

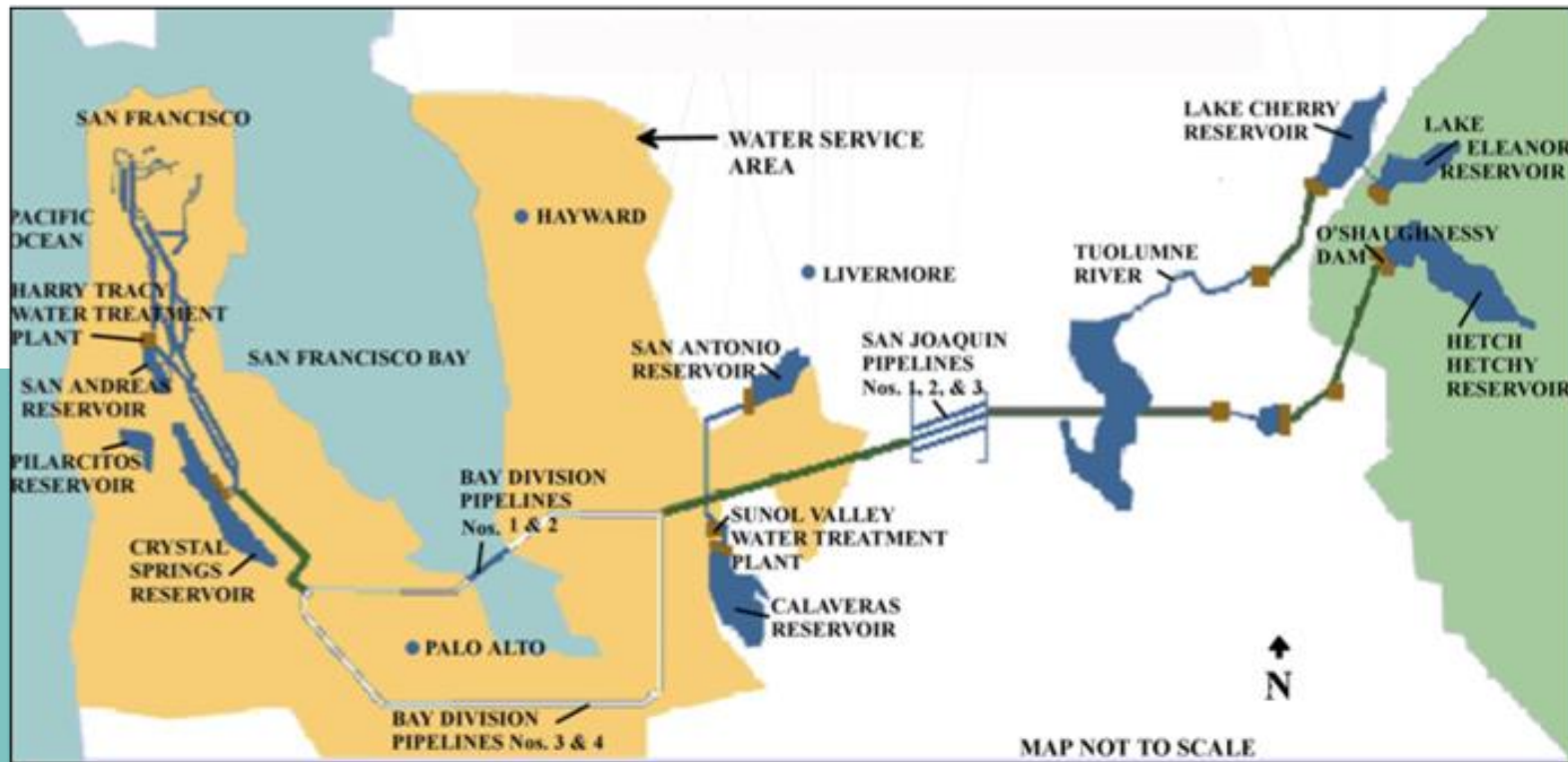
Sustainable Water Use by Industry:

How can we save us from ourselves?

