Quiz 1: A catalog ('Synthetic catalogue.xlsx' in the shared folder) records seismicity activity for ten years, evaluate probabilistic seismic hazard in origin (Lat: 0˚, Lon: 0˚).

The synthetic catalog distributed the earthquake in the square region (figure 1):

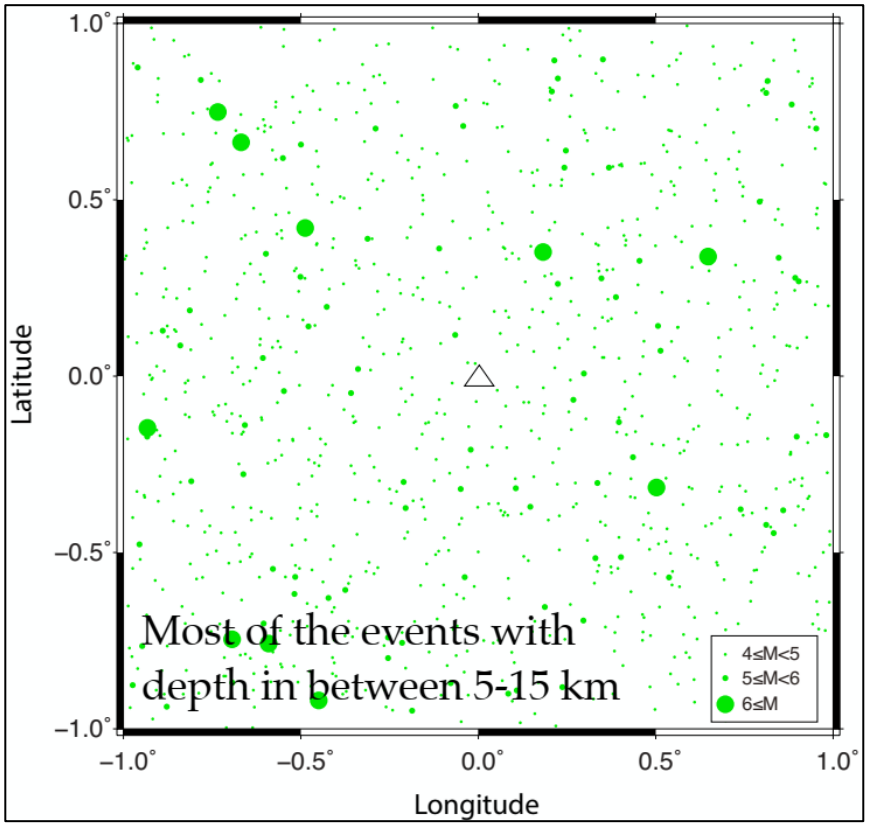

Figure 1: The earthquake epicenter of the synthetic catalog (figure from Chung-Han Chan)

To aimed the target of this homework on the logic tree assigns to the PSHA for this region. First, I assumed that the target area had been affected by four regions of the source denoted by zone number 1 to 4 in figure 2. In each part, the fault line is defined by the connection of the two largest events (e.g., zone 1, 2), or point source (zone 3), or combined of the fault line and the area source (zone 4); the black-dot or black-line represents all the sources in figure 2. Second, the Gutenberg-Richter law is estimated from earthquake recorded in this region (table 1) using the magnitude in the range of 5.0 to 7.

Table 1: a and b value characterized to four regions in this study

Zone number	a-value	b-value
1	-4.590	0.520
2	-3.837	0.548
3	-2.348	0.622
4	-3.188	0.618

Then, the uncertainties weighting (UW) are characterized by:

$$\mathrm{UW} = \frac{\mathrm{N}_{\mathrm{event}\geq 6 \text{ in zone}}}{\sum \mathrm{N}_{\mathrm{event}\geq 6 \text{ of all}-\mathrm{region}}}$$

,with all the values of the uncertainties weighting of four regions listed in table 2.

Table 2: The uncertainty weight for four souces in this study

souce number	Uncertainty weighted
1	0.3
2	0.2
3	0.1
4.1 + 4.2	0.4

The final results are represented in figure 2; other support figures are listed in appendix 1 of this report.

