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GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

CALIFORNIA STATE HAZARD MITIGATION PLAN

Volume 2

Appendix H. Hazard Impact Rating

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Appendix H. **Hazard Impact Rating**

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H. HAZARD IMPACT RATING

A hazard impact rating was performed for the hazards of concern described in this Plan following the fundamental definition of risk:

Probability x Impact = Risk

This impact rating assesses such factors as:

- **Probability** – The probability of each hazard's occurrence
- **Impact on Assets** – The likely impact on the State-owned or -leased assets which are critical lifelines to the State's capability to respond and recover from hazard events
- **Impact on People** – The population exposed (both total population and the population of equity priority communities)
- **Future Impacts** – The potential for the expansion of risk due to buildable lands and future impacts from the hazard due to climate change

This impact rating was conducted using a combination of quantitative and qualitative data on each hazard for these selected metrics. Metrics are the quantifiable measures that are used to compare and assess the identified impacts of each hazard. The impacts to each hazard were rated as high, medium, or low based on parameters established by the State Hazard Mitigation Plan (SHMP) planning team. These impacts are then multiplied by the probability factor to generate the hazard impact rating for each hazard. The quantitative analysis aspect of this exercise was limited to hazards with a clearly defined extent and location. For other hazards, a more qualitative approach was applied. For example, a hazard that does not have a clearly defined extent and location like air pollution, exposure cannot be differentiated based on a clear "in-or-out" assessment. In this case, rankings were assigned qualitatively based on assumptions on impacts the hazard might have on the metrics identified (State-owned or -leased facilities, lifelines, population, etc.).

H.1. FREQUENCY OF OCCURRENCE

A significant factor in determining "risk" is how often a hazard event has happened or is likely to happen. This is referred to as the frequency of occurrence. Some hazards will have a rich history of past events to help establish the metrics for this factor, while

other hazards that may not have a rich history, may have studies or analytics that have established probabilities for occurrence (e.g., the 100-year floodplain or 100-year probabilistic earthquake). Timeframe values have been identified to set the metrics for a hazard's frequency of occurrence as shown in Table H-1. Values for each hazard were based on historical occurrence data, or probabilistic data that may be available for a given hazard. Figure H-1 shows probability factors for each hazard.

Table H-1. Probability of Occurrence

Probability	Occurrence	Probability Factor
High	Hazard event likely to occur within 25 years	3
Medium	Hazard event likely to occur within 100 years	2
Low	Hazard event is not likely to occur within 100 years	1
No exposure	There is no probability of occurrence	0

H.2. IMPACT ON ASSETS

H.2.1. State-Owned or -Leased Assets

Values were assigned based on the percentage of the total replacement cost value (RCV) for State-owned or -leased assets exposed to the hazard. The basis for this value is a spatial evaluation of the RCV of assets exposed to each hazard compared to the total RCV of all assets. For example, if there are 50 State-owned or -leased facilities located with the 100-year floodplain that have an aggregate RCV of $50 million, and that $50 million represents 17 percent of the aggregate RCV for all State-owned or -leased facilities, the metric assigned for the impact flood on State-owned or -leased facilities would be "medium". This assessment makes no determination of the importance of each asset. All assets have been weighted equally. Impact factors were assigned as shown in Table H-2. Hazard impacts are shown in Figure H-2.

Table H-2. Impact Factors for State-Owned or -Leased Assets

Impact	Percentage	Impact Factor
High	≥30% of the total RCV for State-owned or- leased facilities exposed to a hazard	3
Medium	15 – 29% of total RCV for State-owned or -leased facilities exposed to hazard	2
Low	≤14% of the total RCV for State-owned or -leased facilities exposed to a hazard	1
No Impact	Hazard is not likely to impact State-owned or -leased facilities	0