Cheryl Davis

IWA Specialist Group on Sustainability in the Water Sector
CKD Consulting

San Francisco Public Utilities Commission Regional Water System





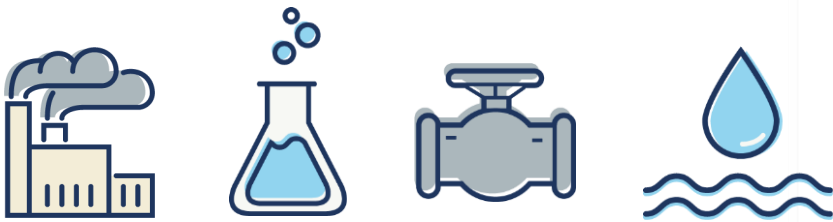
Industry Water Use

20% of world-wide
consumption;
up to 50% in some countries

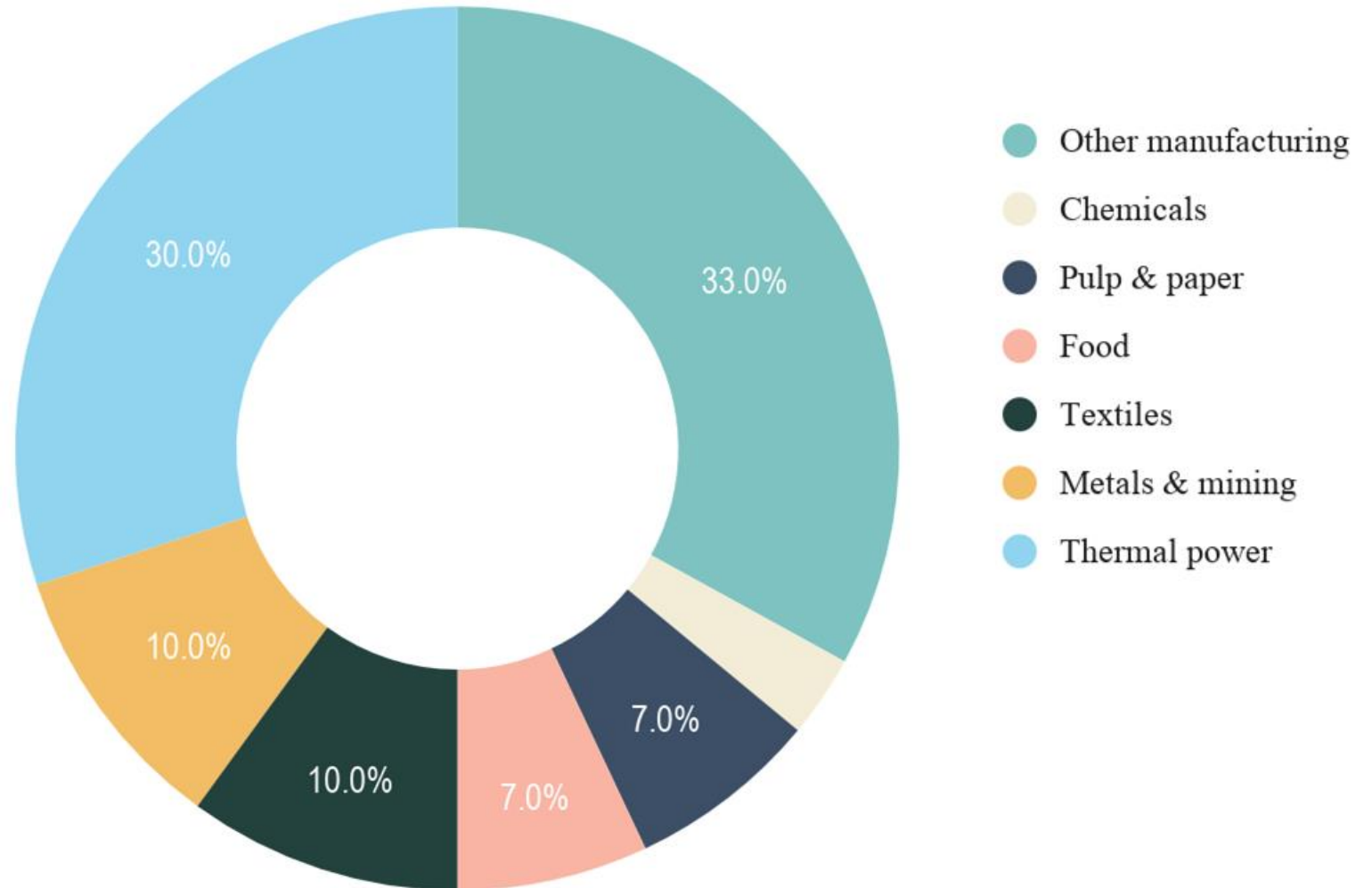


Water-Intensive Industries

Forecast industry demand
for water, 2030

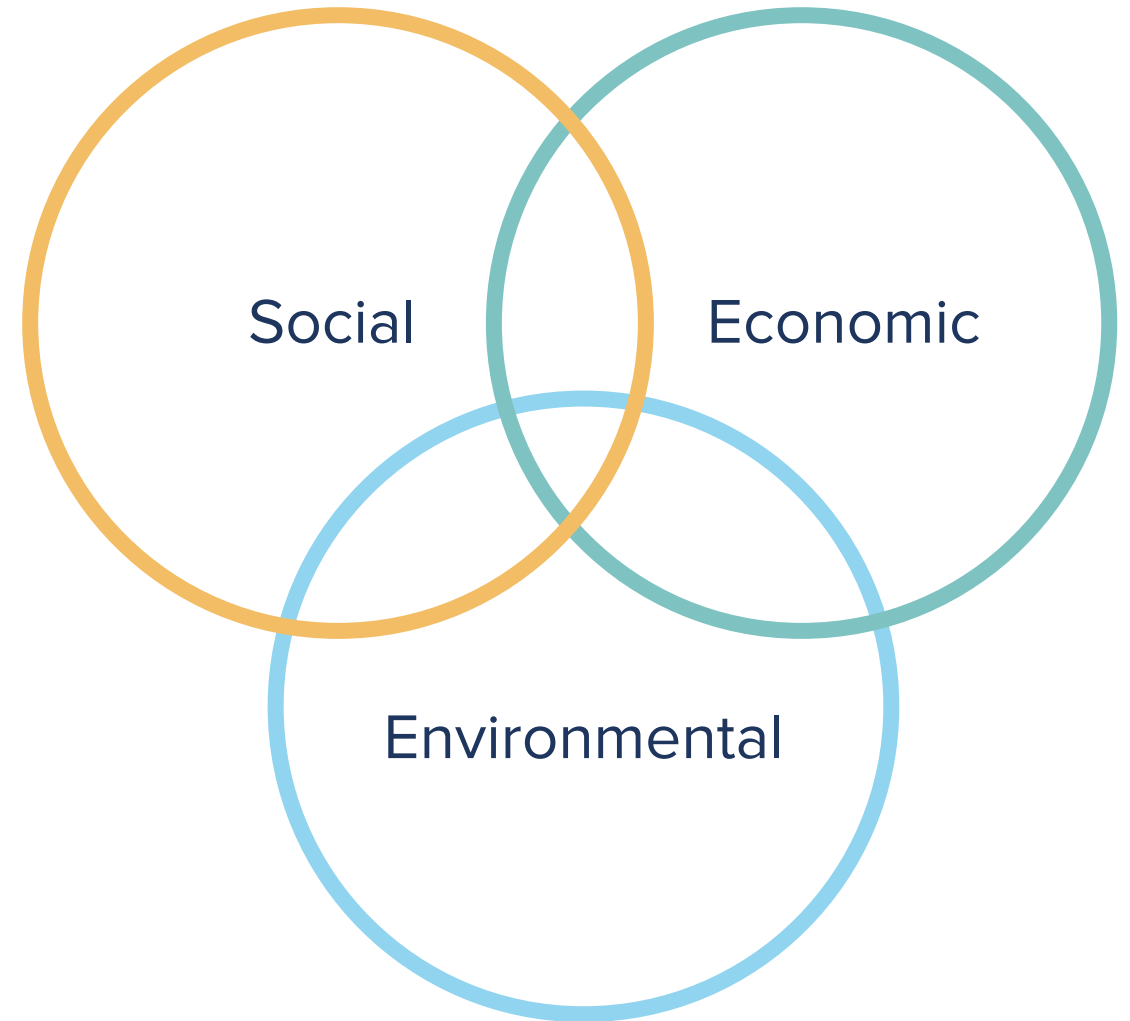


Reference: 2030 Water Resources Group, CLSA 2014



Current and Future Impacts

- A. Water consumption (quantity)
- B. Type of water consumed
- C. Water quality impacts
- D. Reliability and safety of facilities
- E. Inter-generational impacts
- F. Transparency





CASE STUDY

Bento Rodrigues Dam Disaster (Brazil, 2015)



Economic

Impact on community's economic base-
agriculture and fishing

Bento Rodrigues Dam Disaster (Brazil, 2015)





Environmental

Iron tailings containing arsenic, lead, and mercury flowed into the Doce River and through to the ocean.