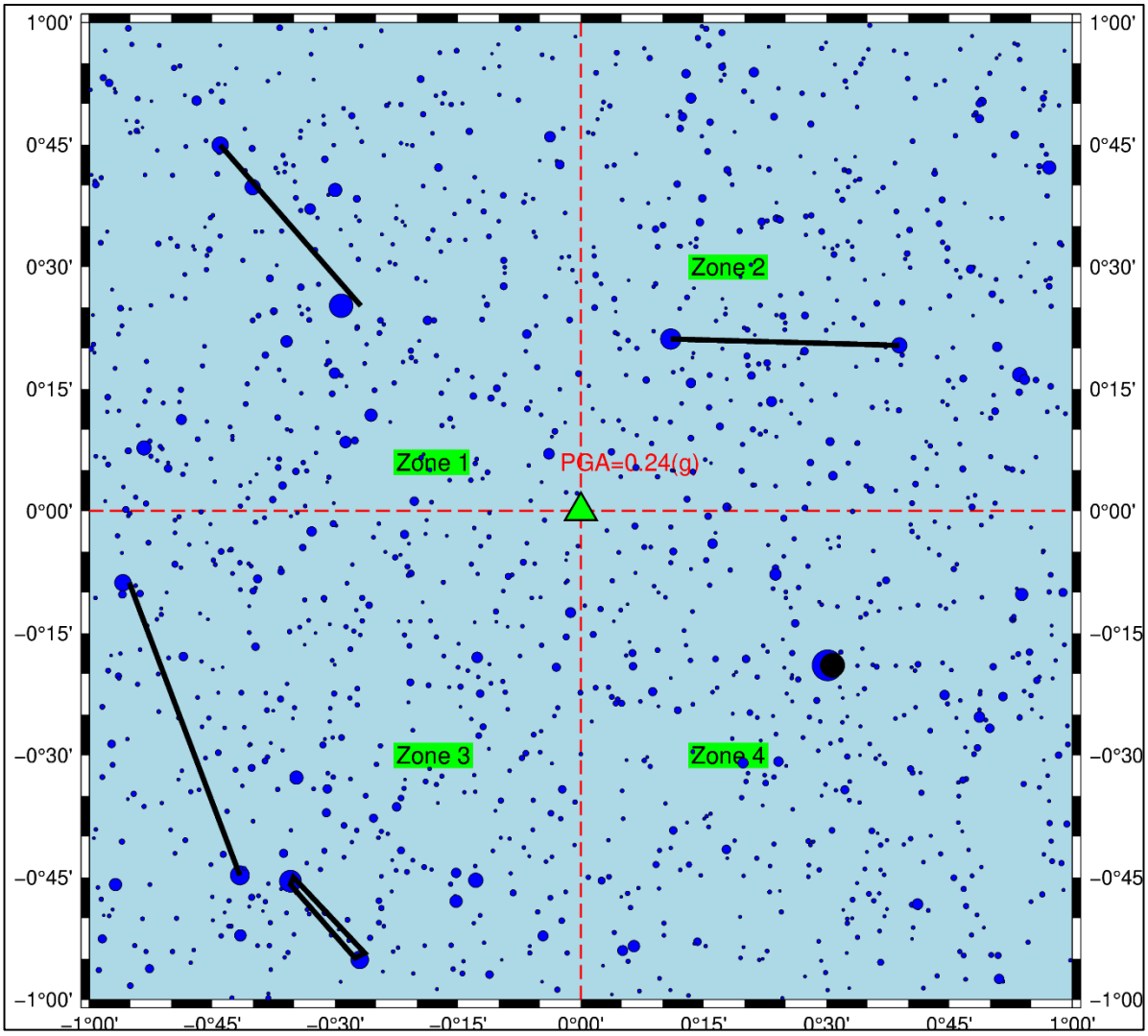

Figure 2: The Probabilistic Seismic Hazard Assessment for the origin target. The green triangle denotes the target, while the red text represents the forecasted value area. The study area is separated into four zones by the dash-red-line and represented by green-fill text. Each zone, the seismicity described by the green circle with the magnitude proportional to the blue-ring; and the sources are characterized by the black-line or black-dot.

