

Interactive comment on “Measuring and Characterizing Community Recovery to Earthquake: the Case of 2008 Wenchuan Earthquake, China” by Jie Liu et al.

Jie Liu et al.

liujie198643@163.com

Received and published: 12 April 2017

Dear Referee:

At first, we would like to express our great appreciation to you for your comments on our paper entitled "Measuring and Characterizing Community Recovery to Earthquake: the Case of 2008 Wenchuan Earthquake, China" (ID: nhess-2017-72). Those comments are all valuable and very helpful for revising and improving the quality of our paper, made our paper more readable and clear, as well as the important guiding significance to our researches. We have studied comments carefully and realized the problems and deficiency of my manuscript, so we have revised my manuscript carefully and seriously according to your comments, which we hope meet with approval. The revised paper

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has been uploaded in the supplement file, and the added and revised sentences and paragraphs have been marked red in the revised paper. The main corrections in the paper and the responds to your comments are as following:

1. Section 1 Comments: The literature review is comprehensive, although I missed some key references on concept of economic resilience, which is cited a few times but not directly tackled. For example, dynamic economic resilience (Carter et al., 2007; Hallegatte et al., 2016; Le De et al., 2013; Rose and Krausmann, 2013) is not explicitly presented, which is not what I would expect from a paper studying recovery. Authors may alternatively refer to “ability of the economy to cope, recover, and reconstruct and therefore to minimize aggregate consumption losses” (i.e. indirect impacts) (Hallegatte, 2014). References to indirect/dynamic resilience are necessary to put your contributions into context.

Answer: The referee provided an important reference (Hallegatte, 2014) for us to research economic recovery. So in Page 3, line 182-186, we have replaced “dynamic economic resilience (Carter et al., 2007; Hallegatte et al., 2016; Le De et al., 2013; Rose and Krausmann, 2013)” with “ability of the economy to cope, recover, and reconstruct and therefore to minimize aggregate consumption losses (i.e. indirect impacts) by Hallegatte (2014). And we have added this reference “Hallegatte, S.: Risk and Opportunity—Managing Risk for Development, World Development Report , Washington, DC, World Bank, 2014.” in the section of References (Page 25, line 1472-1475).

2. Section 2 Comments: Section 2 is sufficiently informative. In general, the manuscript would benefit from revision by a native English speaker.

Answer: Thank very much for your comments about the grammatical errors of our paper. Because English is not our native language, there are many spelling and grammatical errors in our paper. With the help of you and an English-native expert, numerous errors in grammar and syntax had been corrected, and the language of our manuscript had been improved.

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3. Section 3 Comments: Section 3.3 is not sufficiently detailed; methods are claimed to be a relevant contribution of the paper (and are in any case necessary to understand results) but are presented in less than 1 page. -The section also fails to put methods into context. The triangle approach is but one method to assess recovery, and this should be acknowledged. Alternatives should be presented, and pros and cons described (I wonder how relevant is this approach in the literature?). Authors should conclude stating why this method is used, and what their contribution offers as compared to other alternatives. -I have the impression that the triangle method may be too simplistic for the economic analysis part I'm familiar with. There is much work in this area relying on more complex models that could be applicable to the study area (see e.g. citations above). A reader familiar with these methods may wonder: why authors do not use them? It may be due to data constraints, or to keep homogeneity in the assessment of different recovery measures, or due to some limitations of the methods, but this has to be explained. -Authors provide some thresholds to assess recovery (immediate, emergency, etc.) and seem to apply them to every recovery measure (economic, population, etc.) without explaining the motives for this, and if this is coherent with the complexity of recovery and the different implications the concept has for the economy or infrastructures, for example. Overall, assessing these complex concepts with a single method seems challenging. -The definition of economic recovery in section 3.2 is insufficient. What's the counterfactual if you address GDP growth only? The original GDP growth rate? Do you consider any trends? What about redistribution of income? -Section 3.2 seems an extension of the literature review in Section 1 and could be better placed there.

Answer: (1) We are very sorry that we can't provide a clear explanations of the definition and assessment method of the community recovery. So in the revised paper, we have rewritten the section 3 Data and Methods so that the reader can understand how to measure the community recovery in this paper. The added and revised sentences and paragraphs which used to illustrate the assessment method of the community recovery have been mainly in the section 3.2 Defining and assessing the community