5000 streams, 10,000 hectares of land, and a park important for bio-diversity damaged.

Bento Rodrigues Dam Disaster (Brazil, 2015)



Social

19 deaths, school, churches, and homes destroyed

Bento Rodrigues Dam Disaster (Brazil, 2015)

What does it take to
generate change?

Dam Safety





CASE STUDY

Brumadinho dam collapse (Brazil, 2019)

Dam collapse: Many feared buried in mud

SOUTHEASTERN BRAZIL

Hundreds missing as death toll rises from flood of mine waste

By MARCELO SILVA DE SOUSA
AND ANNA JEAN KAISER AND
PETER PRENGAMAN
The Associated Press

BRUMADINHO, Brazil — The death toll from the collapse of a dam holding back mine waste in southeastern Brazil rose to 40 Saturday as searchers flying in helicopters and rescuers who were laboring in deep mud uncovered more bodies. An estimated 300 people were still missing, and authorities expected the death toll to increase during a search made more challenging by intermittent rains.

Scores of families in the city desperately awaited word on their loved ones, and Romeu Zema, governor of Minas Gerais state, promised that those responsible “would be punished.”

Employees of the mining complex owned and operated by Brazilian mining company Vale were eating lunch Friday afternoon when the dam gave way, unleashing a sea of reddish-brown mud that knocked over and buried several structures of the company and surrounding areas. The devastation led President Jair Bolsonaro and other officials to describe it as a “tragedy.”

The flow of waste reached the nearby community of Vila Ferteco and an occupied Vale administrative office. On Saturday, rooftops poked

above an extensive field of the mud, which also cut off roads. After the dam collapse, some were evacuated from Brumadinho. Other residents of the affected areas barely escaped with their lives.

“I saw all the mud coming down the hill, snapping the trees as it descended. It was a tremendous noise,” said a tearful Simone Pedrosa, from the neighborhood of Parque Cachoeira, about 5 miles from where the dam collapsed.

Pedrosa, 45, and her parents dashed to their car and drove to the highest point in the neighborhood. “If we had gone down the other direction, we would have died,” Pedrosa said, adding that she had a feeling “that this was the end of my life.”

“I cannot get that noise out of my head,” she said. “It’s a trauma ... I’ll never forget.”

In addition to the 40 bodies recovered as of Saturday afternoon, 23 people were hospitalized, said authorities with the Minas Gerais fire department. There had been some signs of hope earlier Saturday when authorities found 43 more people alive. Company officials also had said that 100 workers were accounted for.

But the company said Saturday afternoon that more than 200 workers were still missing, while fire officials at one point estimated the total number at close to 300.

Vale CEO Fabio Schvartsman said he did not know what caused the collapse.

Emergency workers suspended their search shortly



An aerial view shows a destroyed bridge Saturday after a dam collapsed in Brumadinho, Brazil. Rescuers searched for survivors in a huge area buried by mud from the collapse.



ANDRE PENNER / THE ASSOCIATED PRESS



LEO CORREA / THE ASSOCIATED PRESS

Friends and relatives comfort themselves Saturday as they wait for information on those who disappeared after the dam collapse.

after nightfall. They planned to resume at first light Sunday.

For many, hope was fading

to anguish.

“I don’t think he is alive,” said João Bosco, speaking of his cousin, Jorge Luis Ferrei-

ra, who worked for Vale. “Right now I can only hope for a miracle of God.”

The rivers of mining waste also raised fears of widespread contamination.

According to Vale’s website, the waste, often called tailings, is composed mostly of sand and is nontoxic. However, a U.N. report found that the waste from a similar disaster in 2015 “contained high levels of toxic heavy metals.”

