Core outcomes and measures in peatland research and monitoring

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Peatland core domain sets: building consensus on what should be measured in research and monitoring

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Peatland core domain sets: building consensus on what should be measured in research and monitoring

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SUMMARY

It is often difficult to compile and synthesise evidence across multiple studies to inform policy and practice because different outcomes have been measured in different ways or datasets and models have not been fully or consistently reported. In the case of peatlands, a critical terrestrial carbon store, this lack of consistency hampers the evidence-based decisions in policy and practice that are needed to support effective restoration and conservation. This study adapted methods pioneered in the medical community to reach consensus over peatland outcomes that could be consistently measured and reported to improve the synthesis of data and reduce research waste. Here we report on a methodological framework for identifying, evaluating and prioritising the outcomes that should be measured. We discuss the subsequent steps to standardise methods for measuring and reporting outcomes in peatland research and monitoring. The framework was used to identify and prioritise sets of key variables (known as core domain sets) for UK blanket and raised bogs, and for tropical peat swamps. Peatland experts took part in a structured elicitation and prioritisation process, comprising two workshops and questionnaires, that focused on climate (32 and 18 unique outcomes for UK and tropical peats, respectively), hydrology (26 UK and 16 tropical outcomes), biodiversity (8 UK and 22 tropical outcomes) and fire-related outcomes (13, for tropical peatlands only). Future research is needed to tackle the challenges of standardising methods for data collection, management, analysis, reporting and re-use, and to extend the approach to other types of peatland. The process reported here is a first step towards creating datasets that can be synthesised to inform evidence-based policy and practice, and contribute towards the conservation, restoration and sustainable management of this globally significant carbon store.

KEY WORDS: evidence-based policy and practice, evidence synthesis, outcomes, standardisation

INTRODUCTION

The use of evidence to inform policy is often limited by the availability of comparable data that can be integrated across studies and sites. It is rare to find individual studies that conclusively resolve a major knowledge gap or controversy relevant to policy, whose findings are consistently reproduced by others; what Platt (1964) described as "crucial experiments". Instead, knowledge mostly tends to advance through the accumulation of sometimes conflicting evidence via multiple studies of the same phenomena using different methods in different contexts (Poincare 1905, Forscher 1963, Nelder 1986, Pickett 1999, Kemp & Boynton 2021). The most robust and unbiased inferences about the

Why

- It is difficult to combine insights from different studies about the same subject when different outcomes have been measured in different ways or when datasets or models are not fully or consistently reported
- In medicine there are communities of practice that have created processes to develop sets of variables, or “Core Domain Sets” to provide an agreed standardised collection of variables for measuring and reporting.
- Environmental science lacks such a unified process.

How

- Adapted the OMERACT (Outcome Measures in Rheumatology Clinical Trial) approach for identifying, evaluating, and prioritising the core outcomes to be measured and applied it to environmental science and conservation, using peatlands as a case study.

