

## ***Interactive comment on “An agent-based model for flood risk warning” by Thomas O’Shea et al.***

### **Anonymous Referee #1**

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#### General comments

This paper recognises the complexity of hazard situations and responses, but also that adaptive actions overall may be simulated from individual or ‘agent’ behaviours through using agent-based models (ABMs). On the physical side, hydrodynamic behaviour can have an equivalent concern for the local through detailed topographic modelling and floodwater routing. The paper demonstrates how combining the two, through an innovatively developed approach coupling hydrodynamic and agent-based models (named here HABMs), allows site-specific procedures for warning provision and evacuation to be usefully designed. This is accomplished through simulating populations and exploring their alternative behaviours to see which might be of most benefit for responses to flooding events given the local geography – as in the case of Lancaster, UK, flooding described here. An interesting feature of the approach is that the human behavioural aspects are here justified by appeal to social theory, just as the (now better-established)

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hydrodynamic modelling is justified and rests on physical theory.

### Specific Comments

The promotion of new quantitative approaches that combine physical understanding of hazards with possible actualities of human responses to them is surely to be welcome. Until recently there has commonly been an academic gap between the two: (1) improved modelling of physical phenomena and their dynamics on the one hand, but (2) ‘top-down’ imposition of (mostly hard engineering) solutions at affected sites without exploring what their populations might be doing, or could best be doing, in response. Localized decision-making is likely to improve greatly if those involved have good understanding of what best to do in the situation they confront – rather than putting schemes to the vote at some higher political level, the advantages or disadvantages of which are little understood on the ground. ‘Participatory methods’ have to be better than this. Coping with hazards is at heart a human cognitive activity, and so how people at different participatory levels can behave, or get informed as to how better to behave, should be beneficial.

### Technical Corrections

18. ‘ . . . constructed using the Bass Diffusion Model’. 118. Omit last comma in cited references. 127. Put ‘Dawson’ in the bracketed reference. [also line 570] 171. Dawson et al., 2011; Müller, . . . 183. Semi-colons needed between EA Reports: 2006; 2012; 2016. And after Neal et al., 2009; [Also in line 752 after 2003.] No need for ‘ands’ within the reference brackets; see also lines 207-8; 214; 234; 267. 304. ‘imitators’ 305. a priori. 323. Chen & Zhan, 2008; 334. One quote mark only needed. 394. Dawson et al., 2011; Also no full stop after 1994 within the brackets. 487. Comma after information [to be consistent with elsewhere]. 587. Add full stop to sentence after bracket. 627. How does the map show ‘areas through which people are most likely to move’ as the caption suggests? That’s made more visible in figure 10. 651. Why a semi-colon here? Perhaps: ‘ . . . traditional terms that may be thought of as an acceptance’ 654. Give cited

reference, not just its number. [Also line 665] 659. Semi-colon needed after 2015. 719. Last sentence of caption incomplete. 751. Omit 'of'. 758. Full stop after bracket, not before it. 846/7. (Figure 8a), (Figure 8b) [add the word 'figure', and not in bold]. Also line 859. 875. 'being based on shifted Gompertz . . ' 902. 'value' rather than 'truth' perhaps. 907. Not bold. Need to check house style (especially whether 'figure' should have a capital letter). This long sentence at the start of the paragraph needs recasting, too. 923. their understanding. 940. Readers might appreciate a page number for this quotation.

Lettering sizes on Figures 2, 3 and especially the side panels of Figures 5-7 are on the small size.

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