The code and the report also contained in:

https://github.com/havinhlong1988/PHSA_logic_tree_demo

Appendix 1: *The a and b-value for fours region based on the Gutenberg Richter law*

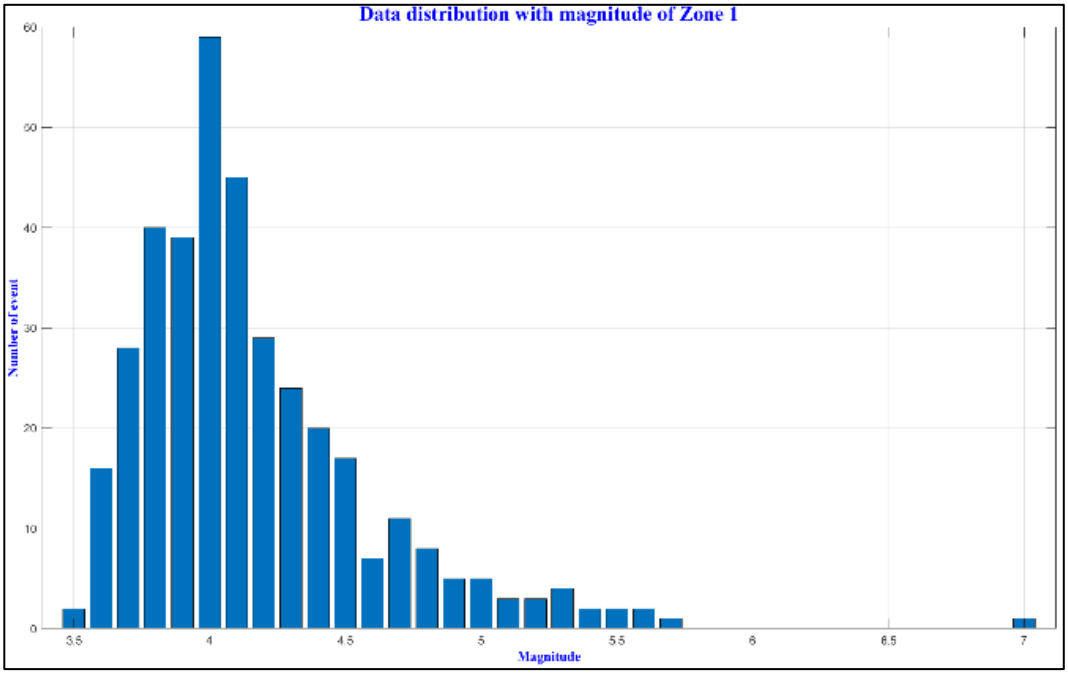

Figure s1: Catalog statistic for zone 1.

