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Natural Hazards and Earth System Sciences
Discussions
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# *Interactive comment on* "Strategies to increase the accessibility of tsunami shelters enhances their adaptive capacity to risks in coastal port cities: The case of Nagoya City, Japan" *by* Weitao Zhang et al.

**Weitao Zhang et al.**

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RC: Figs. 1, 2, and 4: Scales are necessary in the maps.

Reply: Thank you for your precious reminder. We have added the scale in the maps. The revised Figs are shown in the attachment.

RC: Table 2: As for spatial scale, the upper half lines seem to be Cross-region evacuation, and the lower half lines seem to correspond to on-site evacuation.



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Reply: We so appreciate that you pointed out this mistake. We are sorry about it and have revised it which is shown in the attachment. Thank you for your careful correction again.

RC: In Section 5.2, or in any earlier section, there should be some references and comments on the range of time after the earthquake occurrence tsunami is expected to hit along the coastal area of Nagoya city and also on the distance pedestrian evacuees or evacuees using vehicles may possibly move to and reach some safe shelters.

Reply: Thank you for your valuable suggestions. Yes, we have obtained effective data about tsunami's arrival time and evacuation's distance which are applicable to Nagoya City study. These data are achieved mainly from official Disaster Prevention Planning documents in Japan, and reports and studies on Great East Japan Earthquake. We have added these references in Section 3.2 where we think it would be more appropriate. We also enriched Fig.3 to show these references more clearly.

Section 3.2 has been revised (in blue in the attachment) as:

"...According to Japan's coastal city disaster prevention document and Great East Japan Earthquake's experience (Disaster Prevention Plan of Tokyo Port Area, 2016; Tanaka, 2017), tsunami warnings are issued by administrative departments in 2 to 3 min after a heavy earthquake. And the tsunami will finally arrive at 30 to 60 min (Atwater et al., 2005)..." "....Combined with a statistical research on evacuation traffic patterns in Great East Japan Earthquake (H. Murakami et al., 2014), three evacuation traffic patterns can be sorted out in the multiple tsunami evacuation time-space routes: on-site pedestrian evacuation (90% pedestrian evacuation in 1000m), on-site vehicle evacuation (80% vehicle evacuation in 2000m), and cross-regional vehicle evacuation (20% vehicle evacuation over 2000m). Therefore, these three traffic patterns refer to tsunami shelter accessibility needs and are studied in this paper. They can be measured along with three-hierarchy roads, and include a total of eight accessibility indicators. Each indicator is calculated based on the arithmetic mean of tsunami

shelters in each School District sample (see Table 2)..."

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-267/nhess-2018-267-AC4-supplement.pdf

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2018-267, 2018.



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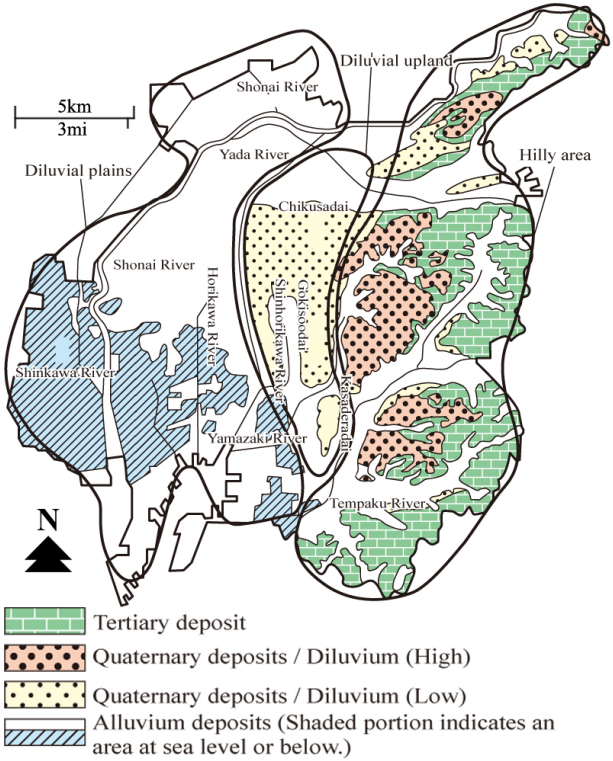


