



ICOLD Symposium on Sustainable Development of Dams and River Basins, 24th - 27th February, 2021, New Delhi

ASSET MANAGEMENT AND DAM SAFETY : TWINS RAISED APART?

BOB LEITCH

Senior Consultant, Woolpert, Dayton, Ohio, USA

ABSTRACT

The modern practice of managing dam safety and the practice of ISO 55000-aligned Asset Management have largely evolved separately to date even though both have a number of similarities, starting with their original development in response to safety and reliability concerns. Dams often have considerable regulatory requirements, and the same can be true of an asset management effort in a regulated industry such as a utility or transportation provider. Both practices incorporate risk management in support of decision making, and both also acknowledge the need for internal and external communication, coordination, and attention to human factors. Yet the two practices are often conducted in virtual isolation from one another, even within the same organization. This paper will compare the two practices in order to propose that they are actually more similar than dissimilar, and that better understanding of their similarities could lead to improved coordination between the two; perhaps even integration and synergy. In addition, the leading practices of ISO 55000-aligned asset management may offer considerable additional improvements to the modern practice of dam safety, such as a more comprehensive consideration of organizational objectives and the means to incorporate that consideration into improved lifecycle investment decision making. This could in turn provide significant benefits in terms of more effective and efficient use of limited resources, improved lifecycle management and decision making, and ultimately increased delivery of benefits including safety and reliability.

1. ORIGINS AND SIMILARITIES

The modern practice of managing dam safety and the practice of ISO 55000-aligned Asset Management have largely evolved separately to date even though both have a number of similarities, starting with their original development in response to safety and reliability concerns.

Modern dam safety practices began to emerge in the late 1970s as awareness grew of both the sheer number of dams present in the world, and their associated risks that were highlighted in the U.S. particularly by such events as the Teton Dam failure in 1976, and the Kelly Barnes dam failure in 1977 (Chadwick, et al. 1976, and Crisp, et al., 1977). The first event killed 11 people and has generated estimates of damages as high as \$2 billion, while the second killed 36 people and caused an estimated \$2.8 million in damages.

The foundations for the eventual emergence of ISO 55000-aligned Asset Management are usually also attributed to large-scale infrastructure failures. Two seminal events in the U.K. that contributed enormously to this development were the explosion and collapse of the Piper Alpha North Sea oil platform in 1986 that killed 136 people and caused an estimated \$2 billion in economic damages; and the Clapham Junction railway collision in 1988 that killed 35 people and injured nearly 500 others.

Each of these incidents were investigated by an independent group of subject matter experts and took a comprehensive look at the possible causes of failure. In the Piper Alpha and Clapham Junction investigations, the investigations delved even deeper in an attempt to ascertain any contributing causes as well, which were reflected in the investigation reports produced.

One result from all of these incidents was increased regulatory oversight of the affected industries and infrastructure, which elevated compliance into a major catalyst for change. Another result was the findings of the Piper Alpha and Clapham Junction disasters that specifically noted business process oversights and human factors, such as organizational culture, along with the need for improved communication, training, and accurate, timely information, as significant contributors to the incidents (Cullen, 1990, and Hidden, 1989). For the U.K., these findings along with nearly simultaneous management awakenings in Australia and New Zealand addressing primarily transportation and utilities infrastructure, helped to develop and advance the practice of asset management much more broadly. All three nations helped to develop the Publicly Available Standard (PAS) 55 for physical assets in 2004, and were driving forces behind the original development of ISO 55000; and all three remain global leaders in the practice of ISO 55000-aligned asset

management today.

Human factors have also been noted as part of potential failure modes for dam safety, especially in regards to communication and the providing of relevant and timely information to affected populations before, during, and after the occurrence of a dam incident. In particular, dam safety Emergency Action Plans explicitly address communication specifics.