Figure H-1. Probability Factors for Hazards of Concern

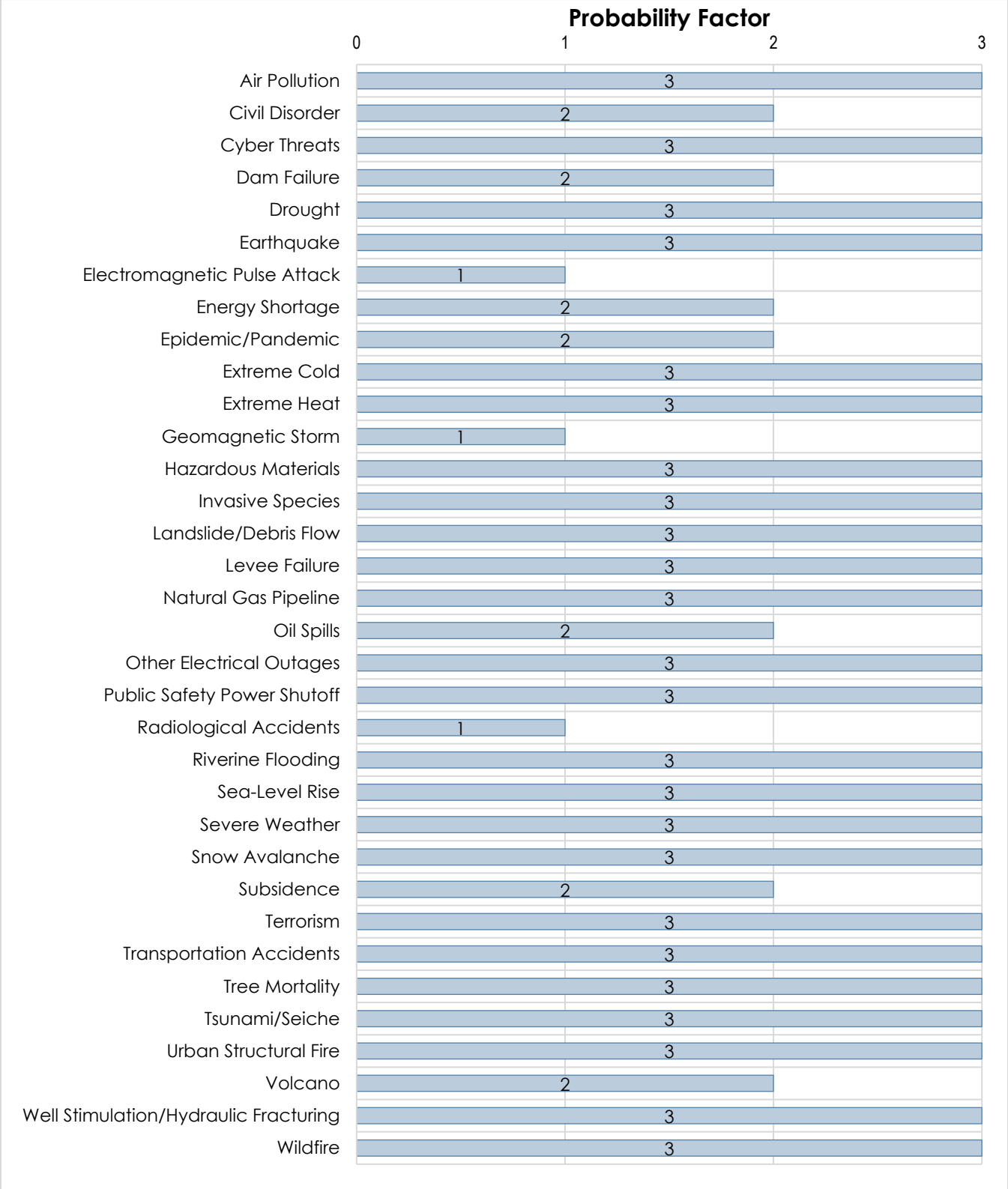
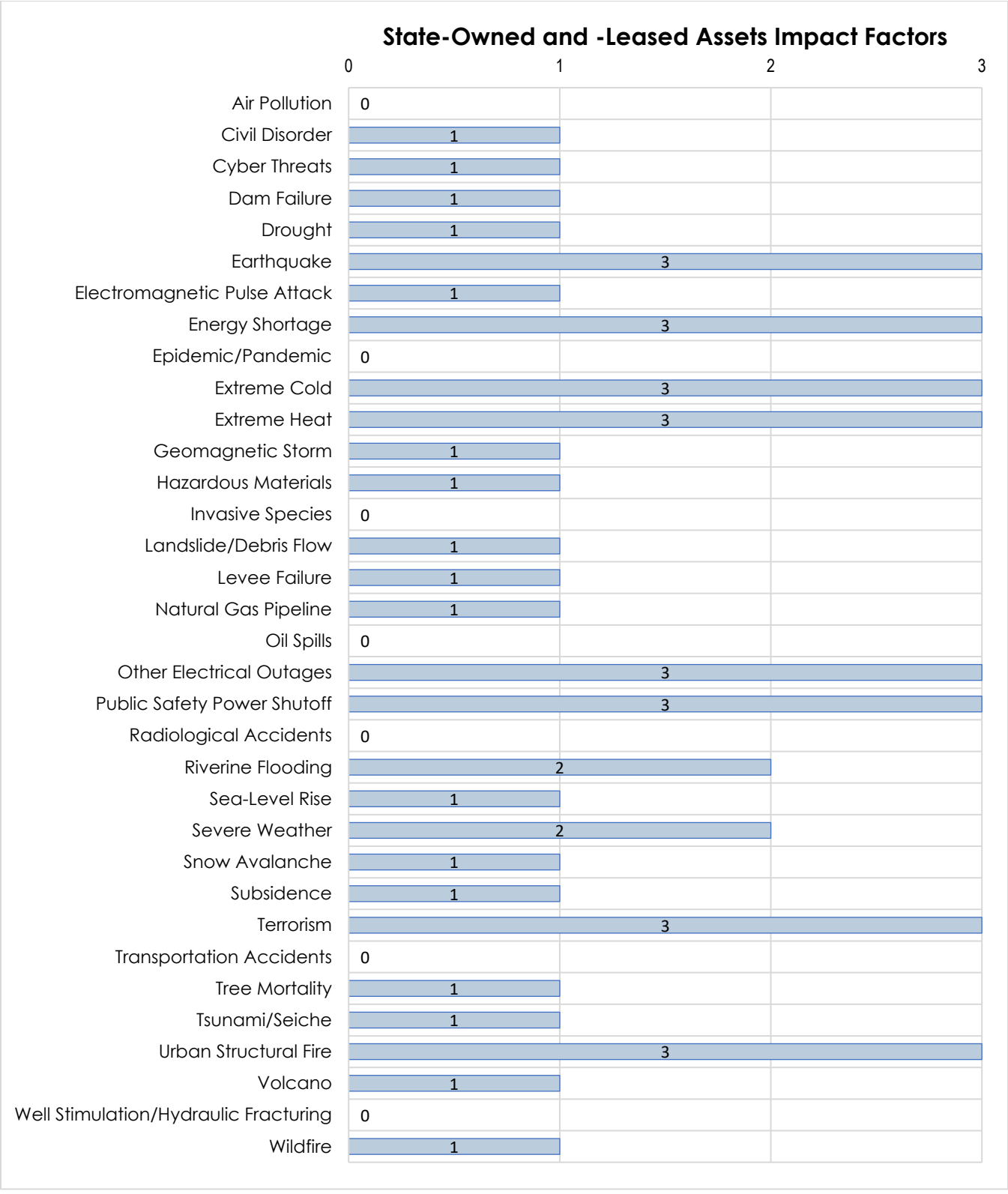


Figure H-2. State-Owned or -Leased Assets Factors for Hazards of Concern



H.2.2. Lifelines

Values were assigned based on raw count of identified lifelines exposed to the hazard. The basis for this value is a spatial evaluation of the location of lifelines relative to the extent and location of the hazard. For example, if there are 100 lifelines located with the severe wildfire severity zones that have an aggregate RCV of $20 million, and that $20 million represents 8 percent of the aggregate RCV for all lifelines in the State, the metric assigned for the impact of wildfire on lifelines would be "low". This assessment makes no determination of the importance of each category of lifeline. All lifelines have been weighted equally. Impact factors were assigned as shown in Table H-3. Hazard impacts are shown in Figure H-3.

