Urban area improvement plan methods that attain smooth tsunami evacuations

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1. Foreword

Based on the experience of the Great East Japan Earthquake, and to reduce the tsunami damages for the predicted Nankai Trough Quake, smooth tsunami evacuation measures will be required for urban district improvements (tsunami evacuation buildings, evacuation routes, emergency stairs, evacuation sites and others). However, from the perspective of smoothening evacuations effectively and efficiently, perhaps urban renewal planning has not been established as sufficiently as it should.

NILIM has been dealing with the development of the tsunami evacuation safety evaluation methods from the standpoint of urban district improvement. Here, we will introduce the development situation of the tsunami evacuation simulator and the concept of urban improvement methods based on the simulation results.

2. Tsunami evacuation simulator

A tsunami evacuation simulator is being developed based on selection models of destinations/evacuation routes, where evacuations begin when the tsunami disaster risk rises above a certain level and the risk minimizes after evacuation begins. The simulator also targets two means of escape: on foot or by car.

Using existing traffic simulation models for reference, evacuations by car was limited to traffic behavior requiring evaluation in order to smoothen tsunami evacuations, and was thereby, substantially simplified (Figure 1).

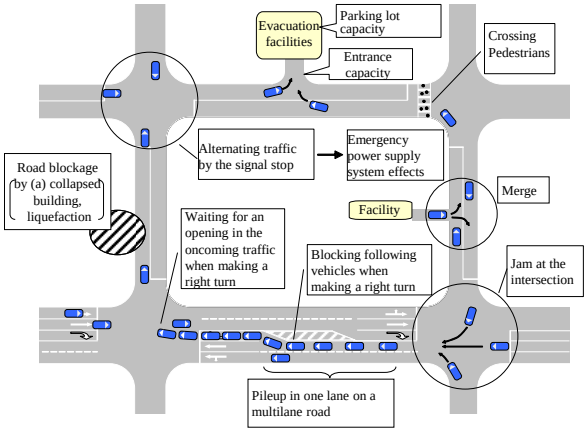

Figure 1: Traffic behavior expressed by the tsunami evacuation simulator

3. Urban district improvement methods based on the simulation results.

Urban district improvements, which are meant to smoothen tsunami evacuations, will extract and conduct procedures to improve areas and factors (congestion, capacity shortage etc.) hindering the tsunami evacuation, based on results acquired from the tsunami evacuation simulator, which was directed at current urban areas (Figure 2). After the improvement plan is created, it will be subjected to the tsunami evacuation simulator, and through comparisons with present conditions, greater awareness of the improvement effect will be grasped, and the validity of the plan will be evaluated.

The obstacles and factors hindering the evacuation, such as evacuation routes, evacuation sites will be tallied and specified in the items listed in Table 1, along with the overall evaluation range.

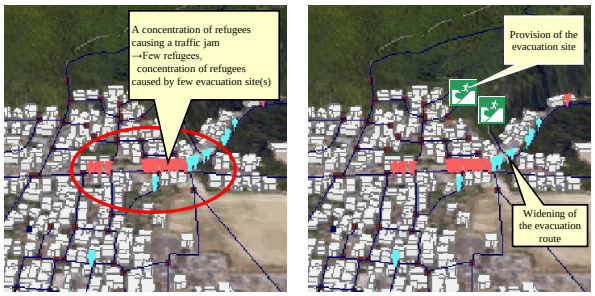

Figure 2: Vision of urban district improvement that smoothen tsunami evacuations

Table 1: Evacuation condition tabulation system

Tabulation target	Tabulation item
Overall evaluation range	No. of people waiting, No. of people evacuating, No. of people who evacuated, No. of people who failed to evacuate, No. of people who failed to evacuate according to cause
Evacuation route	No. of people waiting, No. of people evacuating, No. of people who evacuated, No. of people who failed to evacuate, No. of people who failed to evacuate according to cause, maximum evacuee density, average migration velocity, No. of cumulative passers
Evacuation site	No. of evacuees, mean transit time, No. of evacuees according to departure district
Evacuees	Evacuation start time, evacuation completion time, time required to move, migration length
Departure district	No. of people waiting, No. of people evacuating, No. of people who evacuated, No. of people who failed to evacuate, No. of people who failed to evacuate according to cause

4. Conclusion

Through these case studies, we are scheduled to summarize the methods for urban district improvements to effectively smoothen tsunami evacuations.