POSTER NO: 60

Perspectives on Natural Flood Management (NFM): An Exploration of Priorities in the Somerset Levels through Analytical Hierarchy Process (AHP) and Interviews

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Aim

Formulate a decision-making model for flood management authorities concerning different NFM strategies, approaches, actions and criteria to provide insights for enhancing project implementation.

Objectives

1. Investigate historical flood patterns on decision-making processes related to the choice of flood management measures, understanding the historical context in shaping current strategies.

2. Evaluate and analyse the alignment or divergence of stakeholders' priorities concerning specific strategies, approaches and actions in NFM to identify patterns, or synergies.

3. Conclude if an NFM decision-making model can improve understanding collective and multi-stakeholder negotiations on NFM.

Background

Between November 2013 and March 2014, Somerset Levels experienced severe flooding (Figure 3), inundating 15,000 hectares of land and resulting in estimated losses of £118 million. NFM emerges as a solution, inspired by the Netherlands' approach of harmonising with floods, seeking to enhance ecological water system functions and absorb floodwaters (Figure 2). This research aims to refine NFM barriers and opportunities by understanding stakeholder perspectives and priorities.

Findings and Beneficiaries

NFM research has been mostly led by physical sciences. This project aims to evaluate if a decision-making model could better guide NFM interventions. Literature supports both theoretical and practical implications. Addressing opinions (AHP) and perceptions (interviews) necessitates refining guiding principles through a model. The main beneficiaries will be flood managers who liaise with land, water and public stakeholders to conduct NFM projects.

Methodology

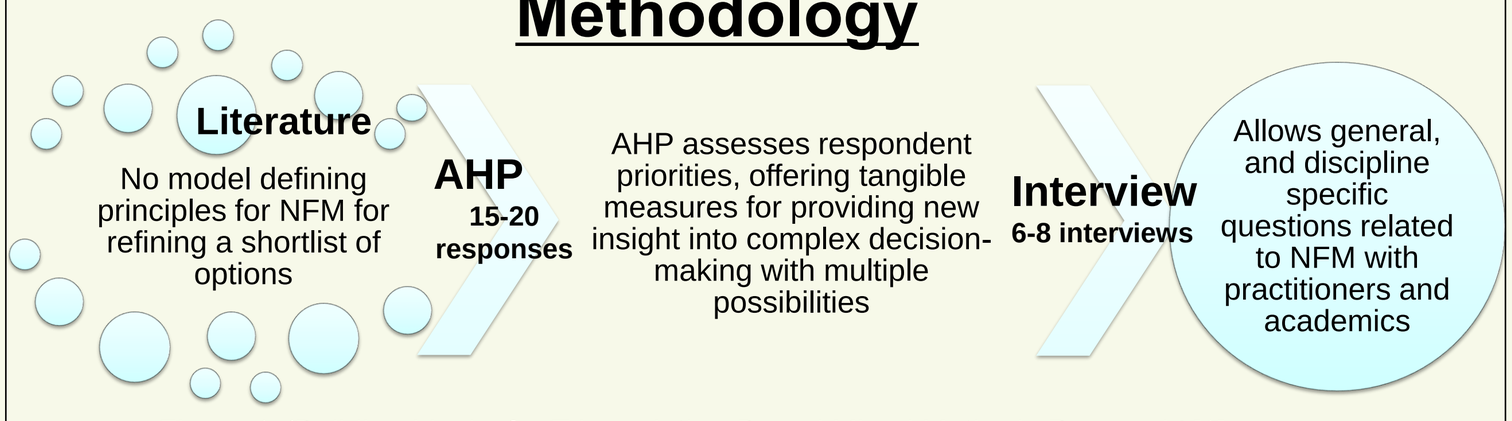

Figure 1: 'Building blocks for Triangulation-Based Mixed Methods Research' [1]

Figure 2: NFM in Somerset Levels [8]

Somerset Levels

- Cover 60,000 hectares, the UK's largest lowland wet grassland [2].
- Heavily engineered flood-prone area with multiple stakeholders, posing management challenges.
- Landscape comprises low-lying farmland, interspersed with hills, ridges, and isolated farmsteads dating back to the 19th century [3].
- Management involves the Environment Agency, 18 drainage boards, several local councils, and 2,000 landowners, making it a highly contested waterscape [4].