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recovery to earthquake (the page 8 to 13) of the revised paper, and marked red. For example, 1) Page 8, line 447-Page9, line 475: We provided a clearer explanations of the four properties of resilience (4R's) which proposed by Bruneau et al., 2003. And the recover time which was from the term of rapidity in the four properties was always used to define and assess the community recovery before. 2) Page 9, line 476-page 10, line 538: We illustrated the concept of resilience triangle (Figure 4) and the calculation formula of resilience (page 10, line 531). In the concept of resilience triangle, the recovery time is taken to assess community recovery. 3) Page 11, line 567-page 12, line 656: We provided a clearer explanations of the assessment method of the community recovery to earthquake. That is we extended the original concept of resilience triangle and used the term of rapidity from four properties of resilience (4R's). So the speed at which the community recovers to achieve a desired state can be used in our paper to assess the community recovery. Figure 6 sketched the assessment framework of the community recovery we proposed in this section. And the recovery score (RS) is formulated as the following two-stage stochastic program from page 12, line 628 to page 12, line 656. (2) We have illustrated the reason why we use the parameter of recovery speed to assess the community recovery, and the advantages of using the parameter, and the disadvantages of using the parameter of recovery time in 'resilience triangle' which is the classic parameters to assess community recovery are in page 10, line 539-page 11, line 562. (3) The motive and purpose of our paper is to provide insights for Chinese Central Government to assess and measure the recovery capacity and performance of local government officials of Wenchuan, which have been illustrated in page 4, line 236-line 271. That "the core dimensions and indicators which we used in this paper to assess the community recovery have been judged and chosen by a total of 15 interviews involving 20 experts. All of these experts were organizational specialists on post-disaster recovery and reconstruction from National Workplace Emergency Management Center which can be the decision-makers of assessing and measuring the recovery capacity and performance of local government officials". We have added the section 3.3 Core dimensions and indicators of community recovery (page 13, line

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660-page 14, line 733) to illustrate it in detail. (4) As the referee said, the core dimensions and indicators (population, economy, building and infrastructure) we have chosen and used to assess the community recovery was not comprehensive. That is the limitation of our paper, which have been illustrated in section 6 Conclusion (page 23, line 1323-1356). For example, “assessing community recovery is focused on describing core dimensions and indicators which can be used by the decision-makers to assess and measure the recovery capacity and performance of local government officials (for example, identifying GDP to assess economy recovery), not considering other economic or social indicators, such as personal income, poverty, and unemployment, and so on, in assessing patterns and progress of community recovery”, and “core indicators of community recovery was defined and chose on the basis of expert interview, these experts we interviewed are all from one organization (National Workplace Emergency Management Center), who may not always have a complete understanding of community recovery”.

4. Section 4 Comments: This section needs to categorically discuss the results shown in the figures before moving on to assess the drivers. This would help readers to understand what we can obtain from the methods and how to interpret it.

Answer: We are very sorry that we can't provide a clear explanations of the assessment results of Wenchuan's recovery to earthquake. So in the revised paper, we have rewritten the section 4 Results to help readers to understand what we can obtain from the methods and how to interpret it. For example: (1) We have provided a explanation of the interrelated phases of the recovery and reconstruction process(page 14, line 768-802). That we have divided the recovery and reconstruction process into three interrelated phases (shown in Figure 7), which can be used to determine the recovery degree of four dimensions of community recovery at different time phases . (2) We have moved the concept of 4 dimensions of community recovery respectively into 4.1-4.4. And we have added a lot of explanation of the assessment results of each dimension of Wenchuan's recovery to earthquake, which has been marked red (page 15,

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line 814-page 20, line 1151). And all of the Figures (figure 8-11) have been redrawn. We wish these revision can provide a clearer interpretation of the assessment results.

5. Specific comments:

(1) P.1, I. 7-8: “So this article proposes the concept of community recovery as the capacity to recover and rebuild after the earthquake disasters by considering the original perspective of recovery.” This sentence is critical to explain the reader how you intend to implement your analysis, but remains vague and imprecise.

Answer: Page 1, line 12-16: According to the referee's comments, we have changed the sentence “So this article proposes the concept of community recovery as the capacity to recover and rebuild after the earthquake disasters by considering the original perspective of recovery.” into “Considering the original perspective of recovery, this article proposes the concept of community recovery as the capacity to recover and rebuild after the earthquake disasters by considering the original perspective of recovery.”

(2) P. 1, I.10: “by extending the concepts of recovery triangle”. Here you should try to explain the methods employed in the paper in a way that even a reader that is not used to them understands how it's done. The current version is ok for a more focused journal, but in NHESS readers come from a variety of disciplines and papers must be informative for this audience.

Answer: 1) Page 8, line 447-Page9, line 475: We provided a clearer explanations of the four properties of resilience (4R's) which proposed by Bruneau et al., 2003. And the recover time which was from the term of rapidity in the four properties can be used by us to define and assess the community recovery. 2) Page 9, line 476-page 10, line 538: We illustrated the concept of resilience triangle (Figure 4) and the calculation formula of resilience (page 10, line 531). In the concept of resilience triangle, the recovery time is taken to assess community recovery.

