A/E Industry’s Perspective on Levees and Risk

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The number of levees needing attention is enormous.
If levees are not improved, lives will be lost and significant property damage will occur.
Both public and private sector engineering resources are needed.
Unnecessary liability concerns limit engineers’ involvement.
The nation needs and deserves a solution to this problem.
CURRENT SITUATION
Current Situation

1. Over 100,000 miles of levees protect lives, property, businesses, farms, and infrastructure.
2. Many levees are in need of assessment and improvement.
3. NFIP issues are driving reaccreditation.

A levee is an economic decision. A levee may not always eliminate the misery, it may only delay it until that point in time when nature’s forces exceed man’s willingness to invest in greater risk protection.

Ed Thomas
4. NFIP focuses on a single factor (1 percent, or 100 year).
5. The National Levee Safety Program is an opportunity to move towards sustainability.
The Problem

1. Liability concerns impede involvement of engineers in both private and public sector.
2. Courts have allowed suits that exceed negligence basis.
3. Risk is neither understood nor appreciated.
4. All levees will eventually fail.
When is Next Black Swan?

1. Outlier, outside the realm of expectations.
2. Carries extreme impacts.
3. Human nature makes us concoct “after the fact” explanations making it seem “predictable.”
How We Got Here

1. **Focus on flood insurance, not safety.**
2. **Levees built to varying standards and quality.**
3. **Land use decisions have led to development in floodprone areas.**
How We Got Here (continued)

4. Lack of understanding of risks.
5. Unrealistic belief in levee protections.
6. Storms and impact areas are growing.
Amid drought, thousands of Californians cancel their flood insurance

HIGHLIGHTS
Since 2012, active federal flood insurance policies in California fell by 30,000, or 12 percent
1. Failings regarding **risk**
   a. Understand
   b. Manage
   c. Communicate

2. A 1 percent level-of-protection means a 26 percent chance of an exceeding event in a 30-year mortgage.

3. The legal climate has expanded suit basis to strict liability, beyond negligence.

4. Unknowable factors may exist that may be too costly to determine for existing levees.

5. Risk assessment is not a factor in decision-making.
6. The sheer number of levees needing reaccreditation requires extensive engineering resources.

7. Are we building paper levees (mounds of paperwork for reaccreditation), or are we improving levees to reduce risk?

8. Plagued by “positioning for least cost”
   a. Inadequate budgets
   b. Desire to transfer risks
   c. Viewing engineers as a source of insurance
1. FEMA accreditation criteria refers to engineering “certification,” which implies a guarantee.

2. Analogous to “for want of a nail…”

✓ A situation in which a failure to anticipate or correct some initially small dysfunction leads by successively more critical stages to an egregious outcome.
1. Since liability beyond negligence or misconduct is not insurable:
   a. Private and public sector engineers are vulnerable to uninsured liability.
   b. The best talent will not take risk and incur unreasonable liability.

2. Even successful defense of a large third party law suit can destroy an engineering firm.
What You Should Be Asking

Do you really want to entrust concerns about your risk to someone who has no concerns about his own?
TOLERABLE RISK
Challenges with the 1 Percent

1. Focus is on the hazard
2. Ignores consequences
3. Implies risk can be eliminated
4. Ignores residual risk

Figure 4. Residual risk typically rises as development fills in close to riverside levees. Adapted from Eisenstein et al (2007).
What is in harm’s way? How vulnerable is it?

What are the hazards and how likely will they occur?

How will the structure perform?
Risk = Probability x Consequence
We Cannot Eliminate Risk

Unacceptable  Tolerable  Broadly acceptable

Range of Tolerability

Risk cannot be justified except under extraordinary circumstances

Tolerable Risk is the level of risk that people are willing to live with in order to secure certain benefits.

No further actions required. Risk regarded as insignificant.
We Make Risk Decisions Every Day
No Dutch person has greater than 1 in 100,000 chance per year of dying in a flood.

Photo courtesy of Jessica Ludy
1. Life safety is paramount.
2. Risk cannot be ignored.
3. Absolute safety cannot be guaranteed.
4. Goal = Risk should be As Low As Reasonably Practicable, or ALARP.

**ALARP** is what can be reasonably done without spending an inordinate amount of time, money, or resources relative to the risk reduction benefits.
Key Considerations for Tolerable Risk

1. **Individual Risk** is the probability of harm to individuals and the things they value.

2. **Societal Risk** is the probability adverse consequences from hazards that impact on society as a whole – society is increasingly averse to hazards as the scale of the consequences increase.

3. **Efficiency** is the need for society to use available resources to achieve the greatest benefit.

4. **Equity** is the right of individuals to be protected, and the right that the interests of all are treated with fairness.
Tolerable Risk vs. Level of Protection

1. Facilitates:
   a. Understanding risk
   b. Managing risk
   c. Communicating risk

2. Recognizes:
   a. Risk cannot be eliminated
   b. Absolute protection is not possible

3. Enables establishing priorities.
4. Accounts for structural vs. non-structural options.

5. Enables:
   a. Evaluation of trade-offs
   b. Assessment of cost-effectiveness
   c. Efficient use of finite resources

SOLUTIONS
1. Enact laws that protect engineers from lawsuits for levee work performed in good faith.
2. Limit liability to a negligence standard (standard of care).
3. Establish merit criteria so that meritless suits can be halted early.
4. Limit the length of time after work is performed that suits can be raised.
5. Implement levee standards and peer review processes.
7. Determine and communicate risks
8. Hold decision-makers responsible for budget and scopes.
Precedence for Limiting Liability

1. No government liability for floods (potential coverage for government contractors).
2. Contractors working on DOE nuclear projects and nuclear site clean-ups (no-fault insurance type coverage).
3. Developers of anti-terrorism technologies.
4. Superfund contractors.
5. Other legislative precedence:
   b. Defense production Act (immunity).
   c. Stafford Act (limits government liability).
Federal Legislative Goals

1. Clarify that NFIP is entitled to immunity, including contractors working on NFIP.
2. Establish mandatory system for indemnification.
3. Create a merit standard for suits based on proof of negligence.
4. Limit liability if Corps standards are used.
5. Provide liability protections similar to those used in DOE programs.
1. Eliminate “certification” from our lexicon.
2. Implement the recommendations of the National Levee Safety Committee.
3. Improve understanding and communication of risk.
4. Move from “level-of-protection” thinking to “tolerable risk.”
5. Adopt risk-informed decision-making.
6. Aggressively move to fix our levee infrastructure.
KEEP CALM AND ASK QUESTIONS