On Friday, Minas Gerais state court blocked \$260 million from Vale for state emergency services and told the company to present a report about how it would help victims. On Saturday, the state’s justice ministry ordered an additional \$1.3 billion blocked.

Brazil’s Attorney General, Raquel Dodge promised to investigate, saying “someone

is definitely at fault.” Dodge noted there are 600 mines in the state of Minas Gerais alone that are classified as being at risk of rupture.

Another dam administered by Vale and Australian mining company BHP Billiton collapsed in 2015 in the city of Mariana in Minas Gerais state, resulting in 19 deaths and forcing hundreds from their homes. Considered the worst environmental disaster in Brazilian history, it left 250,000 people without drinking water and killed thousands of fish. An estimated 60 million cubic meters of waste flooded rivers and eventually flowed into the Atlantic Ocean.

Schvartsman said what happened Friday was “a human tragedy much larger than the tragedy of Mariana, but probably the environmental damage will be less.”

Vale Stock Plunges

\$19B in Market Value Lost after Brazil Disaster



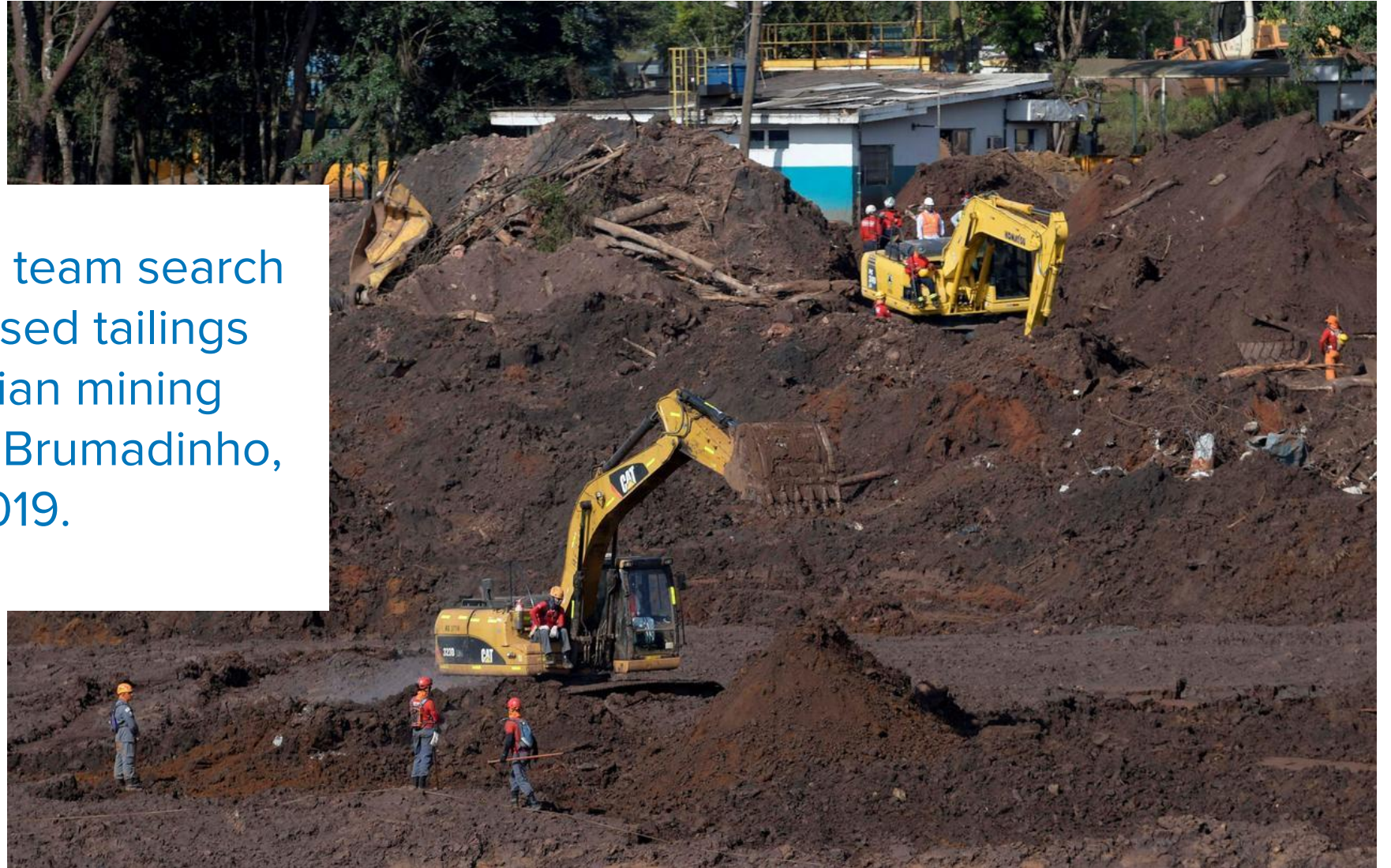