Table H-3. Impact Factor for Lifelines

Impact	Percentage	Impact Factor
High	≥30% or more of total Lifelines exposed to a hazard	3
Medium	15 – 29% of total Lifelines exposed to hazard	2
Low	≤14% of the total Lifelines exposed to a hazard	1
No Impact	None of the Lifelines are exposed to a hazard	0

H.3. IMPACT ON PEOPLE

H.3.1. Total Population

Values were assigned based on the percentage of the total population exposed to the hazard event in comparison to the entire population of the State. For those hazards that have a clearly defined extent and location (e.g., flood, dam failure), the population exposed is that population within the identified zone. The degree of impact on individuals will vary and is not accurately measurable. For simplicity and consistency, the calculation assumes that all people, because they live in a hazard zone, will be exposed to the hazard and will be equally impacted when a hazard event occurs. Impact factors were assigned as shown in Table H-4. Hazard impacts are shown in Figure H-4.

Table H-4. Impact Factor for Total Population

Impact	Percentage	Impact Factor
High	≥50% or more of the population is exposed to a hazard	3
Medium	25 – 49% of the population is exposed to hazard	2
Low	≤25% of the population is exposed to a hazard	1
No Impact	None of the population is exposed to a hazard	0

Figure H-3. Lifeline Factors for Hazards of Concern

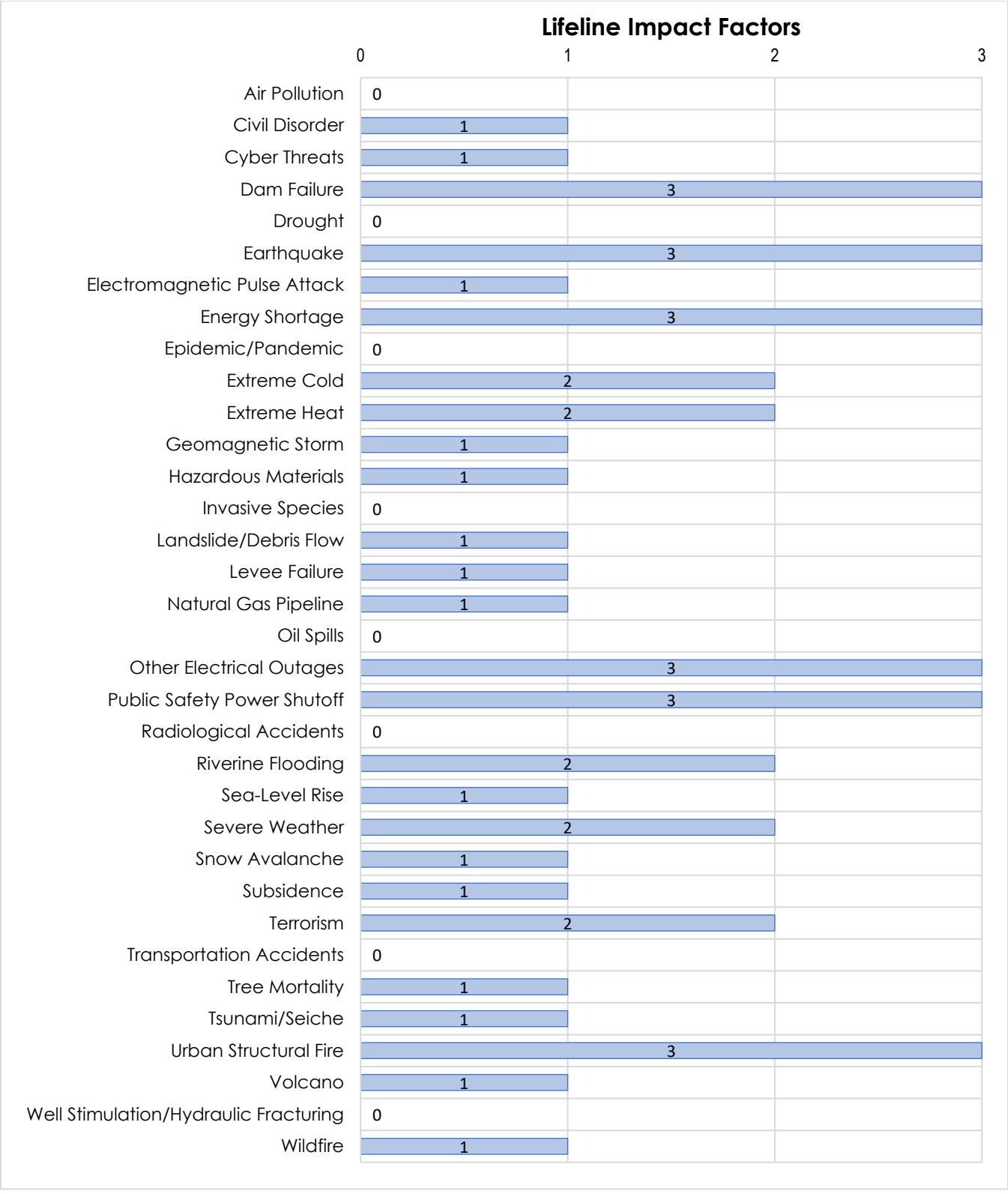
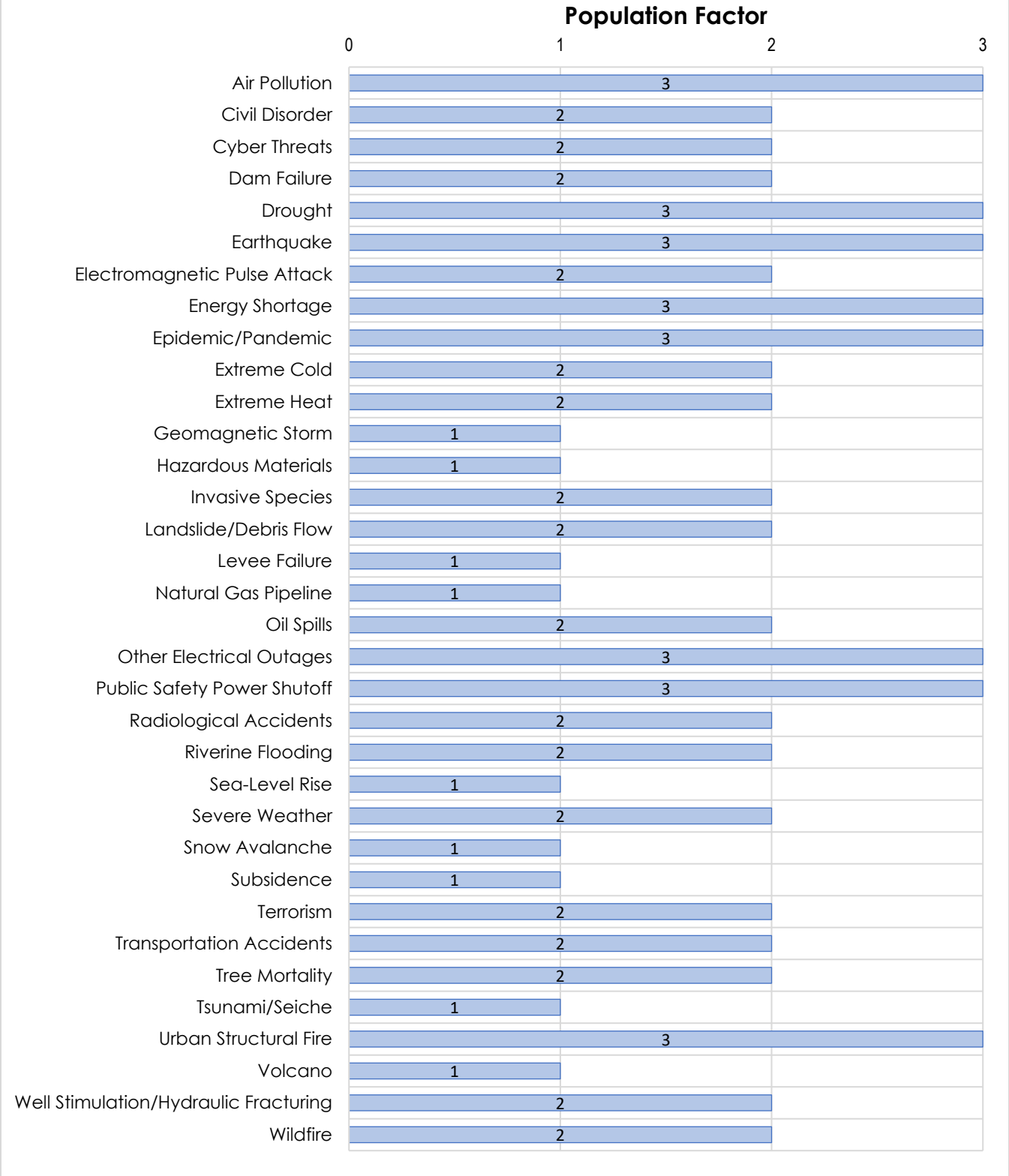