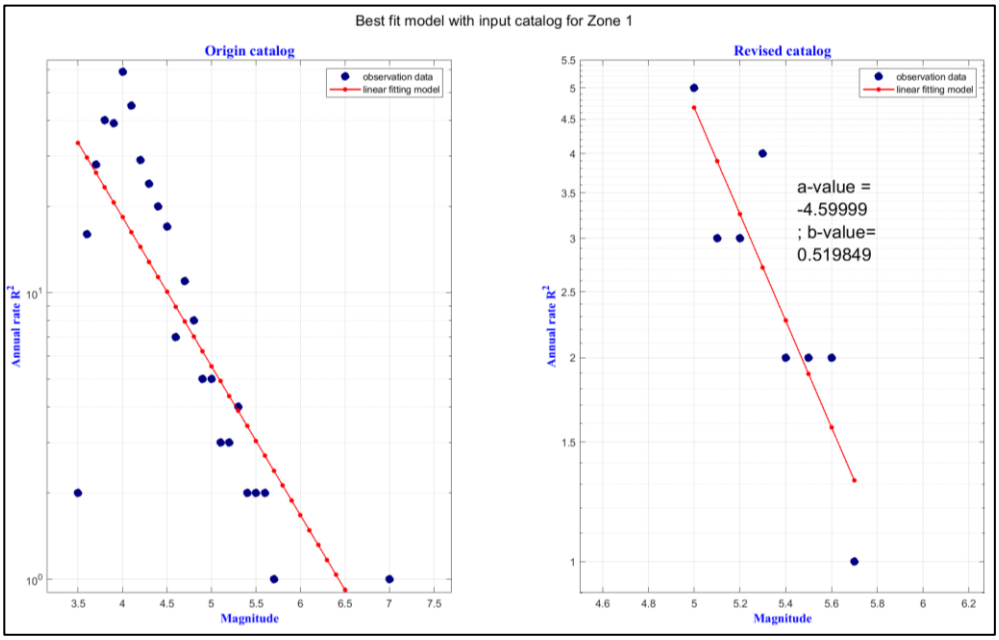

Figure s2: The G-R law estimated for zone 1. The a and b-value are placed on the figures

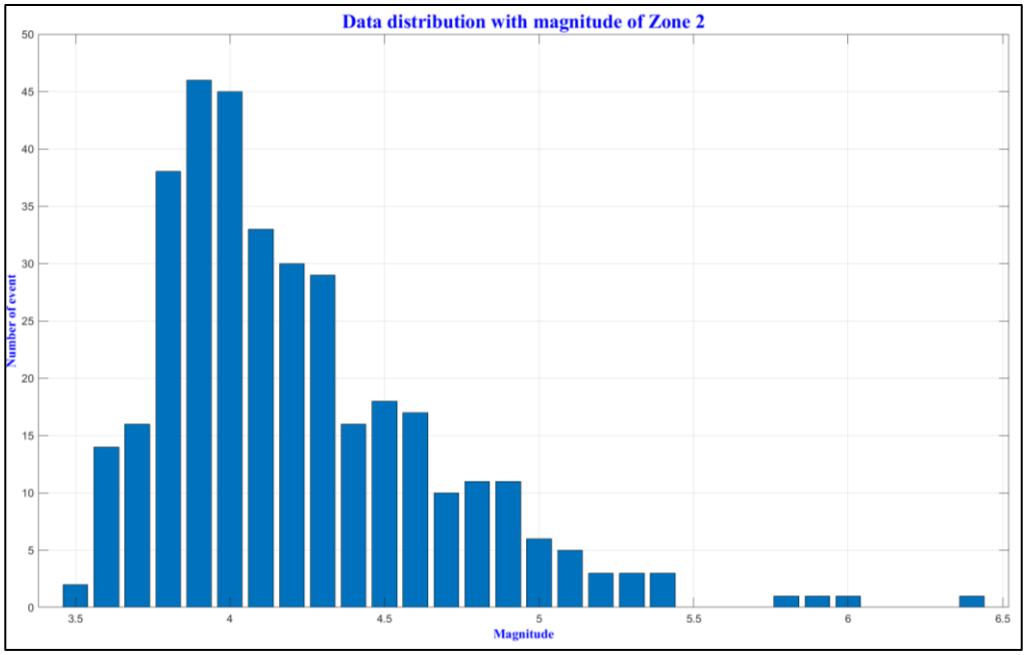

Figure s3: Catalog statistic for zone 2.