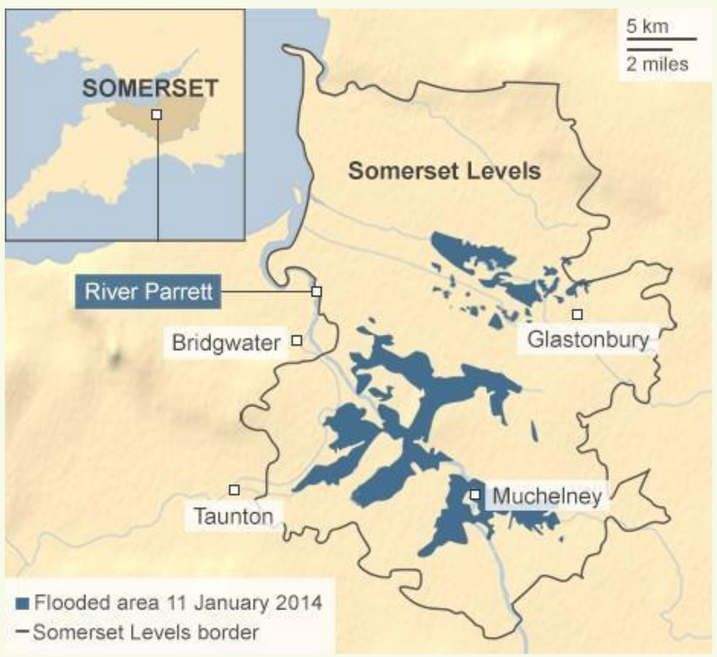

Figure 3: Somerset Levels Location and 2014 Flood Extent. Source: BBC, 2014 [9]

Pairwise Comparison

Example: Respondent thinks 'Setting back Lateral Defences' is moderately more important than 'Removing Flood Defences' so input a '3' in the relevant cell making the reciprocal value '1/3' [5]. Ranks determined by comparison matrix introduced by Satty (1980).

	Setting back Lateral Defences	Remove Flood Defences	Planting Vegetation in Channels
Setting back Lateral Defences	1	**3**	2
Remove Flood Defences	**1/3**	1	4
Planting Vegetation in Channels	1/2	1/4	1

$$\left(\prod_{j=1}^{n} a_{ij}\right)^{\frac{1}{n}} = (1 \cdot 3 \cdot 2)^{\frac{1}{3}} = \sqrt[3]{1 \cdot 3 \cdot 2} = 1.81$$

Geometric Mean for Each Row to Priority

$$\frac{\left(\prod_{j=1}^{n} a_{ij}\right)^{\frac{1}{n}}}{\sum_{i=1}^{n}\left(\prod_{j=1}^{n} a_{ij}\right)^{\frac{1}{n}}} = \frac{1.81}{3.41} = \mathbf{0.53}\ [6]$$