Figure H-4. Population Factors for Hazards of Concern



H.3.2. Equity Priority Population

Values were based on the percentage of the population identified as an equity priority population exposed to the hazard event. For those hazards that have a clearly defined extent and location (e.g., flood, dam failure), the population exposed is that population within the identified zone. The impact on individuals will vary and is not accurately measurable. The calculation assumes that all people in the equity priority population, because they live in a defined hazard zone, are exposed to the hazard and equally impacted when a hazard event occurs. Impact factors were assigned as shown in Table H-5. Hazard impacts are shown in Figure H-5.

Table H-5. Impact Factor for Equity Priority Population

Impact	Percentage	Impact Factor
High	≥30% or more of the population is exposed to a hazard	3
Medium	15 – 29% of the population is exposed to hazard	2
Low	≤14% of the population is exposed to a hazard	1
No Impact	None of the population is exposed to a hazard	0

H.4. FUTURE IMPACTS

H.4.1. Buildable Lands

This category considers how the risk from the hazard could increase because of future development. Values were assigned based on the percentage of the buildable lands within the hazard area compared to the total area of buildable lands within the State. For this SHMP planning effort and "buildable land" is any parcel that is currently undeveloped that could be developed in the future due to current land use regulations that apply to the parcel. This could be residential, commercial, or industrial zoning. Calculations were based on a spatial analysis of the intersection between lands identified as "buildable" and the extent and location of the hazard. Impact factors were assigned as shown in Table H-6. Hazard impacts are shown in Figure H-6.