(3) P1, I.19: “The damaging earthquake risk of cities as the biggest risk of all natural

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disasters". This needs to be referenced, although earthquakes can be devastating there are other risks that happen more frequently. You can say that they are the most devastating in terms of impact, but not in terms of likelihood, and again this should be referenced.

Answer: Page 1, line 42-44: According to the referee's comments, we have changed the sentence "The damaging earthquake risk of cities as the biggest risk of all natural disasters" into "The damaging earthquake risk of cities as the most devastating in terms of impact, but not in terms of likelihood...".

(4) P2, I. 37: possibilities to instead of "possibilities o return to normal"

Answer: Page 2, line 86-89: According to the referee's comments, we have changed the sentence "...includes both the possibilities o return to normal, that is, pre-disaster condition, and alternatively, to be rebuilt or transformed to a completely different status." into "...includes both the possibilities to return to normal, that is, pre-disaster condition, or alternatively, to be rebuilt or transformed to a completely different status."

(5) P2, I.58: "Disaster Recovery Framework developed by FEMA in 2011(FEMA 2011)" say instead developed by FEMA (2011) to avoid repetition.

Answer: Page 3, line 134-136: According to the referee's comments, we have changed the sentence " The new National Disaster Recovery Framework developed by FEMA in 2011(FEMA 2011) define recovery as..." into "The new National Disaster Recovery Framework developed by FEMA (2011) define recovery as..."

(6) P3., I.100 to P.4, I.105. Again, methods are barely presented, which is not sufficient provided this is the main contribution of the paper.

Answer: In the revised paper, we have rewritten the section 3 Data and Methods so that the reader can understand how to measure the community recovery in this paper. The added and revised sentences and paragraphs which used to illustrate the assessment method of the community recovery have been mainly in the section 3.2 Defining and

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assessing the community recovery to earthquake (the page 8 to 13) of the revised paper, and marked red.

(7)P. 5, I. 139: "is from ruins to prosperity (Figure 2c)". I'd rather avoid bold statements like this.

Answer: Page 6, line 340: According to the referee's comments, we have deleted the sentence "the Wenchuan Community is from ruins to prosperity".

(8)As you discussed before, rebuilding the city is just one part of the recovery. What about the human, natural, social capital that was lost, was it recovered? Has the city learned the lessons and is now more resilient to earthquakes? These and other questions need to be addressed before making this statement.

Answer: 1) In the section 5 discussion, we have illustrated what we have learned from this research of the Wenchuan recovery to earthquake. That is "the decision-makers of local government must learn how to address the challenges of disaster response and recovery at the community level, how to leverage community capacity from the earliest stages of disaster response, and to use external resources to bolster and supplement local capacities (Page 21, line 1181-1188)". And "The rebuilding and recovery process of Wenchuan supports perspective of recent research that returning to pre-disaster levels does not necessarily mean building back for the better (Ganapati et al., 2012) (Page 21, line 1204-1208)". Furthermore "And the post-disaster recovery activities provide an opportunity to learn constantly and grow stronger from the previous natural disasters, which can be used to support the proactive mitigation strategies-to rebuild stronger, change land-use patterns, and reduce development in hazardous areas, and also to reshape those negative social, political, and economic conditions that existed pre-event (NHC, 2006; Reddy, 2000; Olshansky, 2006; Birkland, 2006) (page 21, line 1231-page 22, line 1242)", and so on. 2) Because the motive and purpose of our paper is to provide insights for Chinese Central Government to assess and measure the recovery capacity and performance of local government officials of Wenchuan. In this paper, we

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just proposed a assessment method of the community recovery in 4 core dimensions, which have been judged and chosen by a total of 15 interviews involving 20 experts. All of these experts were organizational specialists on post-disaster recovery and reconstruction from National Workplace Emergency Management Center which can be the decision-makers of assessing and measuring the recovery capacity and performance of local government officials. The research of the community recovery in this paper can not consider other dimensions (such as the human, natural, social capital, and so on). So in page 23, line 1323-page 24, line 1391, we have added the limitation and our future research. For example, we have illustrated that "Second, assessing community recovery is focused on describing core dimensions and indicators which can be used by the decision-makers to assess and measure the recovery capacity and performance of local government officials (for example, identifying GDP to assess economy recovery), not considering other economic or social indicators, such as personal income, poverty, and unemployment, and so on, in assessing patterns and progress of community recovery(Page 23, line 1334-1344)". And "Last, core indicators of community recovery was defined and chose on the basis of expert interview, these experts we interviewed are all from one organization (National Workplace Emergency Management Center), who may not always have a complete understanding of community recovery (Page 23, line 1350-1356)". In our future research, we have illustrated that "quantitative indicators of community recovery should be used as a benchmark or reference for more in-depth study, which can be used systematically by local governments and researchers to monitor complex recovery processes (Page 23, line 1360-1365)". And "And considering long-term recovery and reconstruction, the framework should be extended in order to perform a dynamic assessment model of community recovery, where time-dependent indicators reflect post-disaster recovery capacity and performance of local government officials over time (Page 23, line 1375-1382)". And "Learning from the past recovery and rebuilding process, new research is needed to fully operationalize and realize the concept of recovery, and develop appropriate techniques of designing mathematical models to assess and characterize community recovery, which can help local govern-

