Oregon Emergency Management (OEM)
FAQ ON THE OEM *STATEWIDE HAZARD ANALYSIS* METHODOLOGY

Introduction

Oregon Emergency Management (OEM) refined a FEMA methodology first promulgated in the early-80s to produce the tool utilized for local hazard analyses, a product that collectively is known as the *Statewide Hazard Analysis.* Many local jurisdictions in Oregon have been using this methodology for their hazard analyses since 1984.[1]

Vulnerability and probability are the two key components, producing 92% of the total score. Vulnerability examines both typical and maximum credible events, and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 62% of the total score, and probability approximately 30%.

This methodology produces total scores from a low of 24 to a high of 240, one order of magnitude difference. A score of 24 means little or no risk, whereas a score of 240 means considerable risk posed by the hazard.

By using this methodology consistently throughout the state, one can compare the risk posed by a particular hazard from one county to the next, and each local jurisdiction can compare one hazard against others to establish priorities for planning, capability development, and hazard mitigation.

Frequently Asked Questions (and Answers)

Q1. How were the different weight factors developed and assigned? For example, hazard history is a "2" and maximum threat is a "10." Is there a rational, actuarial reason for weighing the elements, or is it an attempt to rationalize an intuitive guestimation?"

A1. Let's examine this:

history = 2
probability = 7

This recognizes that we are more interested in the future than the past, that our written (historic) record of occurrences is short compared to what we may know empirically about the likelihood of occurrence, and that physical changes have occurred that affect the jurisdiction and modify the likelihood of the hazard occurring in the future. Should the methodology give three times as much weight to the future as the past? Perhaps not. Perhaps so. It might be a fun discussion.

vulnerability = 5

Given that this is right in-between "2" and "7," it feels just about right. On the other hand, vulnerability is what we really care about. We don't care so much that the hazard happens as we do about the extent to which people and their structures are vulnerable. With that in mind, vulnerability would seem under-weighted... if not for maximum threat...

maximum threat = 10

Hence, total, we are weighing vulnerability at 15 X (5 + 10) and history/probability at 9 X (2 + 7). This makes vulnerability approximately 62% of the total weighting and history/probability approximately 38%. This "feels" about right.

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1 It is probably important to note that FEMA hasn't promoted this particular methodology for quite some time, and has moved to other loss estimation methods, including HAZUS.

Q2. What was the reasoning for having two distinct parameters that both address potential losses, vulnerability and maximum threat? Is this due to some legal definition that requires both?

A2. This was not due to a legal definition (nothing in the methodology is tied to a law). The OEM methodology gives twice as much weight to "maximum threat" as to ordinary vulnerability. Put another way, maximum threat is 2/3 of the vulnerability total (10 of 15 points). (See also A1.)

When the methodology was devised in the early 80s, the United States was still in the midst of the Cold War. This may have been FEMA's way of making sure that nuclear attack always scored high enough that it would be among the top half dozen or so hazards for local jurisdictions. If so, this was probably to reinforce that they couldn't ignore nuclear attack preparedness in their planning. Every jurisdiction ended-up with the same score for nuclear attack: can you figure-out what that score was?[2]

FEMA also had a tendency in the early and mid 80s to promote a philosophy that if a local jurisdiction could handle a worst-case scenario, they could handle lesser events. OEM took another approach, working with local jurisdictions to build capability from the ground up.

Q3. What was the basis for changing the "bins" between vulnerability (<1% affected, 1-10%, > 10%) and maximum threat (<5, 5 - 25, >25 affected)?

A3. We've long wondered about this too, and while we cannot provide a definitive answer (see also A7), consider that a "low" worse case scenario event would clearly affect more people and developed property than a more "average" occurrence of that hazard. In the low range, the maximum threat bin is five times as high (5 versus 1), and at the high end, it is 2 and 2 times as high (25 versus 10). We are not sure that this makes objective mathematical sense, but it probably works-out okay because it is done across the board, hazard-to-hazard, jurisdiction-to-jurisdiction.

Q4. How much work are jurisdictions putting into this analysis? In general, are jurisdictions doing this quickly off the top of their heads (based on hunches and local experience) or are they doing any kind of analysis with maps, etc., to assess the hazard prioritization?

A4. The answer to this varies considerably from one local jurisdiction to the next. Typically, local emergency program managers (LEPM) called together small committees of mostly local government officials to work their way through the methodology. Sometimes these committees contained state or federal officials, and occasionally hazard specialists. In the early days, OEM staff facilitated these meetings. The meetings typically lasted two or three hours with perhaps another day's worth of word-processing by one person to convert the work of the committee into a document of six to twenty pages. All local jurisdictions have updated their analysis since 1994, and most update them every half dozen years or so (OEM requires an update not less often than every ten years).