**Fig. 1.** The geological features of Nagoya City.

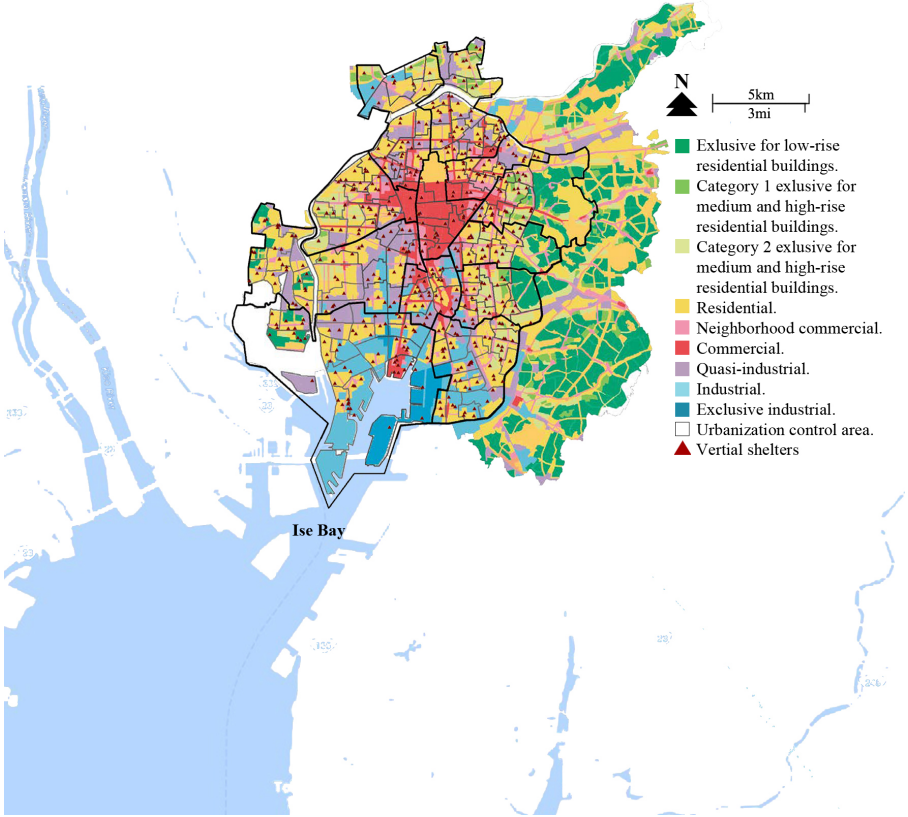


**Fig. 2.** The School Districts and tsunami shelters of the studied administrative regions in Nagoya City.

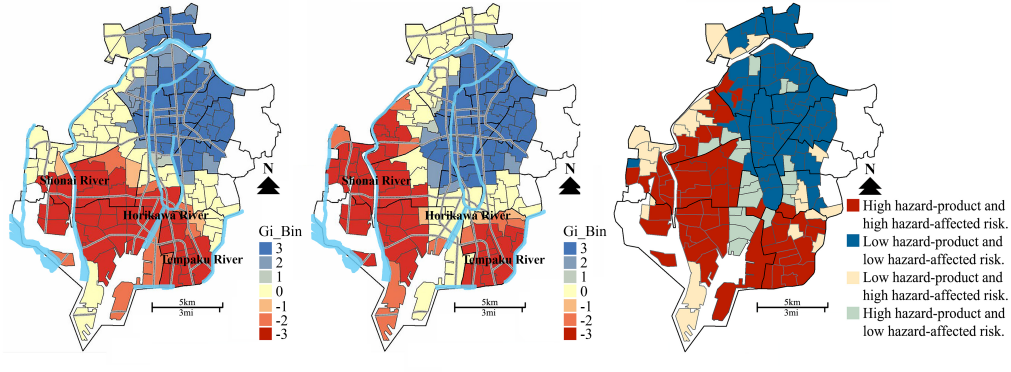


**Fig. 3.** Distribution of hazard risk.



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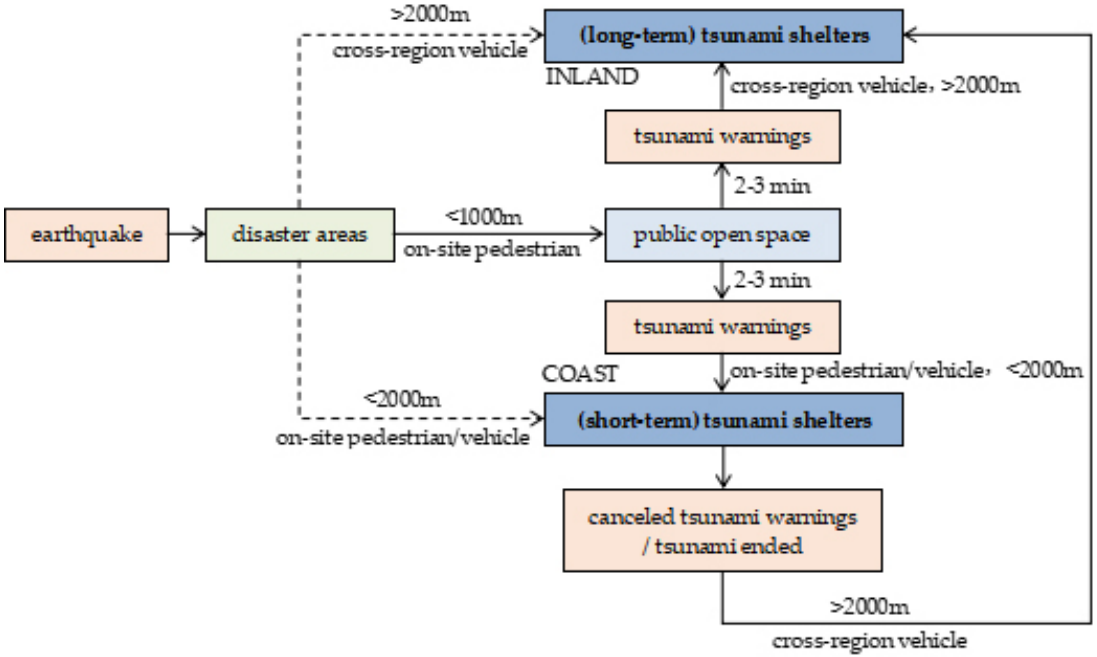


**Fig. 4.** Tsunami evacuation time-space routes with major evacuation activities.



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