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ment and policy makers develop the scientific and effective disaster recovery plan for the next devastating earthquake disaster (Page 23, line 1382-page 24, line 1391)".

(9)P.5, I.151: "random interview of 1000 affected families". Why did you use this method, motivate or else cite papers that used it, describe the method.

Answer: Page 6, line 355-375: We have illustrated questionnaire and interview process of the affected families, and how to get the data of the recovery process and status of the affected people.

(10)-P.6, I.152: "Other statistics and description data are gathered by combining different sources (e.g. . .)". You have to describe categorically all databases used, or where you can find them, so that your methods can be replicated. There is no reference to the data sources, and the description is insufficient. Descriptive statistics could help. Otherwise a more in depth discussion of the data, its gaps, etc. is necessary.

Answer: Page 7, line 381-385, and Table 1: We have provided a clearer explanation of the statistics and description data sources. we have illustrated that "Other statistics and description data (showed in table 1) are gathered by combining different sources (e.g., research report, government report, government agency and website) following the Wenchuan Earthquake." And Table 1 has listed the statistics and description data sources.

(11) P.10, I. 275: "For the purpose of facilitating the calculation, we use the average linear rate to substitute the curve rate." This sounds too simplistic and needs to be reinforced. Can't you estimate a non-linear function?

Answer: We are very sorry that we can't provide a clear explanations of calculation method of the community recovery. So in the revised paper, we have rewritten calculation process in the section 3.2 Defining and assessing the community recovery to earthquake (the page 11, line 567 to Page 12, line 656). The speed at which the community recovers to achieve a desired state can be used in our paper to assess

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the community recovery. Figure 6 (Page 13) sketches the assessment framework of community recovery. But quantifying the slope of the recovery curve to assess the community recovery is very difficult and a challenge in this paper, because the recovery speed of the curve is different at each time point, and not a constant. For the purpose of facilitating the calculation, assuming that the performance of community of the resilience is unchanged and equal, we use the linear functionality recovery path to approximate the curve functionality recovery path. the recovery score is formulated as the following two-stage stochastic program in page 12, line 628-656.

(12)The list above is not exhaustive, and authors are advised to submit the document to a native English speaker or professional proofreading services.

Answer: Thank very much for your comments about the grammatical errors of our paper. Because English is not our native language, there are many spelling and grammatical errors in our paper. With the help of you and an English-native expert, numerous errors in grammar and syntax had been corrected, and the language of our manuscript had been improved. For example: 1) Page 2, line 70-76: we have changed "So policy-makers have called for concerted efforts to build 'earthquake-resilience community' for the purpose of finding the new stable states and rebuilding a safer community in the historically experienced deleterious earthquake disasters (Alesch 2009)." into "So policymakers have called for concerted efforts to build 'earthquake-resilience community' for the purpose to find the new stable states and rebuilding a safer community in the historically experienced deleterious earthquake disasters (Alesch, 2009)." 2) Page 2, line 84-89: we have changed "Recovery represents a fundamental dimension of disaster resilience, includes both the possibilities o return to normal, that is, pre-disaster condition, and alternatively, to be rebuilt or transformed to a completely different status." into "Recovery represents a fundamental dimension of disaster resilience, includes both the possibilities to return to normal, that is, pre-disaster condition, or alternatively, to be rebuilt or transformed to a completely different status." 3) Page 2, line 114-116: we have changed "...since the disaster was often seen as a failure of social structure

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(Bates and Gillis Peacock 1989). " into "...since the disaster is often seen as a failure of social structure (Bates and Gillis Peacock, 1989)." and so on.

We have tried our best to improve the manuscript and made some changes in the manuscript. These changes will not influence the content and framework of the paper. And the revised manuscript has been typeset according to the format of NHESS. We appreciate for Editors (Thomas Thaler) and Reviewers' warm work earnestly, and hope that the correction will meet with approval. Once again, thanks very much for editors (Thomas Thaler) and four Reviewers' comments and suggestions.

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-72/nhess-2017-72-AC5-supplement.pdf>

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2017-72, 2017.

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