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Resilience to Fluvial Flooding: Knowns and Unknowns

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Understanding Fluvial Flooding

The construct of “Known Knowns, Known Unknowns and Unknown Unknowns” was used to assess scientific knowledge on fluvial flood generation, management and resilience through a literature review and stakeholder workshop. VOSviewer was used to and visualise thousands of publications in terms of keywords. Four themes emerged from the analysis (Figure 1):

1. **Climate Change (Blue)**
2. **Flood Generation Hydrology (Red)**
3. **Natural Flood Management (Yellow/Green)**
4. **Stakeholder Engagement (Yellow).**

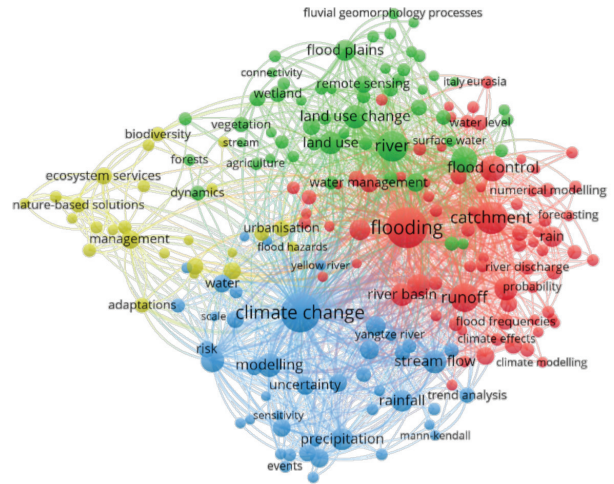


Figure 1: Network Analysis Map based on Keywords

Knowns

Climate Change:

- Expected increase in winter rainfall will increase the likelihood of fluvial flooding.
- The north and west of Scotland will likely experience higher percentage increases in precipitation and flood peaks.

Flood Generation Hydrology:

- Rainfall to runoff is a non-linear process and is catchment and event specific.
- Desynchronising flood peaks from tributaries reduces flow downstream.

Natural Flood Management:

- NFM can slow the flow in small catchments for small storms.

Stakeholder Engagement:

- Intentional stakeholder engagement is essential for flood risk management.

Unknowns

Climate Change:

- How will uncertainty of probabilistic climate modelling be accounted for in fluvial flood management?

Flood Generation Hydrology:

- Can NFM achieve the lag times required to desynchronise tributaries?
- Is it possible to generalize the processes that cause floods which are catchment and event specific?

Natural Flood Management:

- Is NFM effective at larger spatial scales and larger storm events?

Stakeholder Engagement:

- How can Scotland achieve a fair, safe, and affordable level of flood resilience in the long term while meeting other goals?

Please reference this project summary as follows: Pattison I, Lewis CME, Tabas AD (2024) *Resilience to Fluvial Flooding: Knowns and Unknowns Project Summary*. CSPF2023_02. Centre of Expertise for Waters (CREW).

To access the outputs project, please visit: crew.ac.uk/publication/fluvial-flooding-knowns-and-unknowns

RIVER FLOODING

MANAGEMENT AND RESILIENCE

THE KNOWN AND UNKNOWN



Climate change is **HAPPENING** now with **IMPACT** on SCOTLAND

Flooding is Scotland's biggest climate challenge

CLIMATE CHANGE
SPACE SPECIFIC
It depends on the place
What will be the **NEW NORM**?

EFFECT OF EXTERNAL INTERFACES?
UNINTENDED CONSEQUENCES OF
NATURE BASED SOLUTIONS
WHAT ARE THE PUBLIC PERCEPTIONS?
OWNERSHIP RESPONSIBILITY?
IMPACT at a LARGER / CATCHMENT SCALE?
How to QUANTIFY SUCCESS?

ANALYSIS OF LITERATURE
(A.I. ASSISTED - 2000 PAPERS WRITTEN IN LAST YEAR)

BIODIVERSITY LOSS?
FLOOD GENERATION HYDROLOGY
THE ROLE OF CASCADING HAZARDS?
DIFFICULTY OF MODELLING UNCERTAINTY
A NEED FOR OBSERVATION
WHAT IS THE RIGHT MIX OF INTERVENTIONS?

DOMINANT THEMES
CLIMATE CHANGE
HYDROLOGY
CONFIDENCE

CATCHMENT
LAND-USE
SEDIMENT TRANSPORT
NATURE BASED SOLUTIONS
BIODIVERSITY
ADAPTATION
MITIGATION

When will it become DIFFICULT or IMPOSSIBLE to INSURE your HOUSE?



WHY ARE WE STILL BUILDING ON THE FLOODPLAIN WHEN WE KNOW WE SHOULDN'T?

PERSONAL EXPERIENCE AFFECTS PERCEPTION

Consider the circumstances

FLOOD MEMORY IS KEY TO RISK PERCEPTION

WHICH KNOWLEDGE GAPS NEED TO BE ADDRESSED WITH HIGH PRIORITY? HOW?

DECISION MAKING PROCESS CHALLENGES
COMMUNICATION
LIABILITY
FINANCING
STANDARD
DIFFERENT APPROACHES

HOW BEST CAN THE KNOWLEDGE THAT WE HAVE BE TRANSLATED INTO PRACTICE IN THE FLOOD RESILIENCE LANGUAGE IS IMPORTANT

HOW DO INTERVENTIONS WORK TOGETHER?

IMPACT OF SOCIO-ECONOMIC DRIVERS

HOLISTIC APPROACH TO FLOOD RESILIENCE

Join up dots with stakeholders

HOW BEST TO INCENTIVISE ACTION

ADDRESS KNOWLEDGE GAP IN EDUCATION

Reduce future uncertainty with BETTER DATA

CLEAR UNDERSTANDING AND COMMUNICATION OF RESPONSIBILITIES

EVIDENCE BASE-LINE EVIDENCE

ENGAGE EARLY

CO-CREATE FLOOD POLICY

Remove JARGON and ACRONYMS

FLOOD EXPOSURE AND IMPACT INSTEAD OF RISK

GIVE KNOWLEDGE TO COMMUNITIES

LEARN FROM COMMUNITY KNOWLEDGE

Don't build on the flood plain!

UPDATE THE ASSET REGISTRY

STRATEGY FOR LONG TERM CHANGE

INCLUDE IN DECISION MAKING

SHARED



HERIOT WATT UNIVERSITY

CENTRE OF EXPERTISE FOR WATERS

Visual minutes from project workshop.

Graphic Artist: Jenny Capon.