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Tolerable Risk 101: The Key to Public Safety

Briefing to the
National Committee on Levee Safety
23 October 2008

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Bottom Line Up Front

- Risk justifies *Priorities*, but better decisions must *also* be driven from:
  - ***Understanding of what is Unacceptable, Tolerable, and Acceptable*** (tolerability limits & essential standards)
  - ***What is achievable,*** (As Low As Reasonably Practicable Considerations)
  - and the ***Urgency of Action*** (proximity to tolerability)
- …which is why ***Tolerable Risk Guidelines*** are needed***!***

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Definition of Tolerable Risk

1. Risks society is willing to live with so as to secure certain benefits,
2. Risks society does not regard as negligible or something it might ignore,
3. Risks that society is confident that are being properly controlled by the owner, and
4. Risks the owner keeps under review and reduces still further if and as practicable.

ANCOLD Oct 2003

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Agenda

- Discuss: "Why Implement Tolerable Risk Guidelines"
- Tolerable Risk Workshop
  - Summary
  - Actions
- Recommended Path Forward for Implementing Tolerable Risk Guidelines

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Why Tolerable Risk?
…Begin with the End in Mind

- Identify Levees that pose greatest risk
- To what extent do they need to be modified? (tolerability)
- Which levees should be modified first? (priority/sequence)
- How do we balance the desire to reduce risk with the availability of resources? (urgency)
- ….**BETTER DECISION MAKING**

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"Tolerable Risk" – Why we shy away
(… and why we shouldn't)

- Conveys a notion of a single objective decision framework.
  - ALARP drives multiple objective solutions.
- Can lead to some decisions that may not appear reasonable?
  - Guidelines are used to inform, not drive decisions.
- Fear that it will allow "Gaming" the system.
  - Centrally led and reviewed, internally and externally, prevents this.
- Further Complicates Communication
  - Proper risk communications improves the owner's and stakeholders' understanding of the issues at a levee.
- Ready to Make Leap to risk-based thinking?
  - Guidelines formalize the process to evaluate levees and prioritize resources. Not a simple numerical solution.
- Uncertainty in risk estimates
  - Risk assessment identifies the uncertainty so management can make informed decision on the course of action to take.
- Appearance of different technical standards
  - Requirement for standards based review will require disciplined thought in USACE to eliminate conflicting standards.

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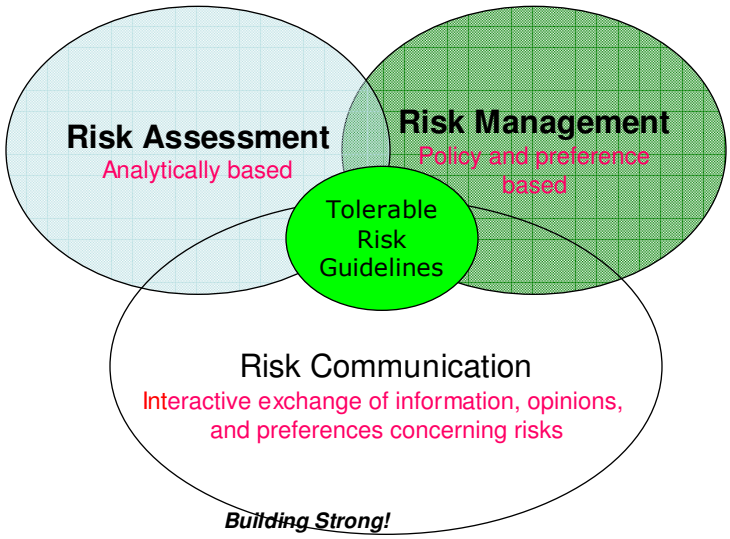
Levee Safety Risk Framework



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International Tolerable Risk Workshop

