

## Comments on the Jefferson County Hazard Mitigation Plan

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Below are proposed changes to the different sections identified below in the Jefferson County Hazard Mitigation Plan. The changes are numbered for ease of reference.

### Revisions Summary:

1. Section III: Recommend removing the strikeout sentence "Mitigation strategies (30 pages) presented in the NOPRCD report are included by reference. ~~The report has been adopted by the City and the County, so there is no need to add the additional weight to the Plan.~~"
  - Rationale: Note that the NOPRCD report has not been adopted by the city and county. While those municipalities were two of the many organizations that participated in the report, it has not been formally adopted. (See comment below regarding adding in the strategies to Section III.)

### Section I – Plan Process:

2. Add to Introduction text (P.. 55, Para. 1, last sentence) "With an ever-continuing growth in population, ~~and the development of natural lands,~~ and advancing climate change, the impact of these natural hazards will continue to escalate."

### Section II – Hazards:

3. P. 73, para. 3, line 7: change "new Sequim..." to "near Sequim...."
4. Climate Change Section:
  - a) Omit the title "All Models are Wrong, but Some are Useful" as well as the 2nd and 3rd paragraphs after this title;
    - Rationale: The first paragraph states the rationale for including climate change in this document well. The two following paragraphs, as well as the title, seems to dismiss all modeling, which is not consistent with the scientific process.
  - b) Modify the 2<sup>nd</sup> line, 1<sup>st</sup> para: "That is a significant purpose of this document – to provide a summary of the best available science – ~~and some outliers~~ – that provide the reader with the possibilities and probabilities of the hazards identified as threatening Jefferson County jurisdictions.
  - c) Omit from the beginning of "Forcing Mechanisms" to just before "How this Document Deals with Climate Change".
    - We also offer the following as replacement text for the sections we recommend omitting:

The extensive effort to predict the natural and human influences on future changes in climate has been focused on how a number of the indicative climate variables (e.g., surface, air and ocean temperatures and precipitation) will change. Complex models of climate,

validated by comparison with past observations, are driven by estimates of future societal energy use and variable natural inputs, such as solar radiation. No such model is perfect, so predictions from a number of models are combined to produce a best estimate and spread of how these climate variables will change in the future. Most hazards are rare events (low probability, high impact) and, thus not directly addressed by this type of model-ensemble prediction. Nevertheless, some trends predicted with great confidence by climate models do alter the likelihood of some hazards, such as the prediction of more frequent, more intense rainstorms increasing the probability of flooding, and drier summers increasing wildfire risk.

It is unfortunate that future climate change is sometimes labeled "global warming" because, although the most direct impact of increased greenhouse gas concentration in the atmosphere is warming of the globally averaged temperature, one of the most important consequences is an increase in weather variability. This is particularly relevant when considering hazard occurrence. As an example, increased storminess during the winter will cause more severe snowstorms and likely raise the danger of avalanches.

A final cautionary note is that while human-driven climate change is upon us and will continue, there are natural factors that can forestall, and even temporarily reverse, some of the eventual changes. Volcanoes are the most often cited example. Particles ejected into the upper atmosphere by volcanoes have repeatedly caused sufficient reductions in solar insolation to cool the planet. The cooling effect is temporary, typically lasting 3 years, but because the scope of this report is not much longer, the possibility of such cooling events cannot be ignored.

- Rationale: We are glad that climate change will be considered explicitly in this Plan and applaud the inclusion of a number of guiding documents created specifically for, or regionally including Jefferson County. However, the bulk of this Climate Change section contains a number of errors. As but one example, the statement "the 2011 Japanese earthquake tilted the earth's axis six degrees" is horribly incorrect; the axis shift was 6.5 inches! Additionally, most of this section appears unnecessary, as the purpose of this document stated in the "Climate Change Definition" section on page 94 is "... it is the purpose of this plan to identify the range of possibilities that can affect the natural hazards in Jefferson County...". Adding into this plan an explanation of climate science appears to be out of scope, so the recommendation is to replace it with the above text, which briefly summarizes the IPCC modeling process which is the basis for the projections cited elsewhere in this plan

**5. Recommendation for all remaining Section II sections:** Recommend that for each section II section in the document, if climate change is relevant to the section, that the "Climate Change – Warming" and "Climate Change – Cooling" sections be combined into one "Climate Change" section that addresses the range of climate change projections for Jefferson County. (For brevity, the change to each of these sections is not listed below.)

**6. Section II-NatHazA/D-Avalanches/ClimateChangeEffects:**

- Replace "If the region sees a warming trend as predicted by global warming hypothesis," with "If the region sees a warming trend as predicted by the overwhelming consensus of climate science experts".

