GAPS IN THE NEW (2016) CODE REGULATING TAILINGS DAMS IN BRITISH COLUMBIA

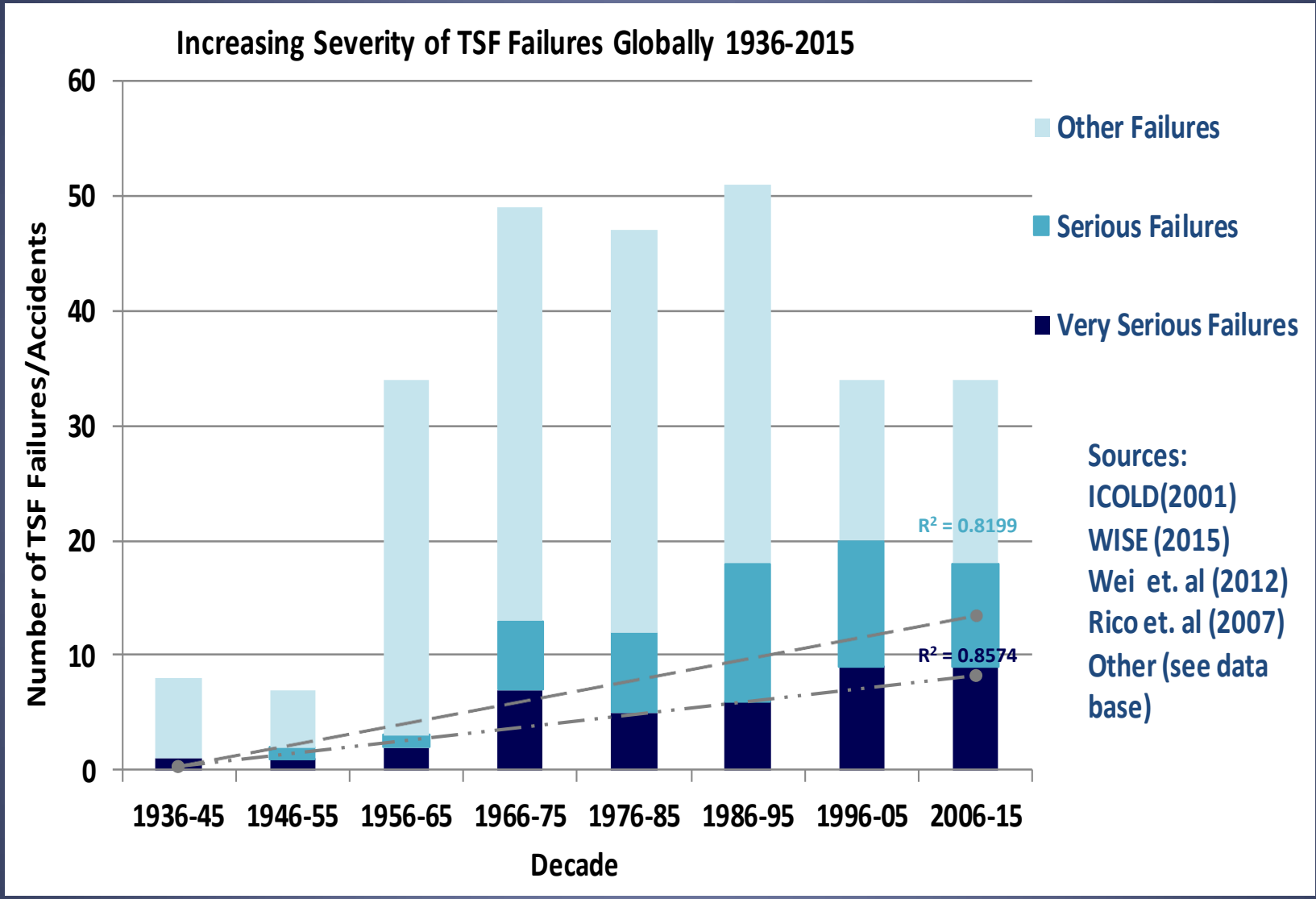
David M Chambers, Ph.D., P. Geop.
CSP², Bozeman, MT