Hosted by USACE, USBR, & FERC
Alexandria, Virginia 18-19 March 2008

- Our Questions:
  - How is tolerable risk defined?
  - How it is being used to evaluate risks and to justify risk reduction measures?
  - What implementation problems have been encountered and how they have been addressed?
- Our Findings:
  - Many Organizations using Tolerable Risk to drive better decisions
  - Many Commonalities, However Differences are Focused on Organizational Issues

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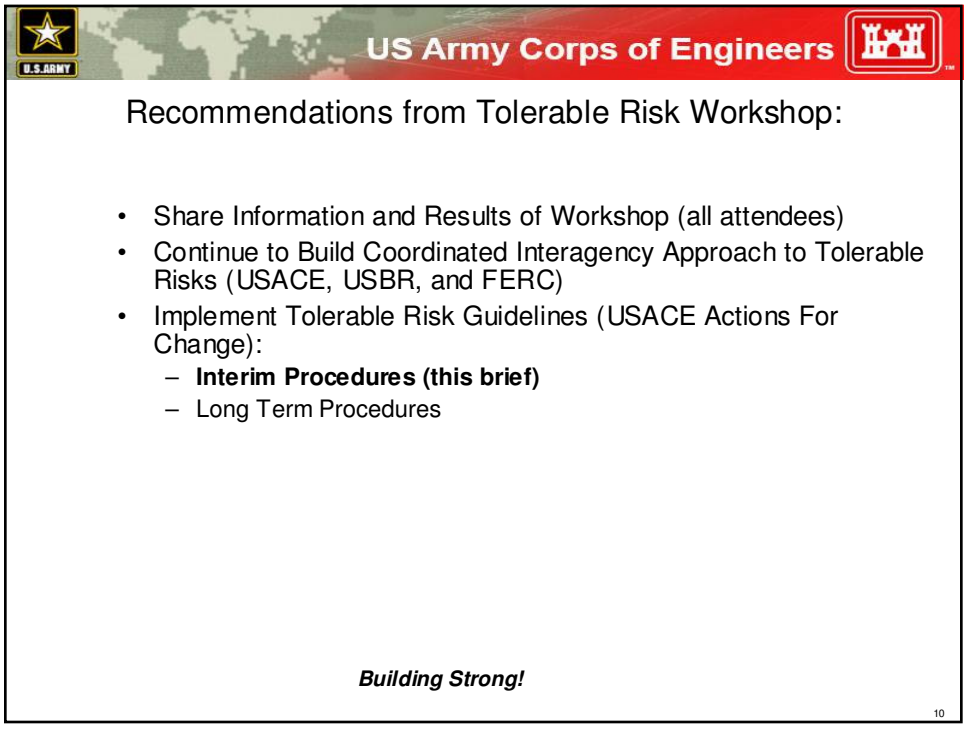
Presenters / Attendees
Oil & Gas UK
NASA
USDA
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANCOLD
FDA
ONTARIO POWER GENERATION
DSCA
Rijkswaterstaat
AIChE 100
Penn Law
UNIVERSITY of PENNSYLVANIA LAW SCHOOL
FM Global
CDA ACB
HSE
Health & Safety Executive
FEDERAL AVIATION ADMINISTRATION
DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA
UNITED STATES NUCLEAR REGULATORY COMMISSION
RESOURCES FOR THE FUTURE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Recommendations from Tolerable Risk Workshop:
• Share Information and Results of Workshop (all attendees)
• Continue to Build Coordinated Interagency Approach to Tolerable Risks (USACE, USBR, and FERC)
• Implement Tolerable Risk Guidelines (USACE Actions For Change):
– Interim Procedures (this brief)
– Long Term Procedures
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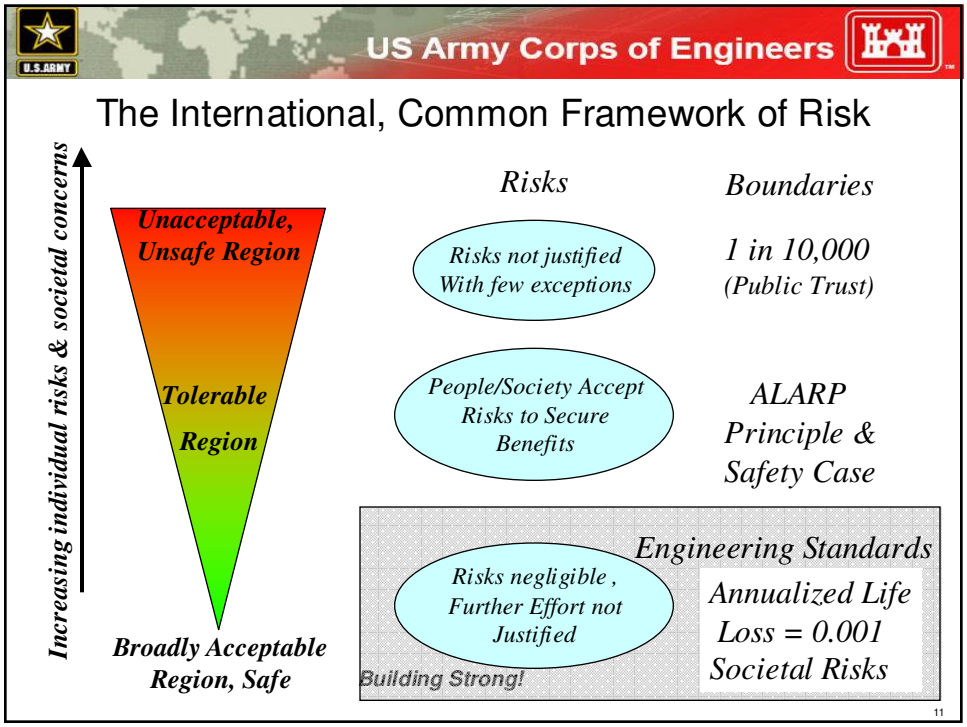
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The International, Common Framework of Risk
Increasing individual risks & societal concerns
Unacceptable, Unsafe Region
Tolerable Region
Broadly Acceptable Region, Safe
Risks
Boundaries
Risks not justified With few exceptions
1 in 10,000 (Public Trust)
People/Society Accept Risks to Secure Benefits
ALARP Principle & Safety Case
Engineering Standards
Risks negligible , Further Effort not Justified
Annualized Life Loss = 0.001 Societal Risks
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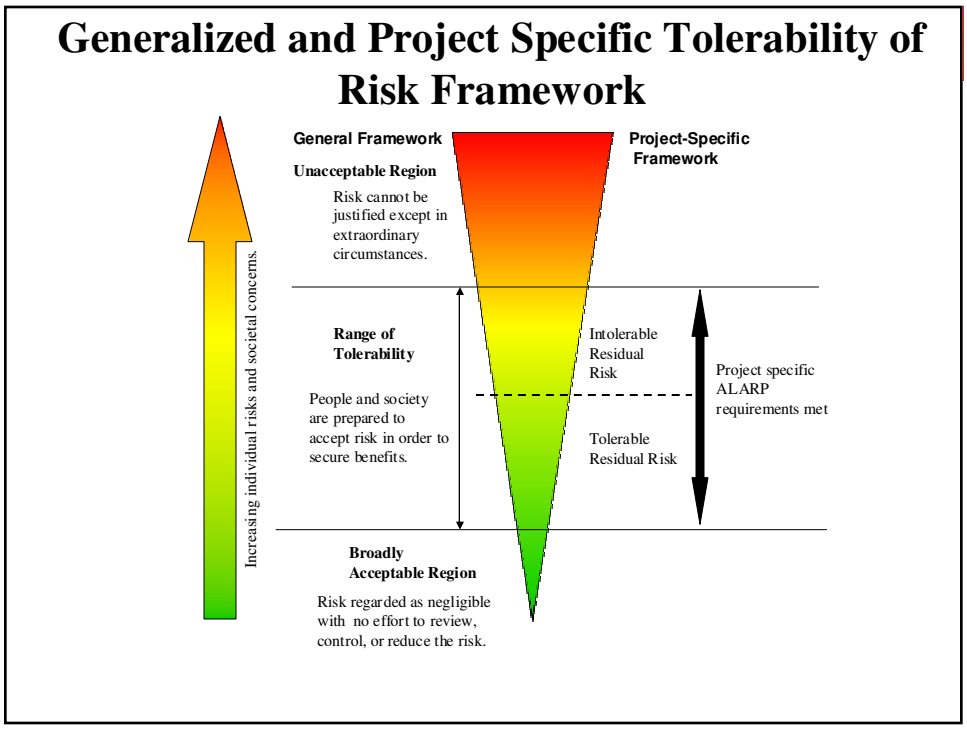
11