Model Example

**Showing only part of the model*

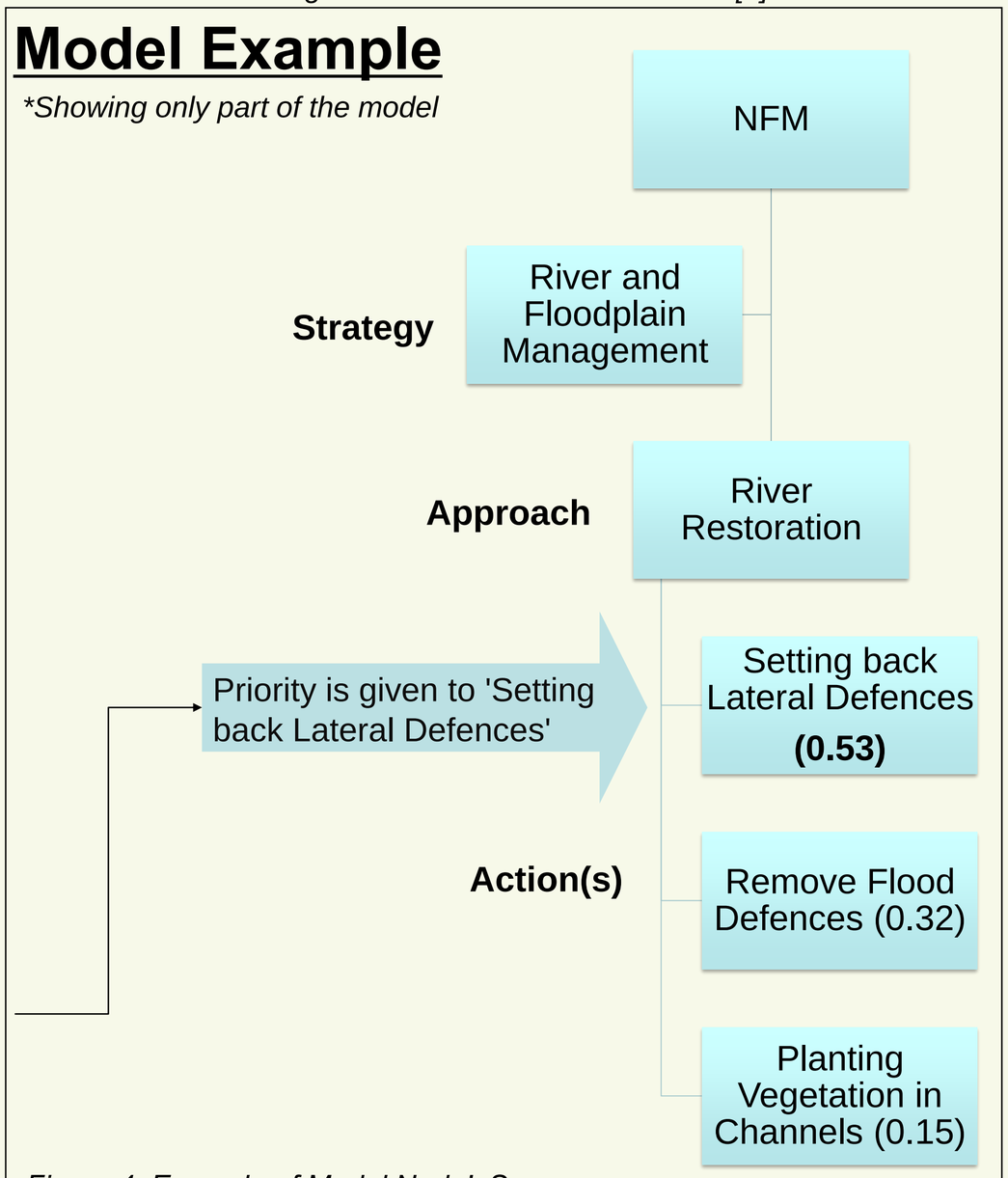

Figure 4: Example of Model Node'. Source: Author 2024, adapted from EA 2017 [7]

References

[1]Turner, S. *et al.,* (2016) 'Research Design for Mixed Methods: A Triangulation-based Framework and Roadmap', *Organizational Research Methods*, 20(2), Pg 243-267
[2] Hicklin, A.J. (2004) 'Flood Management, Communities and the Environment: A Strategy for the Somerset Levels. *Water and Environment Journal*, 18, Pg 20-24
[3] Historic England (2020) 'Farmstead and Landscape Statement Somerset Levels', Swindon: Historic England
[4]Hicklin, A.J & Phil, D. (2004) 'Flood management Community and the Environment: A Strategy for the Somerset Levels and Moors', *Water and Environment*, 18(1)
[5] Satty, T. L. (1980). The Analytical Hierarchy Process: Planning, Priority Setting, Resource Allocation. New York: McGraw-Hill
[6] Matteo B. (2015) 'Introduction to the Analytic Hierarchy Process'. Springer Briefs in Operations Research. P. 83. 978-3-319-125
[7] Environment Agency (2017) 'Working with Natural Processes Literature Review
[8] https://www.somersetriversauthority.org.uk/farmers-invited-to-bid-in-somersets-first-online-auction-for-flood-works/
[9] https://www.bbc.co.uk/news/uk-england-somerset-26080597

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