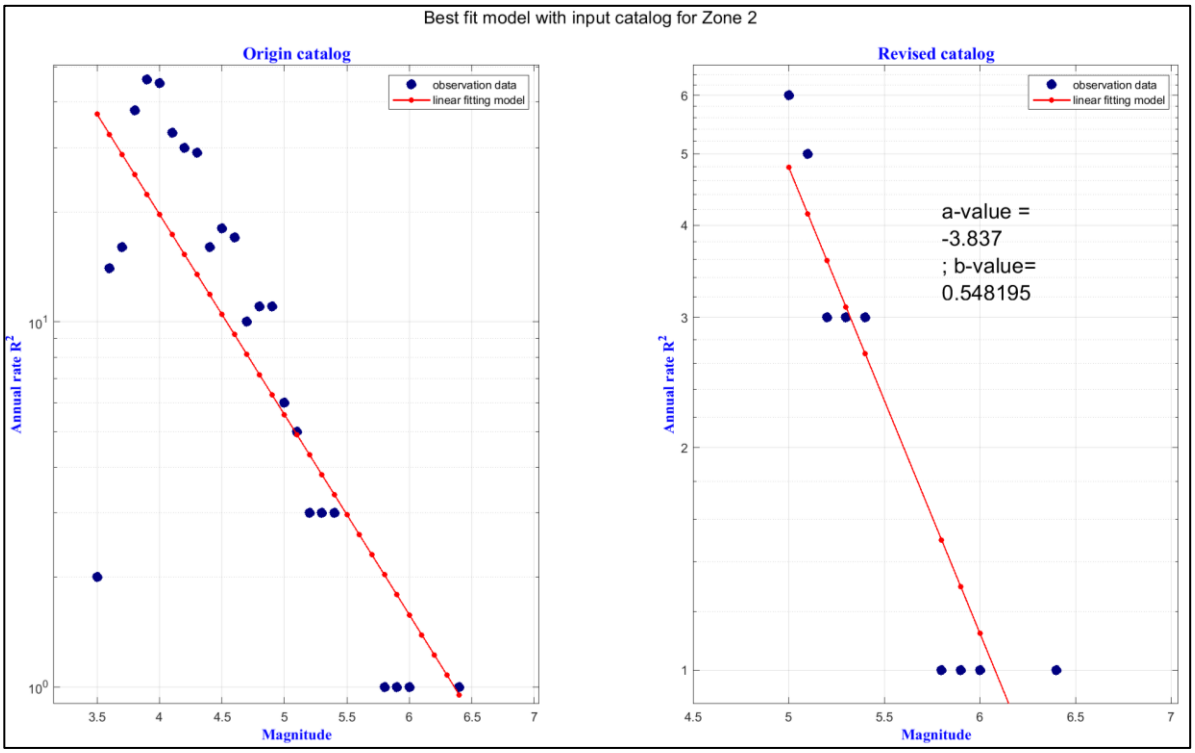

Figure s4: The G-R law estimated for zone 2. The a and b-value are placed on the figures

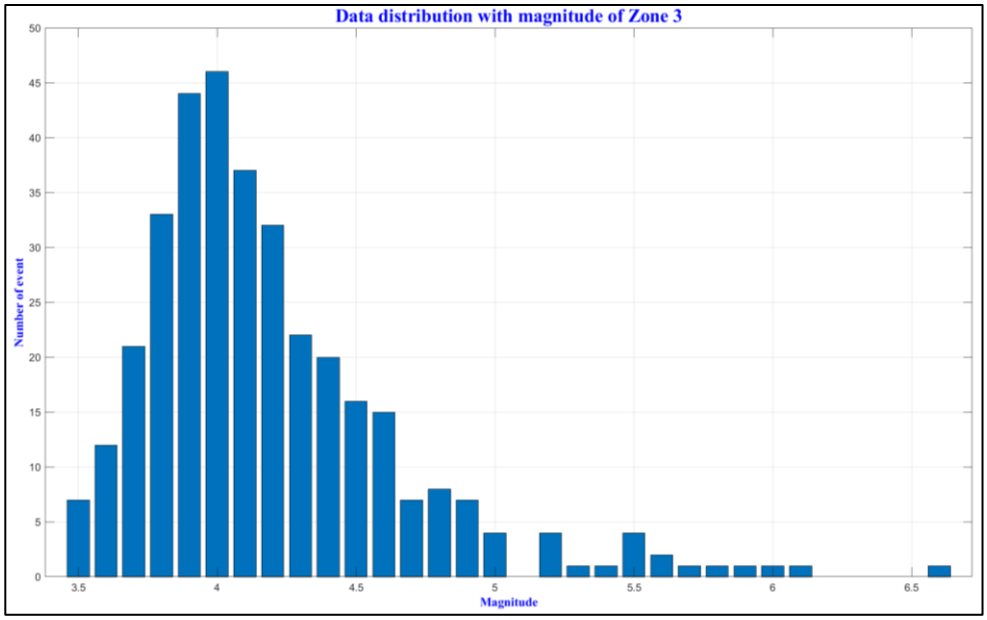

Figure s5: Catalog statistic for zone 3.

