New York Times advocating for the removal of all dams in early 2014.<sup>1</sup>

Missing from these two examples, and other appearances of dams in the media, is a broad analysis of the bigger picture. Systems Thinking

tools can provide these comprehensive, bigger picture insights through visual representations that account for the many factors in both arguments, regardless of individual positive or negative values associated with each.

Using a causal loop diagram, a critical Systems Thinking tool, it is possible to understand the concerns of each stakeholder and to create solutions that span individual perspectives. In the case of dam construction and removal, the causal loop diagram in Figure 1 represents the elements in the system. Each arrow illustrates a direction of influence and impact. Each loop, or cycle of influence, is labeled either B or R to indicate its status as either a balancing loop or a reinforcing loop, the two types of influence these feedback systems can have. Active balancing loops push to reach a goal, while reinforcing loops drive escalating growth or decline.

In the causal loop in Figure 1, it is possible to see the elements for both arguments. The elements that make up the argument for building dams are power creation and environmental concerns around consumption of fossil fuel. Represented alongside



**Figure 1:** This diagram illustrates the relationships between the various elements involved in the creation and maintenance of dams.

the elements in favor of building dams are the elements articulated in dam opposition: ecosystem disruption, environmental concern, and extreme workarounds.

Linking these elements in a single diagram allows an understanding of the relationships between the pieces to emerge. The legislation to facilitate the building of dams can look like an environmentally friendly power investment (B1) when considered in isolation, but has the negative side effect of disrupting ecosystems (R2), which was pointed out by Patagonia’s founder. Together, these causal loops, seen in Figure 1, create a classic “Fixes that Fail” situation, in which a solution to a problem has an unintended consequence that compounds the original problem.

Examining the comprehensive systems thinking diagram enables viewers to quickly see the full picture and to think creatively about potential new solutions that work to resolve multiple arguments, as other potential leverage points come to light. In this situation, a potential leverage point for a middle-ground policy approach exists in the balance between defunct dams and the creation of new dams.

In a concrete example, it is estimated that 80% of the approximately 80,000 dams in the United States will be defunct by 2020. In an effort to mitigate overall environmental side effects, there is the potential to combine the production of new, efficient hydropower dams with concerted efforts to tear down smaller defunct dams (seen in loop B4 in Figure 1). Often systemic solutions tend to be combinations of activities, and may include elements of both strident voices in a conflict.

**Often, systemic solutions tend to be combinations of activities and may include elements of opposing voices in a conflict.**

Systems Thinking tools create space for new perspectives and creative solutions to take hold with dams and with other policy topics. The possibilities for a media dialogue that adds value and comprehensive understanding could lead to more effective decision-making and improved citizen engagement on the whole. As a first step, Systems Thinking can open up the conversation around these divisive topics.



## Sources

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