Vale to Dismantle 10 Dams

In Wake of Brazil Mining Disaster

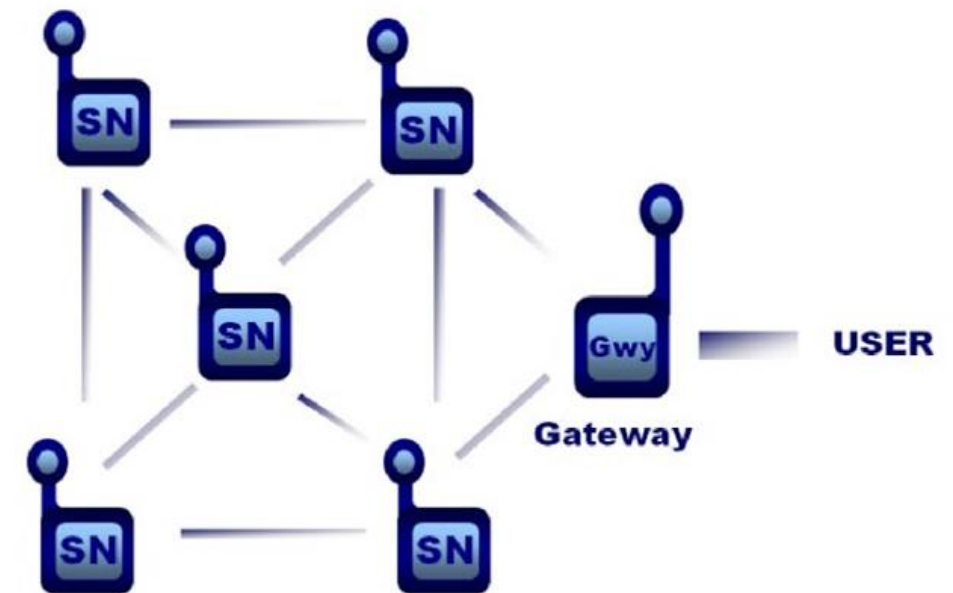
Brazil's Vale SA said it would dismantle 10 dams that are similar to the one that collapsed on Friday, killing at least 84 people, after police arrested five people in connection with the disaster earlier Tuesday.

The Search for Victims

Members of a rescue team search for victims of a collapsed tailings dam owned by Brazilian mining company Vale SA, in Brumadinho, Brazil February 10, 2019.

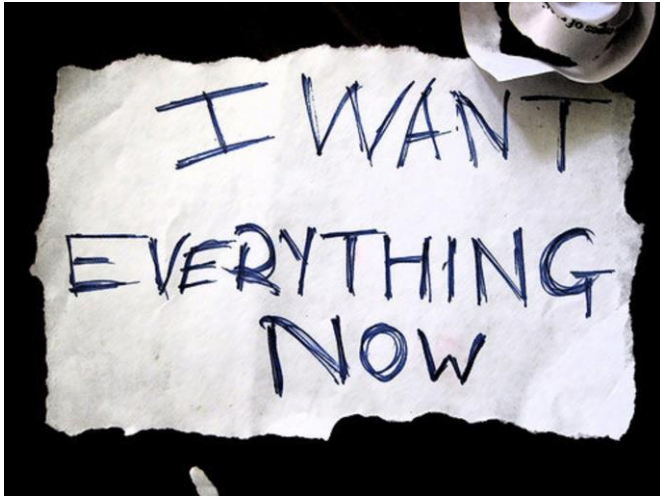


HOLLYWOOD, Fla. (Reuters) - After last month's deadly tailings dam disaster at a Vale SA facility in Brazil, Freeport-McMoRan Inc Chief Executive Richard Adkerson sent a memo to his 29,000 employees telling them to **immediately report any safety concerns** about the scores of dams his company operates. The disaster, which killed more than 300, has sparked a **push to set global standards for the construction and inspection of tailings dams**, which store the muddy detritus of the mining process, as well as emergency preparations. The move reflects **a radical departure from the way the facilities have operated for more than a century.**



What are we up against?