Table H-6. Impact Factor for Buildable Lands

Impact	Percentage	Impact Factor
High	≥15% or more of the buildable land is exposed to a hazard	3
Medium	7 – 14% of the buildable land is exposed to hazard	2
Low	≤6% of the buildable land is exposed to a hazard	1
No Impact	None of the buildable land is exposed to a hazard	0

Figure H-5. Equity Priority Community Factors for Hazards of Concern

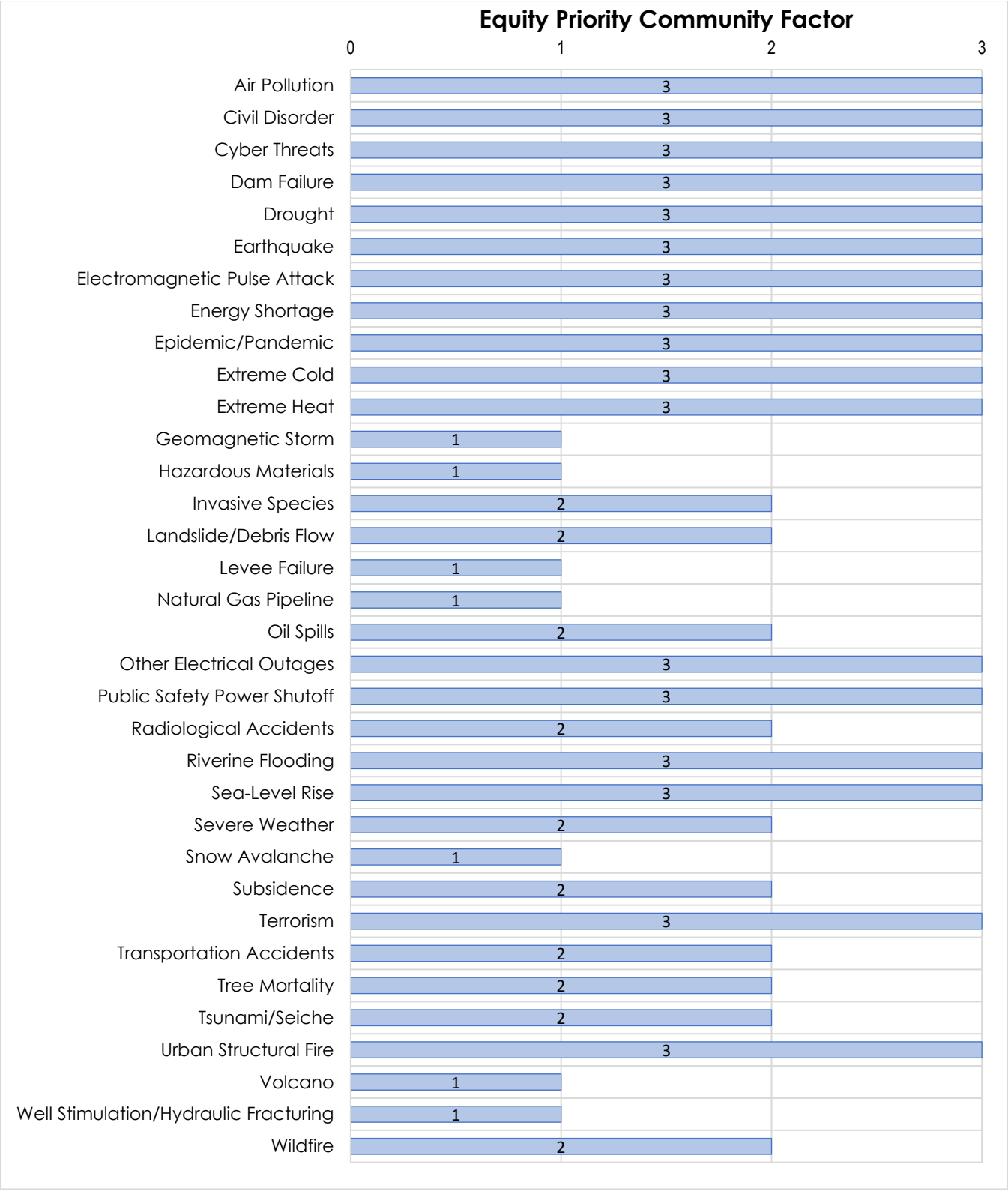
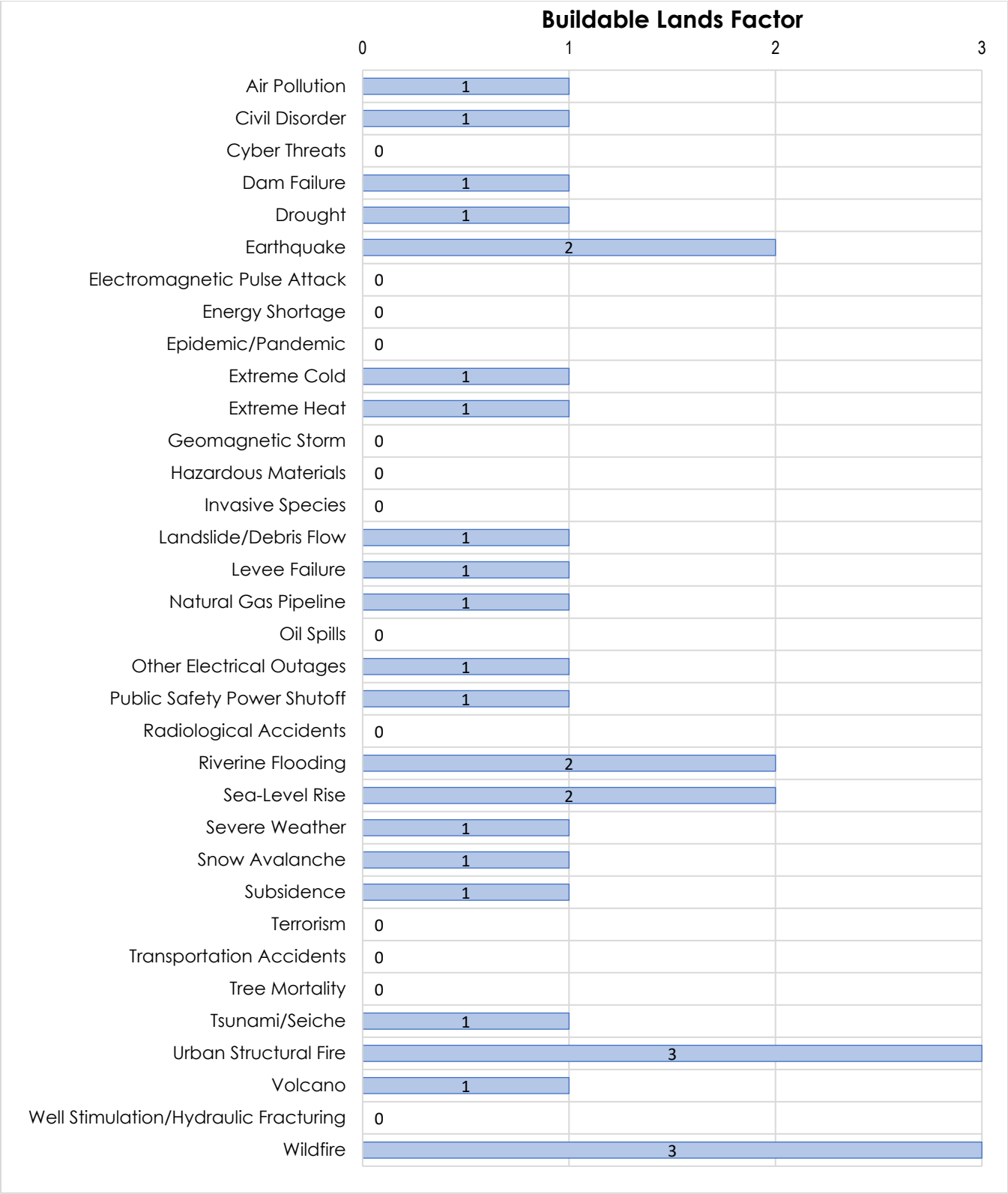