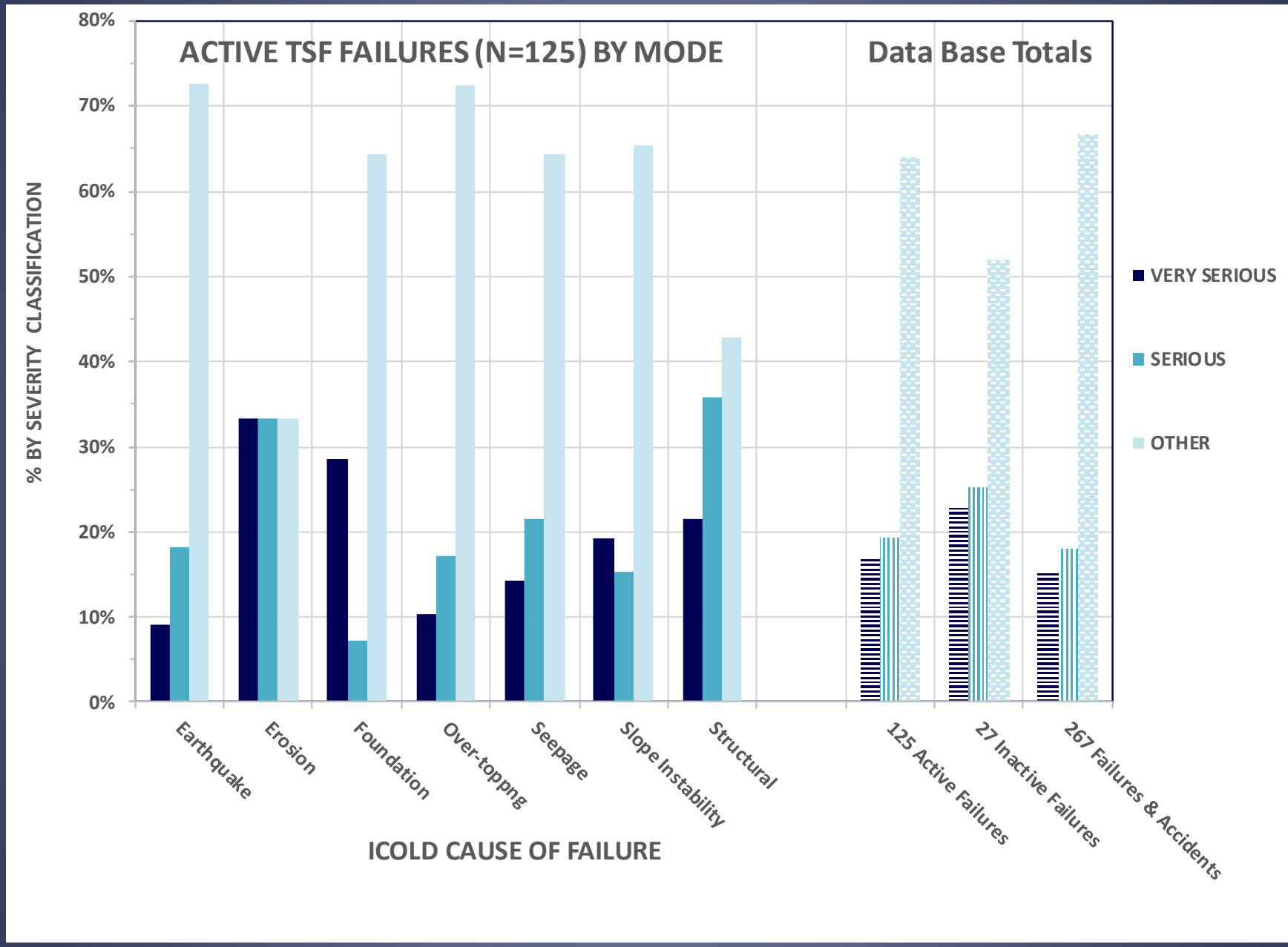
Mt Polley dam failure – Aug 2014

Why is it important to determine the risk of new failures?

(1) to prevent future failures; and,

(2) to provide compensation and mitigation for the losses incurred by any future failures.