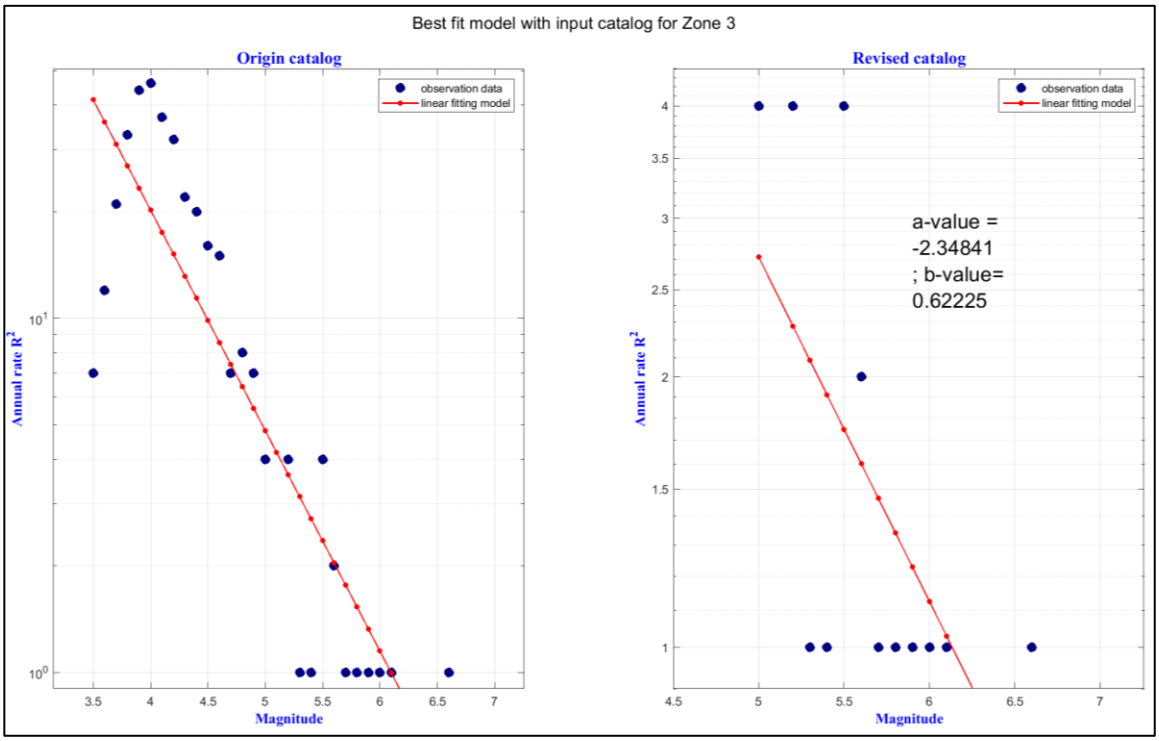

Figure s6: The G-R law estimated for zone 3. The a and b-value are placed on the figures