Figure H-6. Buildable Land Factors for Hazards of Concern



H.5. CLIMATE CHANGE

Using current data and projected models, the analysis for this category was based on the anticipated impacts that the changing climate will have on increasing the frequency, severity, and extent of each hazard assessed. Impact factors were assigned as shown in Table H-7. Hazard impacts are shown in Figure H-7.

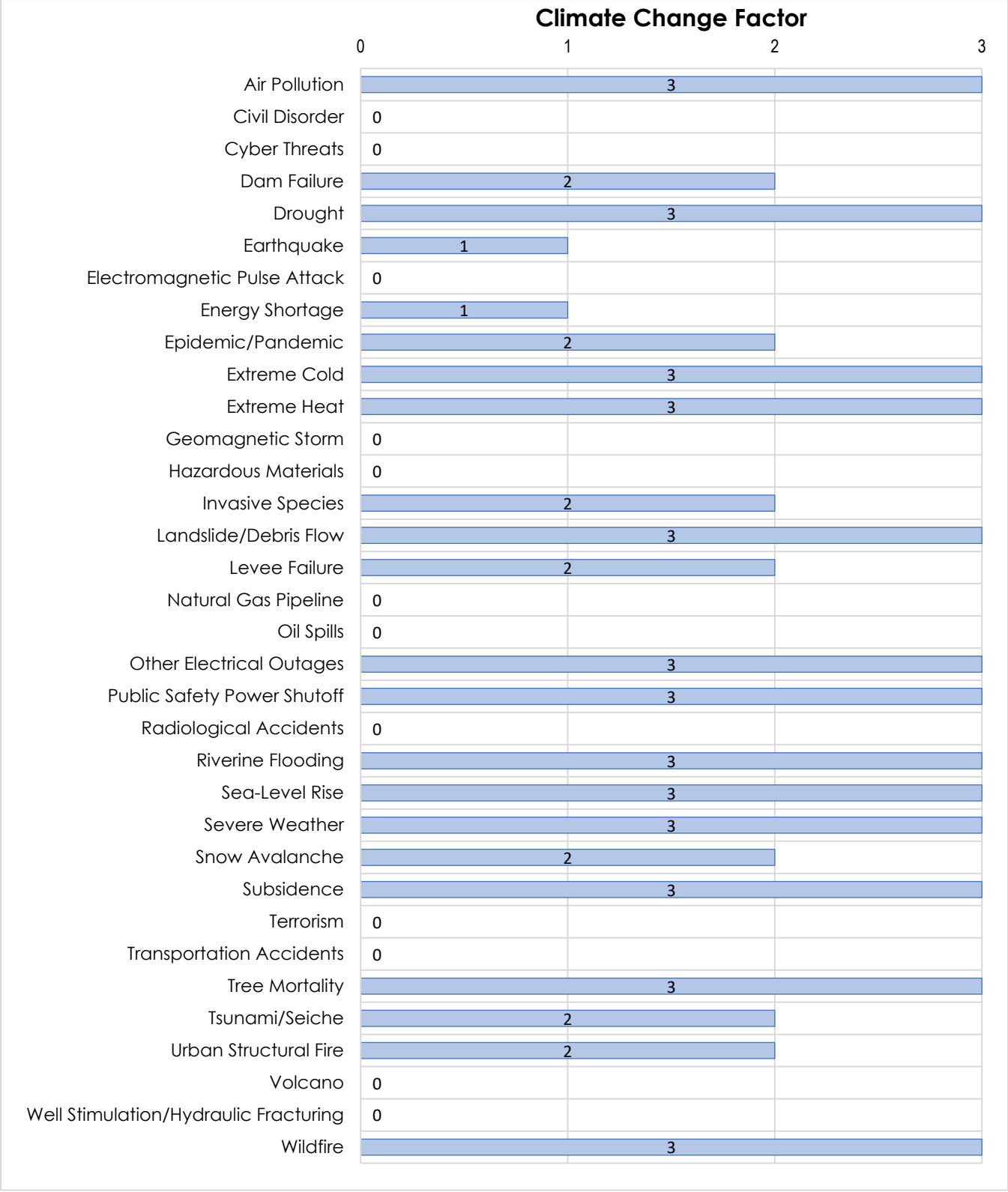
Table H-7. Impact Factor for Climate Change