Human Nature



Immediate Gratification



Narcissism



Denial

Where are companies on the
maturation curve?

Long-Term Perspective

- *Early Adopters*
- *Potential Adopters*

Short-Term Perspective

- *Profiteers*
- *The Poor*



Early Adopters

See the long-term benefits of more sustainable water use.

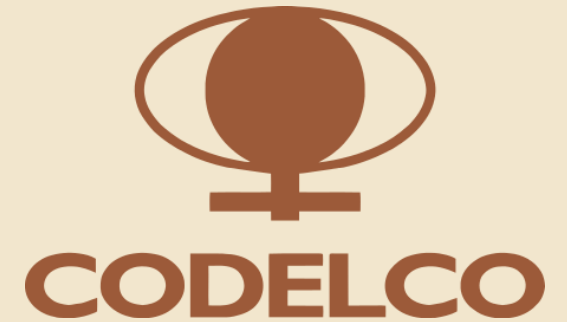
Have both the resources and the will to invest in water stewardship practices.



Codelco

Chilean state owned copper mining company headquartered in Santiago.

Largest copper company in the world with largest known copper reserves.



Potential Adopters

Have resources but don't see a business case for the investment and effort required to implement more sustainable practices.

Serious costs may turn potential adopters into late adopters.



Profiteers

Focused on short-term economic benefits.

Have resources but no interest in external or long-term impacts.



The optionless

Focused on immediate financial survival.

Lack knowledge and resources to adopt water stewardship practices.



Call for Action on Sustainable Use of Water by Industry

SUSTAINABLE WATER USE BY INDUSTRY

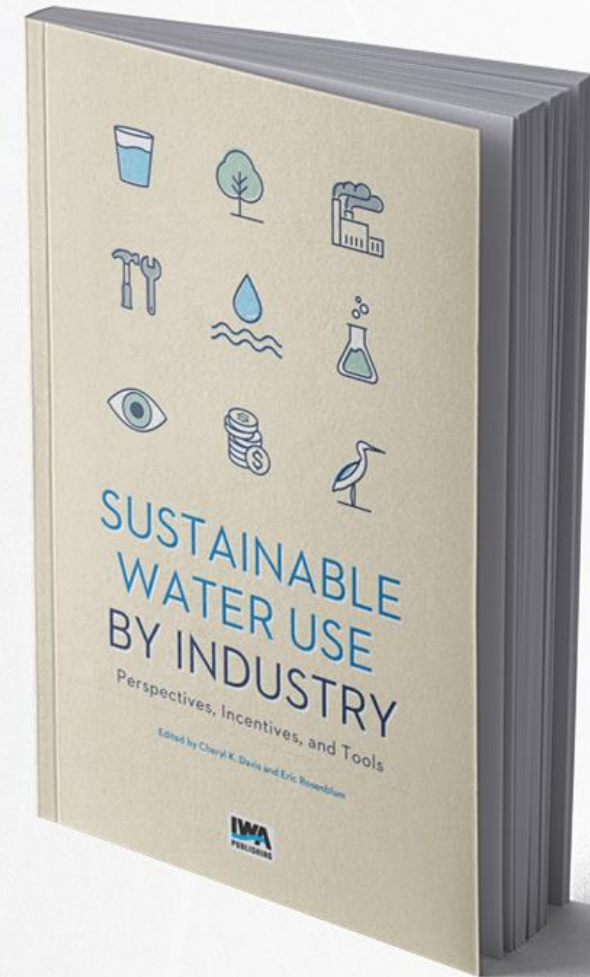


Perspectives, Incentives, and Tools

Edited by Cheryl K Davis and Eric Rosenblum

Written for and by

- Industry
- Academics/Researchers
- Professional Organizations
- Government Policy-Makers and Regulators
- Financing Institutions
- NGO's
- Community Organizations and Advocates
- Water/Wastewater Service Providers



Anticipated Book Release

Summer 2020

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