Generalized and Project Specific Tolerability of Risk Framework
General Framework
Project-Specific Framework
Unacceptable Region
Risk cannot be justified except in extraordinary circumstances.
Range of Tolerability
People and society are prepared to accept risk in order to secure benefits.
Intolerable Residual Risk
Tolerable Residual Risk
Project specific ALARP requirements met
Broadly Acceptable Region
Risk regarded as negligible with no effort to review, control, or reduce the risk.
Increasing individual risks and societal concerns.

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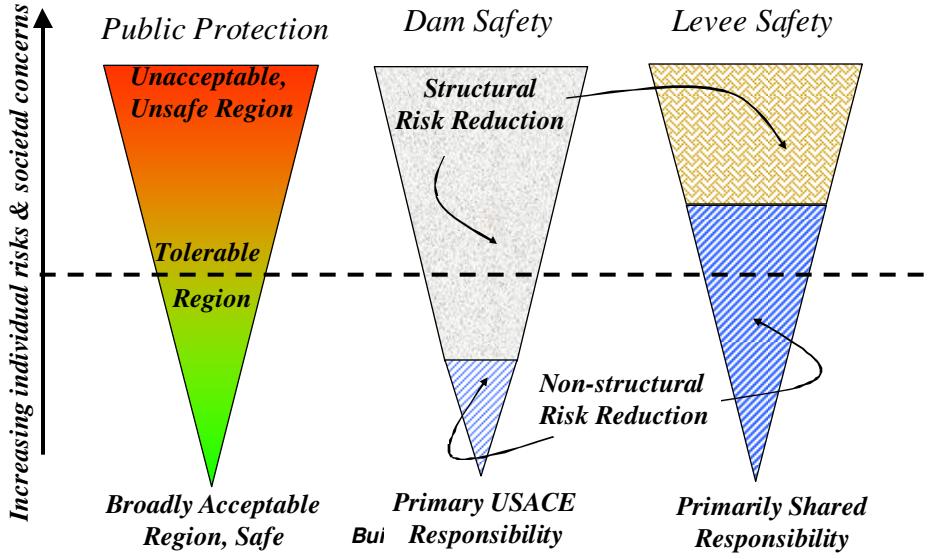
Dams Vice Levees



13

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Tolerable Risk Principles and Considerations

- Principle of Equity
- Principle of Efficiency
- Consideration of “As-low-as-reasonably-practicable”

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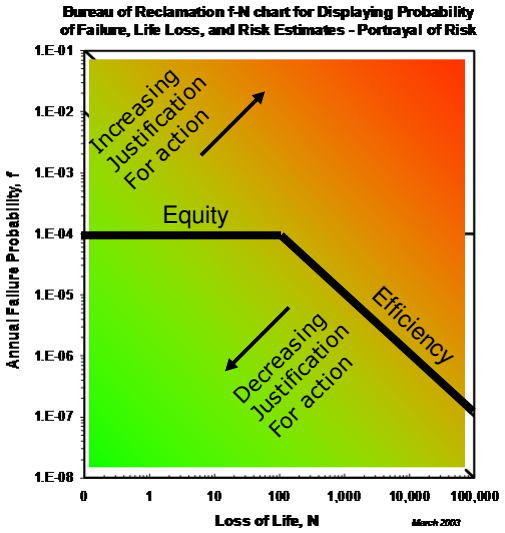
Concept of Equity & Efficiency



- **Equity** –The principle, which holds that the interests of all are to be treated with fairness and that individuals and society have the right to be protected (ICOLD); and
- **Efficiency** –In relation to society's use of resources, that principle, which seeks to gain greatest benefit from the available resources.
- This leads to the notion that tolerable risk should consider both **societal** and **individual** risks as an integral part of the framework for managing risks.