Impact	Percentage	Impact Factor
High	Measurable impacts to frequency, severity and extent of the hazard are likely to increase measurably within the next 30 years	3
Medium	Measurable impacts to frequency, severity and extent of the hazard are likely to increase measurably in greater than 50 years	2
Low	Measurable impacts to frequency, severity and extent of the hazard are likely to increase in greater than 50 years.	1
None	Climate change is not anticipated to have any impact on the hazard	0

H.6. HAZARD IMPACT RATING

As noted in Chapter 4, section 4.1.3 of the base SHMP, the State has segregated the Risk Assessment into two categories: natural hazards of interest and other hazards of interest. The primary driver for the decision to separate these hazards is to clearly establish for local planning efforts in the State which hazards should be considered the baseline hazards and which hazards could be considered as optional. As stated in chapter 4, none of these hazards are considered to be binding on local planning efforts within the State. Each local planning effort should determine the hazards of concern to be addressed for their plans through a planning process. The role of the SHMP is to provide guidance and alternatives to support these planning processes.

Figure H-7. Climate Change Factors for Hazards of Concern



H.6.1. Hazard Impact Rating for Natural Hazards of Interest

The hazard impact rating for each natural hazard of interest was determined by multiplying the probability factor by the sum of the impact factors for State-owned or -leased facilities, lifelines, total population, equity priority community population, buildable lands, and climate change as summarized in Figure H-8.

The hazards that ranked as being of **highest** concern are listed below and color-coded in red:

- Earthquake
- Riverine, Stream, and Alluvial Flooding
- Extreme Heat
- Extreme Cold or Freeze
- Wildfire
- Severe Wind, Weather, and Storms
- Sea-Level Rise, Coastal Flooding, and Erosion
- Landslide, Debris Flow, and Other Mass Movements

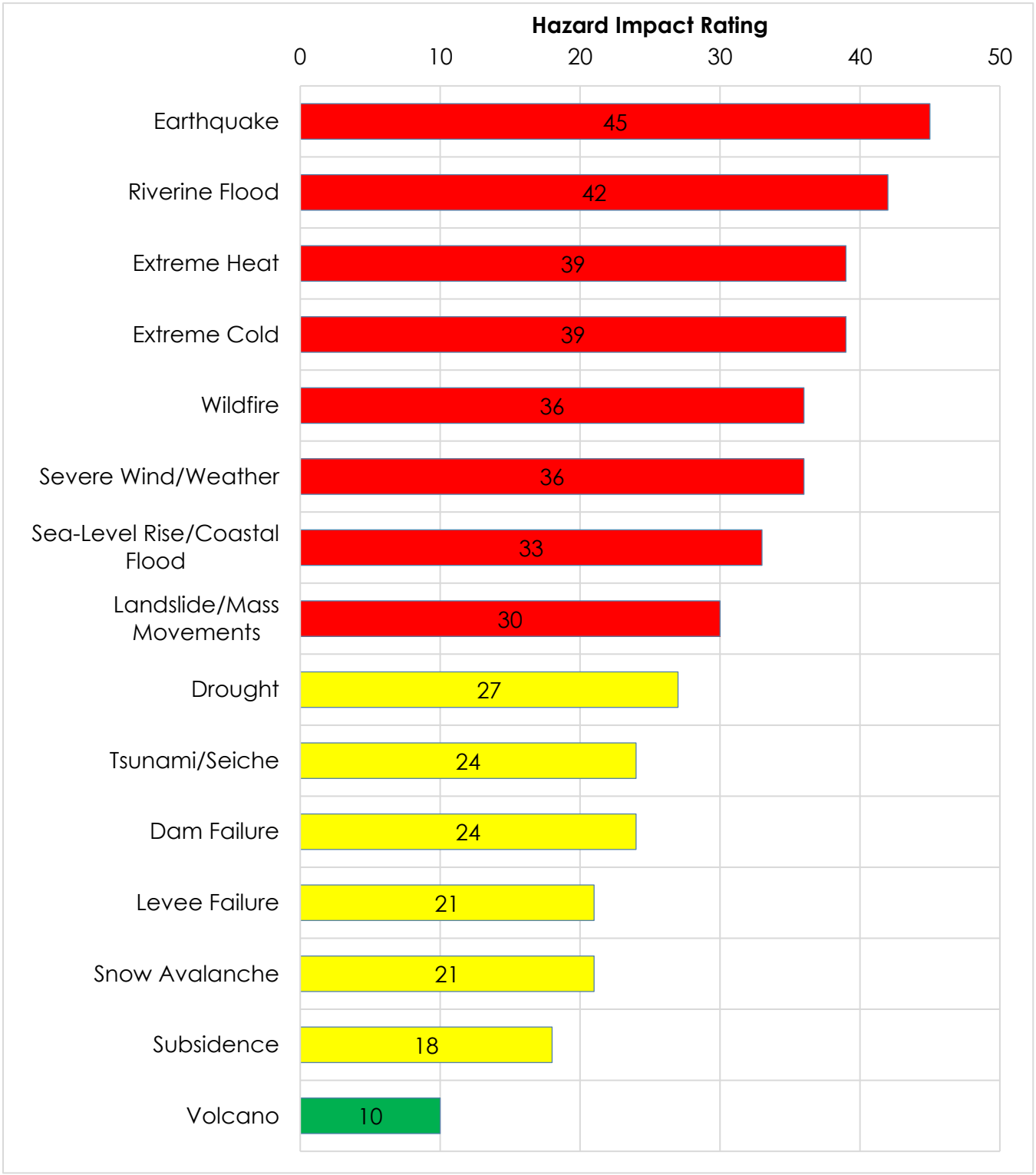
The hazards that ranked as being of **medium** concern are listed below and color-coded in yellow:

- Drought
- Tsunami and Seiche
- Dam Failure
- Levee Failure
- Snow Avalanche
- Subsidence

The hazards that ranked as being of **lowest** concern are listed below and color-coded in green:

- Volcano

Figure H-8. Total Hazard Impact Rating for Natural Hazards of Concern



H.7. HAZARD IMPACT RATING FOR OTHER HAZARDS OF INTEREST

The hazard impact rating for each other hazard of interest was determined by multiplying the probability factor by the sum of the impact factors for State-owned or -leased facilities, lifelines, total population, equity priority community population, buildable lands and climate change as summarized in Figure H-9.

The hazards that ranked as being of **highest** concern are listed below and color-coded in red:

- Urban Structural Fire
- Other Potential Causes of Long-Term Electrical Outage
- Public Safety Power Shutoff (PSPS)
- Terrorism
- Air Pollution

The hazards that ranked as being of **medium** concern are listed below and color-coded in yellow:

- Energy Shortage
- Cyber Threats
- Tree Mortality
- Invasive and Nuisance Species
- Epidemic, Pandemic, and Vector-Borne Disease
- Civil Disorder
- Natural Gas Pipeline Hazards

The hazards that ranked as being of **lowest** concern are listed below and color-coded in green:

- Hazardous Materials Release
- Transportation Accidents Resulting in Explosions or Toxic Releases
- Well Stimulation and Hydraulic Fracturing
- Oil Spills
- Electromagnetic Pulse Attack
- Radiological Accidents
- Geomagnetic Storms (Space Weather)

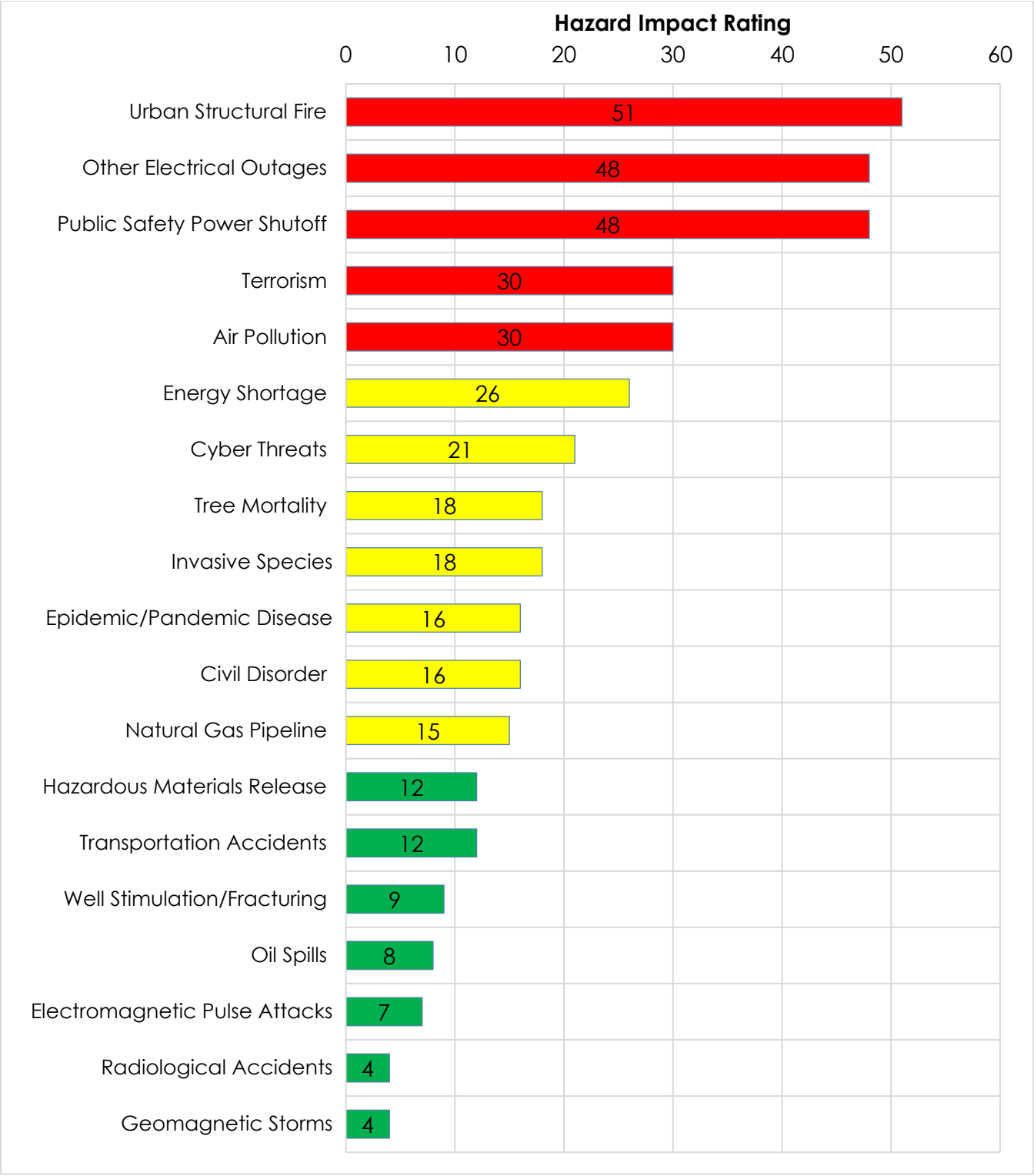



Figure H-9. Total Hazard Impact Rating for Other Hazards of Interest