Professor Robert Wilby, Loughborough University – Written evidence (NSD0032)

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The following evidence addresses the following question:

5. How should implementation of nature-based solutions be integrated with other government policies for landscapes and seascapes, for example, agricultural, forestry, and land-use planning policies?

How could nature-based solutions implementation contribute to the UK's goals surrounding biodiversity, the preservation of nature, and adaptation to climate change?

There is growing interest in the use of natural flood management (NFM) schemes to reduce present and projected flood risks, including adapting to climate change. Creation of woodland areas in headwaters, riparian zones, and as cross-slope woodland barriers could deliver both carbon sequestration in the landscape *and* the co-benefit of flood risk reduction.

NFM schemes are generally designed to (1) retain flood water in the landscape through management of infiltration and overland flow; (2) retain flood water in the landscape by managing connectivity and conveyance of water via the drainage system; and/or (3) making space for flood water by enhancing floodplain conveyance and storage (Dadson et al., 2017). Such interventions seek to attenuate the volume and delay timing of flood peaks, as well as reduce the synchroneity of flood peaks converging from multiple tributaries.

The balance of evidence from systematic reviews is that NFM can deliver moderate reductions (of the order <20%) in flood peaks for small floods/frequent events (<10 year return period) in small catchments (<10 km^2). However, little (5-10%) to no discernible reductions are achieved for large floods (1 in 100 year return period, or greater) in large catchments (>1000 km^2) depending on the NFM measure (Burgess-Gamble et al., 2017; Dadson et al., 2017) (see Figure 1 overleaf).

Therefore, **the Committee is advised to exercise due caution when articulating the likely co-benefits of woodland creation for NFM**. This would be consistent with latest online advice provided by the Environment Agency (2021) which states that NFM solutions "*are effective for low level flooding in smaller catchments that flood regularly*". Otherwise, there is a danger of raising false (even dangerous) expectations for vulnerable communities – especially when exposed to severe storms like Ciara and Dennis which would likely overwhelm NFM schemes.

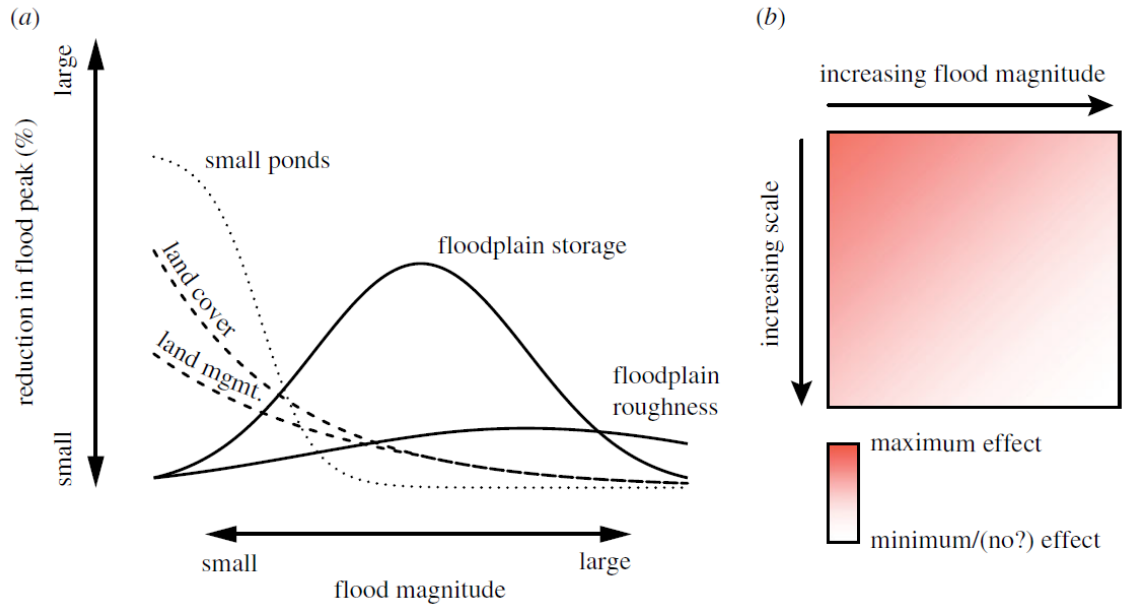

Figure 1. Schematic showing relative effects of catchment-scale interventions on flood peaks. (a) Effect of different types of intervention on flood peak reduction; (b) combined effect of NFM interventions with flood magnitude and catchment scale. Note that the effects achievable in practice will depend on the details of the particular intervention and the context in which it is deployed. Source: Dadson et al. (2017:18).

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Sources

- Burgess-Gamble, L., Ngai, R., Wilkinson, M., Nisbet, T., Pontee, N., Harvey, R., Kipling, K., Addy, S., Rose, S., Maslen, S. and Jay, H. 2017. Working with natural processes–evidence directory. Environmental Agency, Report No. SC150005.
- Dadson, S.J., Hall, J.W., Murgatroyd, A., Acreman, M., Bates, P., Beven, K., Heathwaite, L., Holden, J., Holman, I., Lane, S., O'Connell, E., Penning-Rowsell, E., Reynard, N., Sear, D., Thorne, C. and Wilby, R. 2017. A restatement of the natural science evidence concerning catchment-based flood management in the United Kingdom. Philosophical Transactions of the Royal Society A, 473, 20160706.
- Environment Agency (2021) Use nature-based solutions to reduce flooding in your area. https://www.gov.uk/guidance/use-nature-based-solutions-to-reduce-flooding-in-your-area