15

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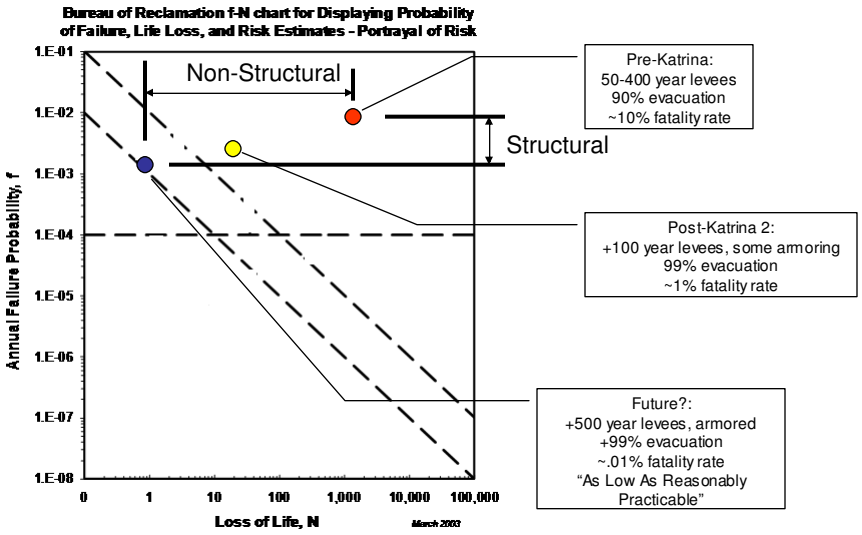
A Louisiana Scenario



16

"As-low-as-reasonably-practicable" (ALARP)

- The "as-low-as-reasonably-practicable" (ALARP) considerations include a way to address efficiency aspects in both individual and societal tolerable risk guidelines.
- The ALARP consideration states that risks lower than the tolerable risk limit are tolerable only if further risk reduction is impracticable or if the cost is grossly disproportional to the risk reduction. (Adapted from ICOLD)
- Determining that ALARP is satisfied is a matter of judgment.

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ALARP Evaluation Factors

- The disproportion between the sacrifice (money, time, trouble and effort) in making the safety improvement and the risk reduction that is achieved.
- The cost-effectiveness of safety improvement options;
- Any relevant recognized good practice; and
- Societal concerns as revealed by the owner's or proponent's consultation with the community and other stakeholders.

Adapted from the New South Wales "Risk Management Policy Framework for Dam Safety." (2006)

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Examples of Existing Tolerable Risk Guidelines for Public Safety

- Bureau of Reclamation - "Guidelines for Achieving Public Protection in Dam Safety Decision making" (2003)
- Australian National Committee on Large Dams (ANCOLD) – "Guidelines on Risk Assessment" (2003)
- New South Wales Government Dam Safety Committee – "Risk Management Policy Framework for Dam Safety" (2006)

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Proposed USACE Interim Tolerable Risk Guidelines

- Use the USBR, ANCOLD, and NWS guidelines to inform our work
- Proposed USACE interim guidelines
  - Annual Probability of failure
  - Life safety risk (Life Loss)
  - Economic consequences
  - Environment and other non-monetary consequences

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Present Activities

- USACE using interim tolerable risk guidelines on high priority dams.
  - Wolf Creek
  - East Branch
  - Success
  - Hills Creek
- Revision of dam safety regulation using interim tolerable risk guidelines.

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Discussion

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