- Remove the language in the Avalanches/Climate Change Effects – Cooling section “If, within the next six years (from 2016), there is a cooling period as predicted by the Met Office, the snow level could drop below 2000 feet for a longer portion of the year, encouraging greater winter tourism and creating more opportunities for avalanches within the Olympic mountains. Relative to other areas of the state that have a robust ski industry, the probability of deadly avalanches would increase but remain small.”
  - Rationale: The Met Office Decadal Forecast predicts possible cooling in only two areas - a portion of the Southern Ocean and the North Atlantic sub-polar gyre. see <http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/long-range/decadal-fc>.

**7. Section II-NatHazA-D/Damaging Winds/ClimateChangeEffects**

- Recommend removing the first two lines in the 2nd paragraph under Climate Change Effects “Warming”: “The NOPRCD report projects a 13% (±7%) increase in days with >1 inch of rain. This increase in major rainfall events implies some increase in high wind events.” The next line from the NOPRCD report sufficiently summarizes the projections: “Currently, there is too much natural variability in wind speeds and storm events to be able to make specific projections of future changes to the direction, intensity, or patterns.”

**8. Section II-NatHazE/Earthquakes/Climate ChangeEffects:**

- Recommend replacing this section, which starts with “There have been arguments floating about since 2006 that global warming can cause earthquakes through two mechanisms: melting glaciers relieving underlying faults of enormous pressure that keep them contained; and relieving pressure allows the superheated rocks below to melt, turning into magma that makes the fault lines mobile and fuels volcanoes. “ with “Not applicable.”
  - Rationale: There is no scientific data indicating reduction in ice will result in more earthquakes, and there are no proposed plans to inject CO2 in Jefferson County.

**9. Section II-NatHazF-P/Flood/Climate Change Effects (p 176):**

- Recommend removing the section on Cooling, which starts “If the Maunder Minimum does have a causative relationship to cooling in the Atlantic region, based on past history, the Olympic Peninsula would actually experience a drier, warmer climate that would have a lower risk for flooding and a higher risk for wildfires.”
  - Rationale: Note that the temperature projections from the NOPRCD report quoted elsewhere in this plan already include the variability of solar radiation, so historic solar radiation phenomena such as the Maunder Minimum are already factored in.

**10. Section II-NatHazF-P/ Heat Wave-Climate Change-Warming (p 187):**

- Remove the first paragraph, which refers to more frequent days over 100°F, as that is based on a Washington State forecast overall, and is different than the forecast for the Olympic Peninsula, which is stated in the 2<sup>nd</sup> paragraph.

**11. Section II-NatHazF-P/ Heat Wave-Climate Change-Cooling (p 187):**

- Remove the paragraph, which states “TBD. There are natural predictable cycles that suggest a cooling period is forthcoming. The question is whether it is sufficient to overcome anthropogenic warming mechanisms.”
  - Rationale: the IPCC models (as referenced in the NOPRCD report) include modeling of natural, predictable cycles, and the anthropogenic warming mechanisms overwhelm those cycles.

**12. Section II-NatHazF-P/ Public Health-Climate Change-Warming (p 216):**

- Note that reference 27 in the Public Health section (University of Washington, Climate Impacts Group, 2013. Climate Change Impacts and Adaptation in Washington State: Technical Summaries for Decision Makers) does not seem to be referenced in the text. (It is available at: <http://cses.washington.edu/db/pdf/snoveretalsok816.pdf>). Note that it does have a chapter titled “How Will Climate Change Affect Human Health in Washington”, and Table 12-1 summarizes those impacts. Recommend that the existing text in the “Climate Change – Warming” section be replaced with that table, and that the “Cooling – To be determined” section be removed.

**13. Section II-NatHazQ/Z-Tornado-Summary:**

- Recommend removing the line “Climatic changes may be impacting the frequency and duration of tornado conditions on the Olympic Peninsula” unless a reference can be provided.

**14. Section II-NatHazQ/Z-Tornado-Climate Change:**

- Recommend removing the line: “An implied assumption is that climate change is creating more favorable conditions for the spawning of tornadoes.” The next line seems to suffice (and is consistent with the projections in the NOPRCD report, which it references): “At this point in time, there is too much variability in wind speeds and storm events and too short of wind time series to be able to make projections of climate changes effect on the intensity or patterns of winds in the region.”

**15. Section II-NatHazQ/Z-Tsunamis (p 236):**

- Recommend removing the following paragraph: “It is the hubris of mankind that we think we can both accurately predict what will happen in nature and devise means to control it. Economists, seismologists, tsunami experts, climate scientists and politicians, to name a few, should learn humility.”