"Quickly off the top of their heads based on hunches and local experience" is closer to the truth than a careful analysis in most cases (there are a few exceptions). In OEM's experience, hazard maps were seldom referenced during the actual meetings; generally instead reasonable estimates were discussed and agreed upon. However, given the nature of this methodology, this is "good enough" to provide the outcomes sought. It's not quite a significant digit issue, but it is a similar issue.

Despite having a written methodology, the analysis was done with slightly different ground rules from place to place, and with different people involved. For one thing, the methodology has gradually evolved since 1984. Also, different staff at OEM have issued slightly different versions of the method even in the same approximate time-frame. For example, the word "or" versus "and" under vulnerability and maximum threat, and different point ranges under the severity ratings. This either detracts from its objective usefulness, or points to its beauty, but at worst creates nuances of different approaches from place to place, time to time.

2 History was always A1" (2X1 = 2), vulnerability was always A10" (5X10 = 50), maximum threat was also always A10" (10X10 = 100), and probability was always A1" (7X1 = 7) for a grand total of 159 points.

Q5. But, doesn't the methodology therefore produce subjective results?

A5. Some say that the methodology is quasi-objective and some pseudo-subjective, but the truth is that it really does a reasonably good job of dissuading the subjective weighting of hazards. The methodology itself is objective.

A little subjectivity does arise from the inconsistent implementation of it across the state over time. One example is that some counties, across the board, produced higher scores than others (i.e., all their scores range higher), e.g., Multnomah Co. versus neighboring Clackamas Co. or Douglas Co. versus neighboring Coos Co.

Still, it is OEM's experience that local teams using the method discover counter-intuitive results. For example, while one major hazard concern in Morrow County is the Willow Creek Dam, it ranked a distant ninth on their hazard analysis. In another surprise, fog ranked ahead of the Umatilla Chemical Depot (UCD), a notorious hazard in Morrow County. Fog kills people in automobile accidents in Morrow County, but thus far, the UCD has not. Hence, the method, in this instance and many others, led local officials to a more objective understanding of risk.

One significant shortfall of the method is that it does not distinguish between high probability - low consequence hazards (e.g., windstorms) and low probability - high consequence hazards (e.g., catastrophic dam failure). Examples: wind at 240 and earthquake at 155 in Lincoln Co., winter storm at 232 and flood at 225 in Grant Co.

Q6. Is this methodology mandated by OEM to secure mitigation or emergency management funding or is it a recommended activity for jurisdictions?

A6. OEM requires that counties and cities receiving Emergency Management Performance Grant (EMPG) funding update their analysis not less often than once every ten years. Hazards don't typically change more quickly than that, nor do communities generally change substantially in less time. In reality, almost every local jurisdiction in Oregon that is required to update this analysis does so more often (more like every five years) even though OEM doesn't require it.

Q7. How are or could local hazard analyses be used?

A7. Any or all of the following:

- Prioritize hazard mitigation and emergency planning efforts
- Tool for conducting hazard-based needs analysis
- Public and public official education about hazards and vulnerabilities
- Help communities make objective judgments about acceptable risk

Q8. How does *the process* of doing local hazard analyses advance hazard mitigation and preparedness?

A8. Done correctly, it requires assembling a team of local officials to discuss hazard vulnerability; this is a logical early meeting of the team that will then develop or revise an EOP or a hazard mitigation plan to address the hazards (a low stress, low conflict teambuilding activity). The team process allows each member to learn from other members specific geographic areas that are vulnerable to a variety of hazards. It is unusual for these teams to discuss hazard vulnerability without anecdotally discussing capabilities and shortfalls, and hazard mitigation.

Q9. How were the weight factors of 1, 5, 10, and 7 actually derived? What is the empirical or theoretical basis?

A9. Many years ago, Joseph Murray of OEM researched the basis for these weight factors at the FEMA "Learning Resource Center" (library) on the campus of the National Emergency Training Center (NETC) in Maryland. He was delighted to find one source document dating from the very early 1980s that appears to have presented the method for perhaps the first time to a broad audience. While the weight factors were used throughout the document, no basis or rationale was given for the relative weighting of these factors. This information may be "lost to history," or perhaps it can be found on a napkin in a file folder somewhere at FEMA's Washington DC headquarters. Chances are pretty good that someone involved in the rationale for these numbers is still alive. Chances that he or she is still working for FEMA are less good twenty plus years later.