Increasing Severity of TSF Failures Globally 1936-2015
Number of TSF Failures/Accidents
60
50
40
30
20
10
0
1936-45
1946-55
1956-65
1966-75
1976-85
1986-95
1996-05
2006-15
Decade
Other Failures
Serious Failures
Very Serious Failures
R² = 0.8199
R² = 0.8574
Sources:
ICOLD(2001)
WISE (2015)
Wei et. al (2012)
Rico et. al (2007)
Other (see data base)


ACTIVE TSF FAILURES (N=125) BY MODE
Data Base Totals
% BY SEVERITY CLASSIFICATION
80%
70%
60%
50%
40%
30%
20%
10%
0%
VERY SERIOUS
SERIOUS
OTHER
Earthquake
Erosion
Foundation
Over-toppng
Seepage
Slope Instability
Structural
125 Active Failures
27 Inactive Failures
267 Failures & Accidents
ICOLD CAUSE OF FAILURE

Independent Expert Engineering Investigation and Review Panel

Report on Mount Polley Tailings Storage Facility Breach

January 30, 2015

MAJOR MT POLLEY EXPERT PANEL RECOMMENDATIONS:

- Tailings dam fail at a rate approximately 10 times that of water supply reservoir dams. (Expert Panel Report, App. I, p. 13)
- Safety, not economics, should be the primary consideration in tailings dam design. (Expert Panel Report, p. 125)
- TSFs should not be used for excess water storage. (Expert Panel Report, p. 121)
- No wet closures for tailings impoundments. (Expert Panel Report, p. 125)

Root Causes of Tailings Dam Overtopping: The Economics of Risk & Consequence

Lindsay Newland Bowker[1] & David M Chambers[2]

[1]Bowker Associates Science & Research In The Public Interest, Stonington, Maine

[2]Center For Science In Public Participation, Bozeman, Montana

MAJOR FINDINGS FROM BOWKER-CHAMBERS:

- The number of catastrophic TSF failures is increasing (the rate is constant) because more large TSFs are being built and operated by companies under financial stress.
- The cost of these catastrophic failures worldwide could be ≈ $600 million per year.
- There is no funding mechanism, other than owner responsibility, to cover the cost of catastrophic failures.

The Cost of Catastrophic Tailings Dam Failures

Documented TSF Very Serious Natural Resource Losses 1990 - 2015

TSF Failure	Year	Original Currency (Millions)	Failure Year M US$	2014 M US$	Ore	Release (M m^3)	Run Out (km)	Deaths
Samarco-Fundao, Minas Gerais, Brazil	2015	R 24,000	$6,200	$6,193	Fe	32.0	637	19
Mt Polley, British Columbia, Canada	2014	C$ 600	$543	$543	Cu	23.6	7	
Kingston Fossil Plant, Harriman, Tennessee, USA	2008	US 1,200	$1,200	$1,300	Coal	5.4	4.1	
Taoshi, Linfen City, Xiangfen, Shanxi Province, China	2008	US 1,300	$1,300	$1,429	Fe	0.2	2.5	277
Baia Mare, Romania	2000	US 179	$179	$246	Au	0.1	5.2	
Los Frailes, Spain	1998	EU 275	$301	$437	Zn/Cu/Pb	4.6	5	
Marinduque Island, Philippine	1996	P 180 + US 114	$123	$185	Cu	1.6	27	
Omai, Guyana	1995	US 100	$100	$156	Au	4.2	80	
Merriespruit, South Africa	1994	R 100	$29	$46	Au	0.6	2	17
				======				
		Average US$2014: $1,171		**$10,535**				


Southeast Alaska Transboundary Watersheds with Large-Scale Mining Activities
Alaska
British Columbia
Pacific Ocean
New Polaris
Tulsequah Chief
Taku
Big Bull
Hat
Whiting
Juneau
U.S. - Canada Border
Schaft Creek
North Rok
Stikine
Red Chris
Galore Creek
Sitka
Iskut
Petersburg
Unuk
Nass
KSM
Wrangell
Brucejack
Craig
Ketchikan
Mining Activities
Proposed
Environmental Review
Development
Operation
0 25 50 100 Miles
3/2016
Wilderness
N
W
E
S


Red Chris Tailings Storage Facility - 2016
QUESTIONS?