Point by point reply to RC1: We would like to thank the referee for the positive and very constructive evaluation of our manuscript and for the helpful comments to improve the manuscript. Requested changes were taken into account.

Point 1: The modeling results (e.g., in lines 17-21) are very usual. They can even be obtained from intuitive reasoning, without building the complicated model as presented in this paper. I would suggest the authors present the modeling results that could really support the unique contribution of this paper (e.g., high resolution, dynamics exposure), especially those that cannot be obtained without high resolution model. Otherwise, we cannot see the benefit of building such model.

Response 1: The agreement of the modelling results and the intuitive reasoning is not the weakness of the model, but an indication that the model's soundness. It would be a concern if the model's results are against the intuitions. The strengths of the model lie in the quantitative analysis of the hazards and exposure under different scenarios for risk assessment and management. Combining with the dynamic distribution of population, the best rescue plan can formulated to minimize casualties.

The resolution of the modeling results is changeable to suit the study area. The time precision of the current results is half an hour, which can be set to 10 minutes or even 1 minute according to the actual demand. In space, the area of the minimum block is 2731.64 square meters. Figures 13 and 14 show dynamic exposure results, which cannot be derived by intuition alone.

Point 2: Line 39, the term "disaster-pregnant environment" is rarely used in English scientific publications. Please change it to some commonly used term. It would be better to let some native English speakers proof read the paper before resubmission.

Response 2: Agreed and amended. The term "disaster-pregnant environment" has been changed to "disaster-prone environment".

Point 3: Lines 46-47, what is "index method"? Please provide some details.

Response 3: Agreed and the following text and reference have been added in the manuscript:

"The exposure index method is to select the natural, social, economic and other evaluation indexes from the characteristics of the disaster-bearing bodies to establish the evaluation index system, determine the index weights by the analytic hierarchy process and expert scoring method, construct the evaluation system by using mathematical model, and obtain the exposures of the disaster-bearing bodies (*Nasiri et al., 2016*)."

Nasiri, H., Mohd Yusof, M.J., and Mohammad Ali, T.A.: An overview to flood vulnerability assessment methods. Sustain. Water Resour. Manag., 2: 331, https://doi.org/10.1007/s40899-016-0051-x, 2016.

Point 4: The daily routine is generated from survey. But the paper does not provide an introduction to the survey

itself, such as how many people participated in the survey, the responders' age distribution and professions, etc. Please add some text to detail the survey in the paper.

Response 4: Agreed and the following text has been added at the end of Section 2:

"Survey data was used to generate daily routine. There were 500 residents participated in the survey. Among them, there were 100 people under 18 years old, 300 middle-aged people and 100 elderly people. Employed people and male people accounted for 55% and 50%, respectively. And 14% of the population had received higher education. The distribution of the above social characteristics is close to the actual population distribution in the study area."

Point 5: Section 3.2 reviews ABM in detail. The paragraph seems to be better fit in "introduction" section, instead of methodology section.

Response 5: Section 3.2 and Section 3.1 are juxtaposed to introduce ABM for population distribution simulation and flood model respectively. Section 3.2 mainly introduces the current commonly used modeling technology, the concept and application of ABM, which shows ABM is suitable to the modeling in this paper. Specific modeling method is described in Sections 3.3 and 3.4. Therefore, no modification or adjustment will be made for the time being.

Point 6: Line 211, classification of activities is confusing. What is the difference between leisure, recreation, and rest? Are there any literatures to justify this classification?

Response 6: We have revised the manuscript to remove this confusion. "Recreation" refers to the activities in leisure places, away from the residential area (home). "Rest" is changed to 'at-home'. The following text has been revised in Section 3.3:

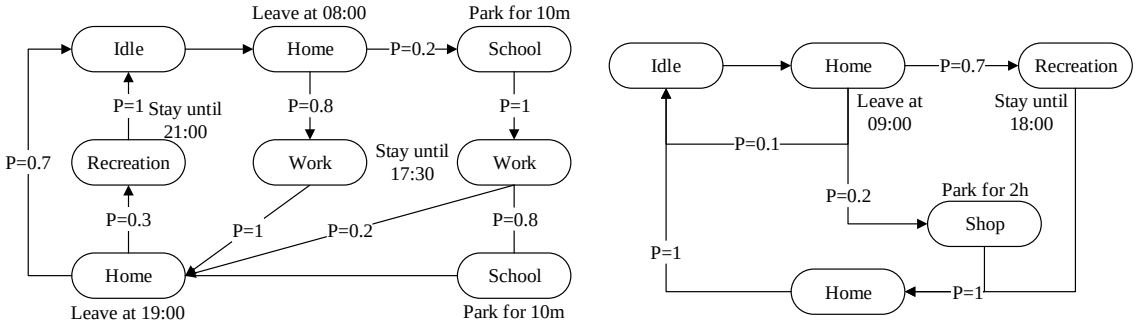
"Activities were classified as work, study, recreation, shopping, at-home, and travel."

Point 7: Figure 4 emphasizes the daily routines for unemployed woman. Why these unemployed women go to school to drop children off?

Response 7: This part of the probability is used to represent some unemployed women (housewives) who are responsible for taking their children to and from school. According to the survey, many housewives send their children to school, and then go shopping in supermarkets before going home.

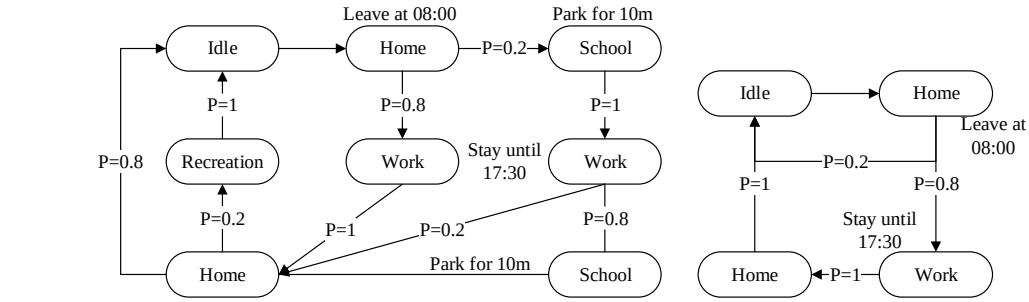
Point 8: The paper never mentioned the daily routine for unemployed man and employed person. However, it might be more important to talk about employed person, than unemployed women as in Figure 4.

Response 8: Agreed and the following figures have been replaced in the manuscript:

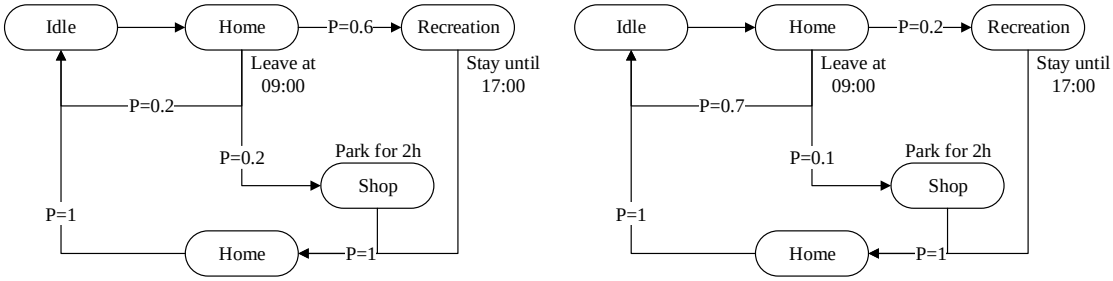


(a) Activity on weekdays (b) Activity on weekends

Figure 4. A synthetic daily routine generated from the travel survey and census data for an employed male agent aged 18–60 years.



(a) Bad weather (weekday) (b) Warning (weekday)



(c) Bad weather (weekend) (d) Warning (weekend)

Figure 5. Activity patterns for an employed male agent aged 18–60 years and highly educated during disaster scenarios. (a) Bad weather (weekday) (b) Warning (weekday) (c) Bad weather (weekend) (d) Warning (weekend).

Point 9: Please provide some introduction how the probability of agents' daily activities is generated (e.g., Figure 4).

Response 9: During the survey, residents and activities were grouped into eighteen types (refer to Fig. 8 (a)) and six categories (refer to Point 6). We have counted the probabilities of all the activities of the population groups under investigation. For example, in Figure 4 (a), about 20% of people send their children to school before going to work,

based on the survey data of the employed adult males.