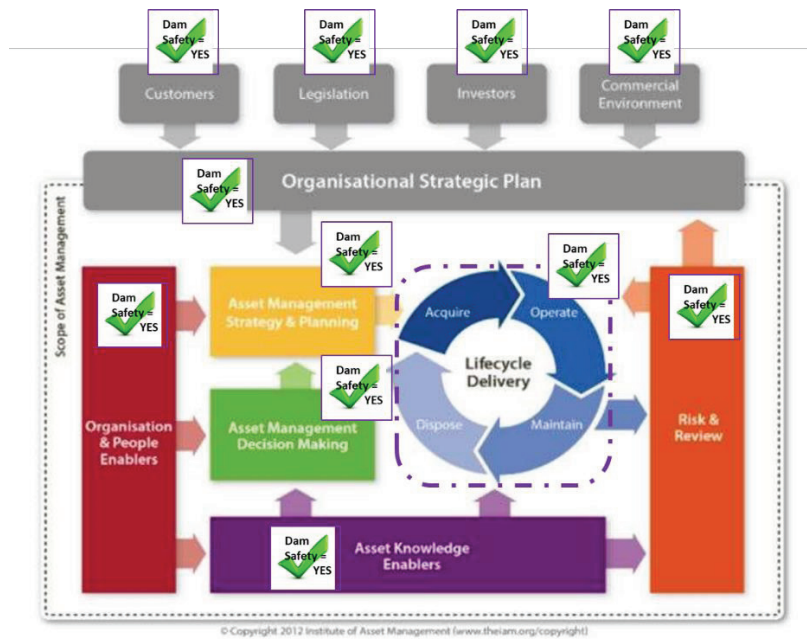
Lastly, both approaches have adapted the practice of risk management, with a focus on reducing risks to the delivery of intended benefits, as a means of more objectively and consistently informing decisions.

There are a number of distinctions between the two approaches relevant to this discussion. Dam safety typically has a narrower focus on value, primarily life safety and economic damages, whereas asset management is explicit about its much broader intended application. Indeed, the very definition of an asset under ISO 55000 as “anything that can provide value to an organization” can be understood to include many things beyond the more traditional fields of financial and infrastructure asset management: things like information, data, people, funding, time, knowledge, and software, to name a few. Also, while both practices are scalable to provide a level of effort appropriate to the issue at hand, that definition of an asset makes it clear that the practice of asset management is ultimately meant to reflect the full breadth of the aims and values of the entire organization.

Because of the large degree of specialized engineering expressed by a dam, the practice of dam safety usually (and quite rightly) involves a greater emphasis on technical analysis and rigor. The practice of asset management, on the other hand, can get as technically rigorous as necessary but often can produce significant benefits with a lesser amount of detail and analysis.

DIFFERENCES

A dam is a unique structure in a number of ways, one of which is the multiple benefits it may provide; two benefits that have been noted are life safety and the prevention of economic damages. These and other benefits can drive conflicting management strategies, as in the case where environmental concerns might require a certain amount of water flow to maintain downstream water habitat temperature, but that conflicts with a recreation, navigation, or water supply benefit to maintain a certain pool depth upstream of the dam. These multiple benefits reflect the breadth of the “values” that



asset management is explicitly intended to address.

The similarities between the practices of dam safety and asset management might be better illustrated by comparing the elements of each practice, as shown in Figure 1:

Figure 1 : Comparison of Dam Safety and ISO 55000-aligned Asset Management Elements

This graphic clearly shows that both practices contain nearly identical elements, though of course the details of each element in practice might differ as needed, and as appropriate. This result provides support to the contention that the two practices are inherently more alike than not, and even perhaps could be considered complementary. In fact, it could be argued that with its narrower focus on particular rather than comprehensive assets, benefits, and goals, the practice of dam safety is perhaps a discrete example of applied asset management principles. As such, it could be possible that the practice of dam safety could benefit from a closer integration and coordination with leading practices of ISO 55000-

aligned asset management.

Some of the possible improvements from such an approach could be a more comprehensive consideration of organizational objectives, and the means to incorporate that consideration into improved lifecycle investment decision making. It could also lead to more effective and efficient use of limited resources, particularly when competition for those resources is fierce, prioritization is difficult, and the alignment between decision results and the achievement of organizational objectives is not as clear as it could be. If the practice of ISO 55000-aligned asset management could enhance the practice of dam safety in this manner, it would also more fully integrate the practice of dam safety along with its influences, decisions, and results, more fully into the organizational fabric; and be reflected through improvements in lifecycle management and decision making, and ultimately the increased delivery of intended organizational benefits.

CONCLUSION

The modern practice of dam safety and the practice of ISO 55000-aligned Asset Management clearly have more similarities than differences. Despite originating with a focus on different assets for initially differing reasons, as the practices have matured and improved over the past three decades they have become increasingly similar in their elements while their different approaches and focus have essentially developed significant overlaps and more commonality. As a result, it is beginning to be recognized that if both practices could develop better alignment and coordination and any subsequent synergies, the benefits to each practice and the organizations employing these practices could be substantial.

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