The probability that a ground motion level is exceeded at a site in unit time is expressed as:

$$P(Z > z) = 1 - e^{-v(z)}$$

where v(z) is the mean number of events per unit time in which Z exceeds z. The region around a site is partitioned into polygons, which constitute a set of area sources. Basic differences in seismicity and geology may exist between the zones. With N seismic sources, and seismicity model parameters S_n for each source n, the mean number of events pr. unit time in which ground motion level z is exceeded can be written as:

$$v(z) = \sum_{n=1}^{N} v_n(z \mid S_n)$$

where

$$v_n(z \mid S_n) = \sum_{i,j} \lambda_n(M_i \mid S_n) \cdot P_n(r_j \mid M_i S_n) \cdot G_n(z \mid r_j M_i S_n)$$

and where $\lambda_n(M_i \mid S_n)$ is the mean number of events per unit time of magnitude M_i ($M_i \in [M_{\min}, M_{\max}]$) in the source n with seismicity parameters S_n. Moreover, $P_n(z \mid M_i S_n)$ is the probability that a significant site–source distance is r_j, ($r_j \in (r_{\min}, r_{\max})$) given an event of magnitude M_i at distance r_j in source n with seismicity parameters S_n. The expression $G_n(z \mid r_j M_i S_n)$ is the probability that the ground motion level z will be exceeded, given an event of magnitude Mi at distance r_j in source n with seismicity parameters S_n. The three functions $\lambda_n(M_i \mid S_n)$, $P_n(z \mid M_i S_n)$ and $G_n(z \mid r_j M_i S_n)$ model the inherent stochastic uncertainty in the frequency of occurrence and location of earthquakes, and in the attenuation of seismic waves.