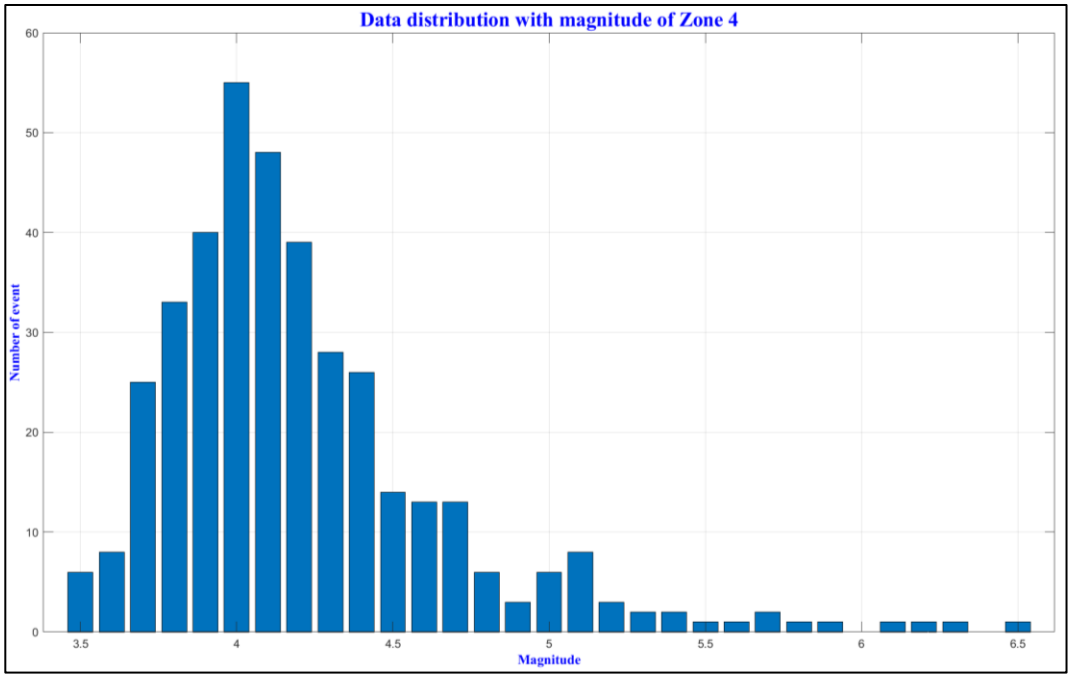

Figure s7: Catalog statistic for zone 4.

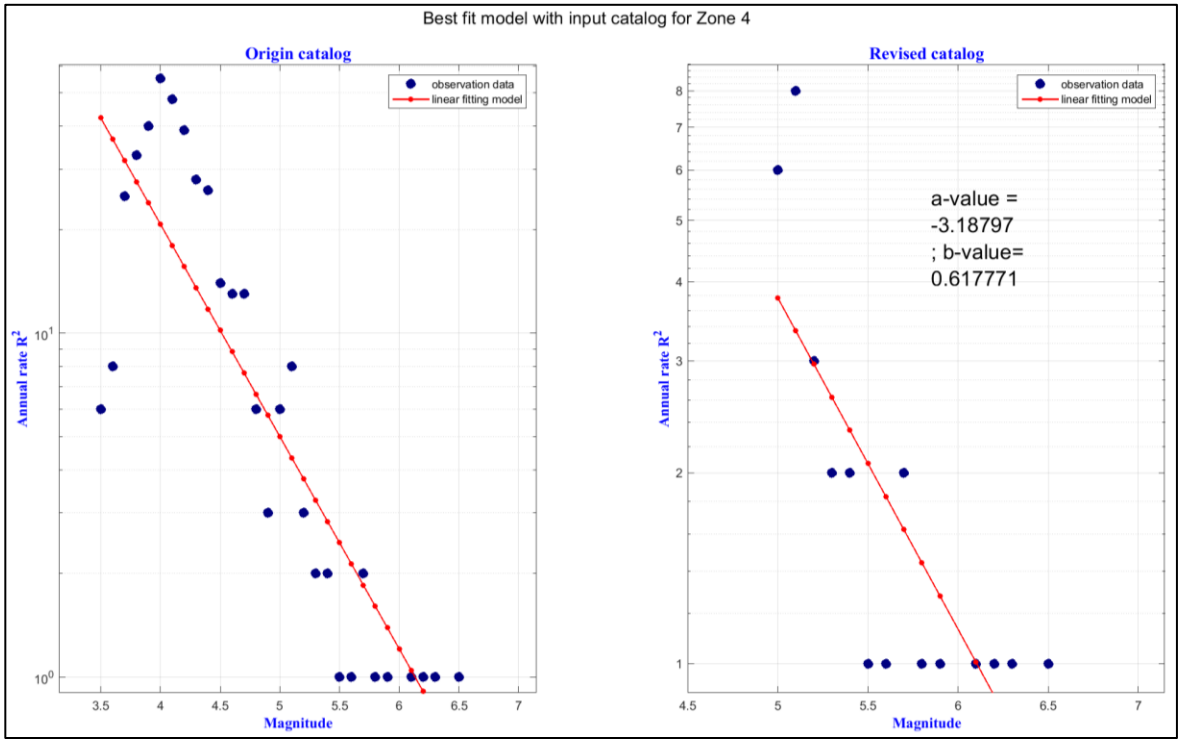

Figure s8: The G-R law estimated for zone 4. The a and b-value are placed on the figures