

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1  
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## **Comment on nhess-2021-301**

Anonymous Referee #1

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Referee comment on "Assessing the effectiveness and the economic impact of evacuation: the case of the island of Vulcano, Italy" by Costanza Bonadonna et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-301-RC1>, 2021

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This manuscript outlines results from an Agent-Based Model (ABM) used to investigate different evacuation scenarios on the Italian island of Vulcano. The relative efficiency of simultaneous and phased evacuations is also investigated. The authors use carefully collected economic data for the island to estimate economic losses for different evacuation scenarios. The scenarios cover different areas of the island; have differing durations and start at different times during the year.

The manuscript provides a nice case study for a small island community with a highly seasonal tourism-based economy. The ABM tool gives the opportunity to look at a number of different scenarios and assess both how long it takes for evacuations to be completed and their economic impacts. The limited extent of the island community makes it possible to capture in reasonable fidelity the population; possible escape routes and the economy of the island. This makes for a fairly well-constrained case study.

The manuscript is logically structured and well-written with figures of reasonable quality that clearly convey the methodology used and the results obtained.

Comments:

- It would be immensely useful to outline clearly the main assumption upon which this work rests. i.e. why the authors believe the Agent-Based Modelling approach used produces results that are sufficiently close to what might be expected in reality to be used as a basis for formulating real-world evacuation plans. Closely related to this would be some discussion of the degree of uncertainty in the modelled outputs of the ABM models. Addressing these two elements directly in the introduction and more discussion of the uncertainty in the results in the discussion section would improve the

robustness of this study.

- Section 4.3 Should mention that using turnover overestimates the economic loss. The economic loss would be the amount of profit lost for the owners. However, for the employees, the loss would be equivalent to lost wages. Turnover is however more transparent, easily calculable and is a reasonable proxy for economic loss.
- Explicit mention of the volcanic hazards posed by Vulcano and a hazard map for the island would provide useful context.
- In Conclusions: clarify how these projections should be used. Not to delay evacuations but to model varying impacts for different scenarios to enable proper allocation of resources required for evacuations and economic support of the affected areas.

Comments by line number:

25 be quantitative rather than just stating "more efficient"

30 be quantitative rather than just stating "significant economic impact"

51 other natural disasters can also have significant and useful warning times. Large storms for example.

284 "divided"

302 Ho, 1992 doesn't seem to be in the reference list.

353 what happens in the case of a chaotic panicked evacuation?

363 Are there any hazards that could impact the ferry in port? I.e. should people be considered evacuated only once the ferry leaves the port?

373 can any volcanic hazard interfere with ship speed. tephra fall etc. Can volcanic hazards disrupt communication?

Table 2 Are there any hydrofoils available? What is the hydrofoil speed? They are mentioned under capacity and then not referred to again

Figure 5 Porto Levante, Porto Ponente in the North and Porto Gelso all need to be labelled clearly on the map.

442 delete "on the contrary"

590 Do you have some hypothesis about why this is the case, why does a 360% increase in population only lead to a 12% increase in evacuation time? Add to the discussion.

Table 3 include location "Vulcano" in the table or caption

There appear to be small arithmetical errors (rounding errors?) in table 3 e.g.  $4943 \times 30 = 148290$ , not 148275 please recheck the arithmetic and correct it.

Table 4

include location "Vulcano" in table or caption

There appear to be small arithmetical errors (rounding errors?) in table 4 please recheck the arithmetic and correct it.

Table 5

include location "Vulcano" in table or caption

There appear to be small arithmetical errors (rounding errors?) in table 5 please recheck the arithmetic and correct it.

Table 7 recheck arithmetic

796 should 'eruption' be 'evacuation'?

871 delete extra 'the' "...we have demonstrated that the both the simultaneous..."

875 '...simultaneous evacuation being more efficient at removing people from the island than the staged evacuation, especially in the low season...' include numerical values which demonstrate increased efficiency.

880 remove as "...We have also shown how, in an island **like** Vulcano, whose economy is based on tourism,..."

881 – 883 include numerical values which illustrate the differential impacts being described.

884 "results" not result

885 an evacuation rather than "the evacuation".

885 delete "number of"

886 for improved clarity state the period explicitly again rather than just "that period"

891 delete "of"