**16. Section II-NatHazQ/Z-Volcanos/Climate Change (p 249-250):**

- We recommend replacing the Section with the following text:  
Volcanoes have a number of very interesting links with climate. Most established is that the ejecta from an eruption lead to a temporary globally averaged cooling lasting typically 3 years, depending on the nature of the particles and the altitude to which the eruption projects them. Larger particles precipitate out quickly (days to weeks), but smaller particles diminish incoming solar radiation and ejected sulfur forms sulfur dioxide which, if it reaches the stratosphere creates sulfuric acid aerosols that also diminish solar radiation. These cooling effects overwhelm the climate-warming effects associated with the volcanic ejection of carbon dioxide, methane and other greenhouse-enhancing gases.

There are less well established ideas that reduced ice cover in a volcanic area can actually lead to an increase in volcanism. The mechanism is in some dispute. The Plan cites a recent article that attributes the cause to reduced ice cover lowering the overburden pressure on magma chambers, softening the magma, leading to more eruptive behavior. However, it is not clear that softer magma under reduced pressure would result in more eruptions. Other scientists have added the idea that reduced pressure would also lead to increased gas production from the liquid magma, thus causing an increase in local chamber pressures.

The net impact of climate change on volcanoes remains in considerable doubt. Increased rates of ice loss driven by climate change are probably not sufficient to cause a marked change in what is already a very sporadic and unpredictable rate of local and regional volcanic activity. However, increases in more active volcanic areas, particularly Iceland, may increase the likelihood for Jefferson County to be affected by a more globally-felt cooling event. This could have local consequences, both positive and negative, even though the cooling would only last a few years. It is important to note that this temporary cooling would be followed by a more rapid rate of globally averaged warming as the climate returns to the warming trends established prior to any single volcanic eruption.

**17. Section II-ManHazM-Z-Power Outage/Climate Change/Cooling (p 350):**

- Recommend removing the language in this section, which starts “If the Maunder Minimum peaks around 2022 and if it does have a cause-effect relationship with a cooling pattern, there is a possibility that the region’s climate will cause an increase in demand for power, just when the region is losing it.”
  - Rationale: Note that the temperature projections quoted in Table PO-1 on this page already includes the variability of solar radiation, so historic solar radiation phenomena such as the Maunder Minimum are already factored in.

**18. Section II-ManHazM-Z-Terrorism:**

- p 353, last paragraph: Recommend removing the following sentence: “With the hobbling of National Security Agency traffic analysis by the Obama administration, it has become easier for terrorist cells to evolve and communicate without detection.”
- P 354: Recommend adding “may” into this sentence: Terrorist groups may include extremists in:
  - Ethnic, separatists, and political refugees
  - Left wing radical organizations
  - Right wing racists, anti-authority survivalist groups
  - Extremist issue-oriented groups such as religious, animal rights, environmental, etc.

**19. Section III-Multi-Juris Hazard Mit:**

- p. 377 currently states:
  - “The organization of the ideas are by hazard in the same order as the hazards were presented in Section II, Multi-jurisdictional Hazard Identification. This is followed by excerpts from two reports that were developed to assess the vulnerability of Jefferson County and its inhabitants, and to assess the Olympic Peninsula’s climate situation and propose how to adapt to changing conditions. They are (*and then lists the Risk Report for Jefferson County and the NOPRCD report.*) ..... Sections of the reports that specifically address mitigation efforts in this Plan have been excerpted and added to suggested strategies for review by the various jurisdictions impacted.”
- Proposal: Since the NOPRCD strategies are not excerpted, and given the comment in the Revisions Summary above, propose adding back “Mitigation strategies (30 pages) presented in the NOPRCD report are included by reference. “

**20. Section IV – Port Townsend / Water System / Natural Hazard Vulnerability (p 421)**

- Recommend that drought be added to this list, given the 2014 experience and the dependence on snowpack, along with climate change projections
- Possible mitigation strategies from the NOPRCD report that could be added are:

- CI-16: Use homeowner outreach to encourage relocation outside floodplains
- CI-17: Encourage relocation of infrastructure outside of coastal flood zone
- E-5: Increase regional capacity for water storage (preferable with natural systems)
- E-23: Develop a funding program appropriate for acquisition of high-risk structures in coastal or riverine flood zones
- WS-1: Enhance education on drought and water supplies issues for the peninsula
- WS-2: Adopt new regulations requiring water-efficient appliances
- WS-3: Promote and incentivize smart irrigation technologies for agriculture
- WS-12: Develop or increase incentives for low-water use landscaping
- WS-13: Adjust rate structure for water use to incentivize conservation where needed
- WS-14: Develop code and infrastructure for a municipal reclaimed water system
- WS-15: Enhance residential water conservation through incentives and outreach

**21. Section VII – Appendices:**

- P. 704: Lists Barney Burke as “deceased” (looks like carry over from prior PUD commissioner.)
- P 717: Note that link for NOPRCD report should be [www.nopr.cd.org](http://www.nopr.cd.org), not nplcc link currently listed.