Point 10: For agents' route choices (start from line 232), minimizing travel time does not mean the agents will choose the shortest path, because too many people choosing the same path might cause traffic jam. In addition, travel time also depend on number of driving ways on road and traffic condition.

Response 10: Agree. At present, a simple but effective shortest path method is used in the porotype system. We will improve the human movements on roads in future.

Point 11: Figure 8 lists some daily scenarios and disaster scenarios. They are confusing. For example, scenarios 2, 5, 8, 11, 14 and 17 are all about traveling by car. Are there are any differences? If they are different, then what are the differences? If not, why they are classified as different scenarios?

Response 11: We have revised the manuscript to clarify this part. The following texts have been revised in Section 4.1:

"Additionally, to reduce the number of agent types, only a limited number of agent classifications were used. The distribution of the population characteristics for Liandu District is shown in Table 4. The agents were divided into 18 types for daily (non-disaster) scenarios (S1, S2, S7, and S8) and 24 types for disaster scenarios (other scenarios except S1, S2, S7, and S8) based on the influence of their education levels on the individual disaster response behavior (Fig. 8)."

"Figure 8. Agent types for daily and disaster scenarios. Daily scenarios refers to S1, S2, S7, and S8. Others are disaster scenarios."

Point 12: I do not see how you model agents' moving process on road. Are there any traffic models to simulate this process? How do you simulate the agents' moving from one place to another during floods?

Response 12: We can get the departure and destination block of each stage according to the activity patterns, and then calculate the shortest path consisting of a series of road sections. At each moment, the block in which the agent is located is calculated. If on the road, according to the different speed of its walking, bus and car, the road section where it is located is calculated. During flooding, it's similar, except that the activity patterns are different.

Currently, no accurate traffic model is used to simulate agents' movements on road. On the one hand, it's for improving efficiency. On the other hand, we do not pay attention to high time resolution human movements (such as precise to one minute or one second). Our time scale is half an hour. We only focus on the population distribution for a period of time, so the resolution requirement of human activities is low. Our team has made an attempt to develop a model on the Netlogo software to investigate flood-induced traffic congestion (*Zhu, et al., 2018*), but the traffic model has not been added to the method and the prototype system developed in this manuscript.

Zhu, J., Dai, Q., Deng, Y., Zhang, A., Zhang, Y., and Zhang, S.: Indirect damage of urban flooding: Investigation of flood-induced traffic congestion using dynamic modeling. Water, 10(5): 622, https://doi.org/10.3390/w10050622, 2018.

Point 13: The first part of "Results" section, subsection 4.1, introduces model implementation and parameter setting. However, this subsection seems to fit better in methodology section since they are not related to modeling results.

Response 13: Section 4.1 mainly introduces the block and agent generation results and exposure threshold. The results of the block and agent generation correspond to Sections 3.3 and 3.4, which vary according to the different study area and data. The block is the result of data processing in the early stage of modeling, and it is an important input data unit. The agent type and exposure threshold are parameters to be set. Therefore, the above three parts are listed separately in Section 4.1 of the result.

Point 14: Section 4.5 Validation is very confusing. Usually model validation appears in the first section of modeling results, to tell readers that the model/method has been calibrated and is reliable. I am not sure why the authors put it at the end of results section. Please explain this arrangement.

Response 14: Agree. We have divided the original validation (Section 4.5) into two parts, one is the validation of flood simulation and the other is the validation of population distribution. We have placed them behind the corresponding simulation results (Sections 4.2 and 4.3).

Point 15: The results section simply introduces the modeling results, without telling us the insights. In other words, what information we can obtain after reading your figures/data? Can the results justify your claiming of the contribution of this paper?

Response 15: Our research focuses more on the explorative method, while the result is just an application case. Due to the limitation of the study area and data, the current results are quite general. Our method also has many areas in need of improvements, such as adding traffic model. In the future, we will continue to improve our method and find more diverse study areas and more comprehensive data for practical case studies, which may produce more informative results. Our method will provide the government with high resolution dynamic exposure results on the local population, roads and buildings in flood disaster scenarios, data for urban vulnerability and loss assessment, in order to support for government disaster risk management, such as pre-disaster evacuation and early warning plans.