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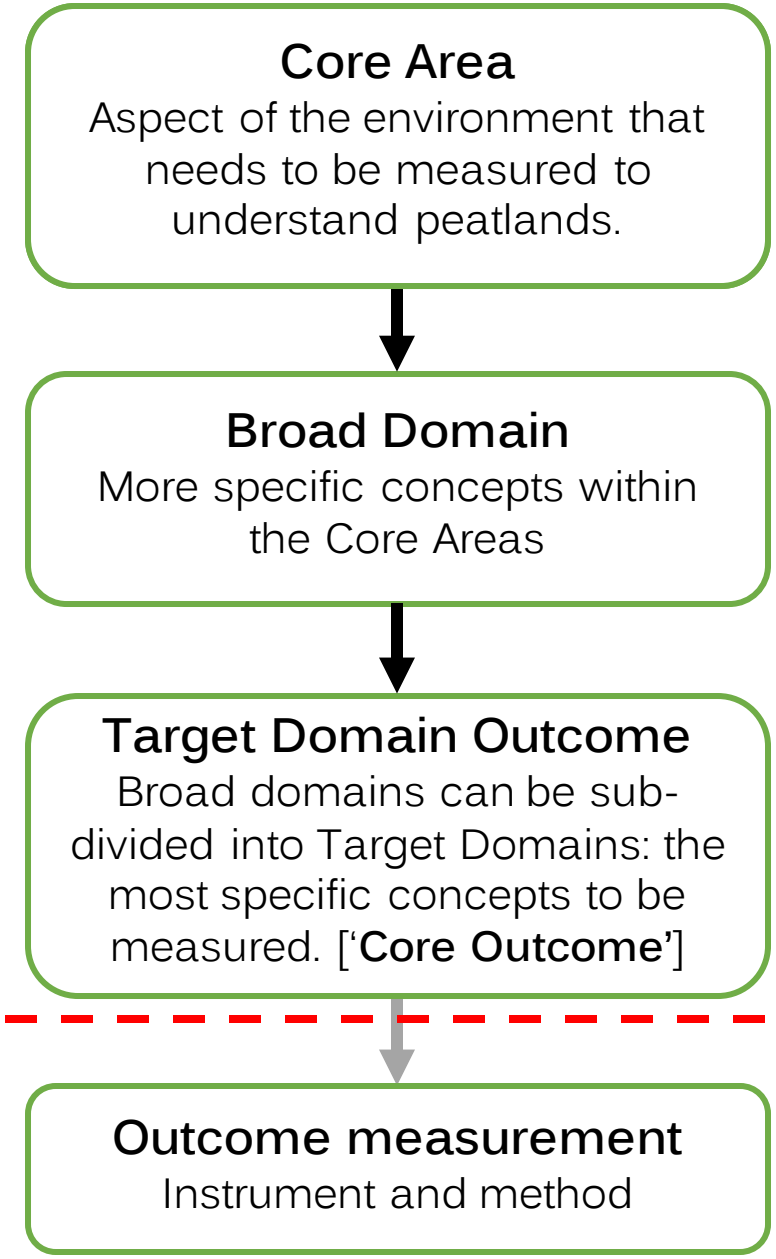
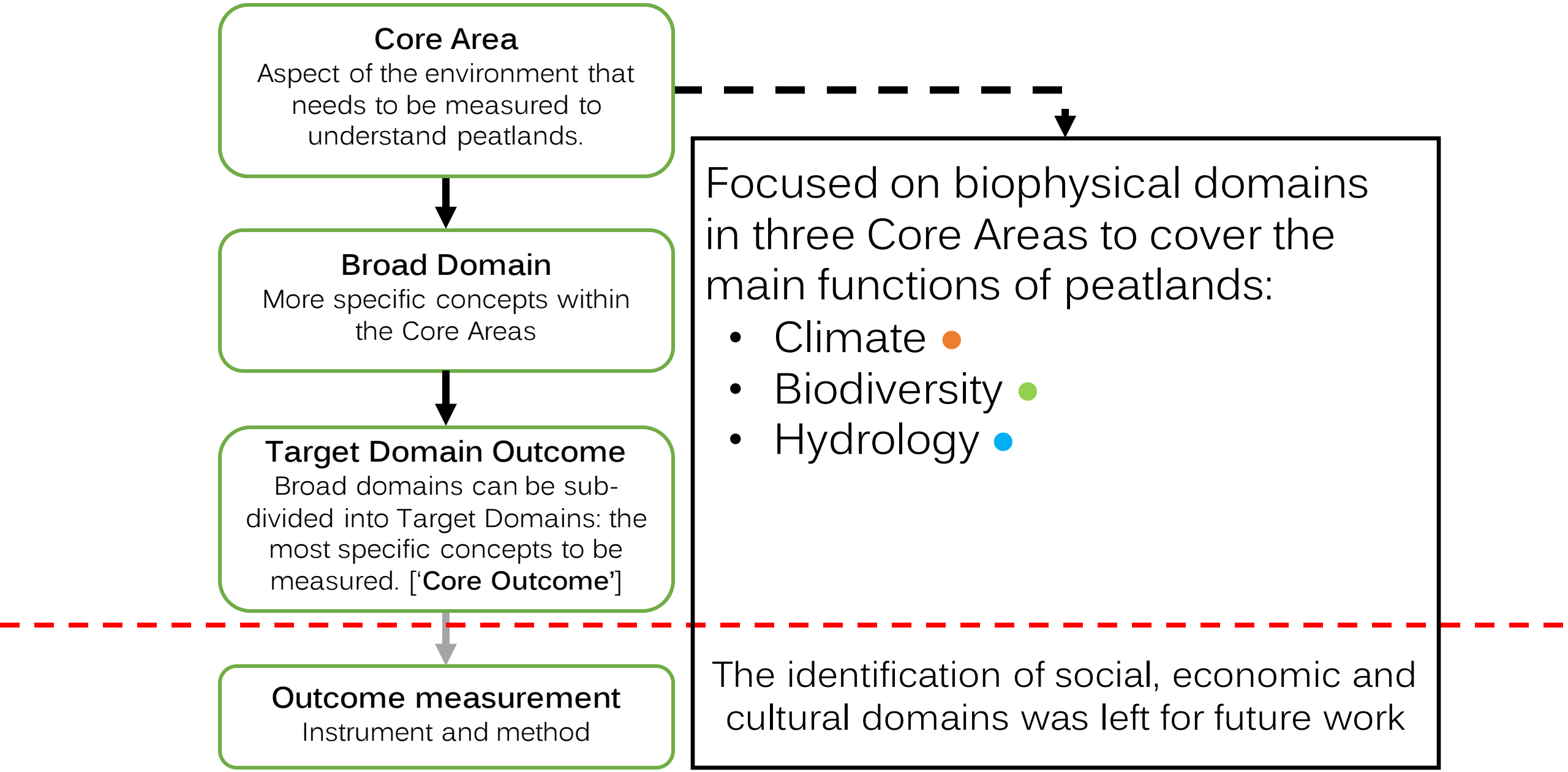
- Application of the framework and process with focus on:
  - *What* to measure and **not** *how* to measure or report it.
  - UK blanket bogs and raised bogs (and tropical peatlands – not covered here)


Core Area
Aspect of the environment that needs to be measured to understand peatlands.
Broad Domain
More specific concepts within the Core Areas
Target Domain Outcome
Broad domains can be sub-divided into Target Domains: the most specific concepts to be measured. ['Core Outcome']
Outcome measurement
Instrument and method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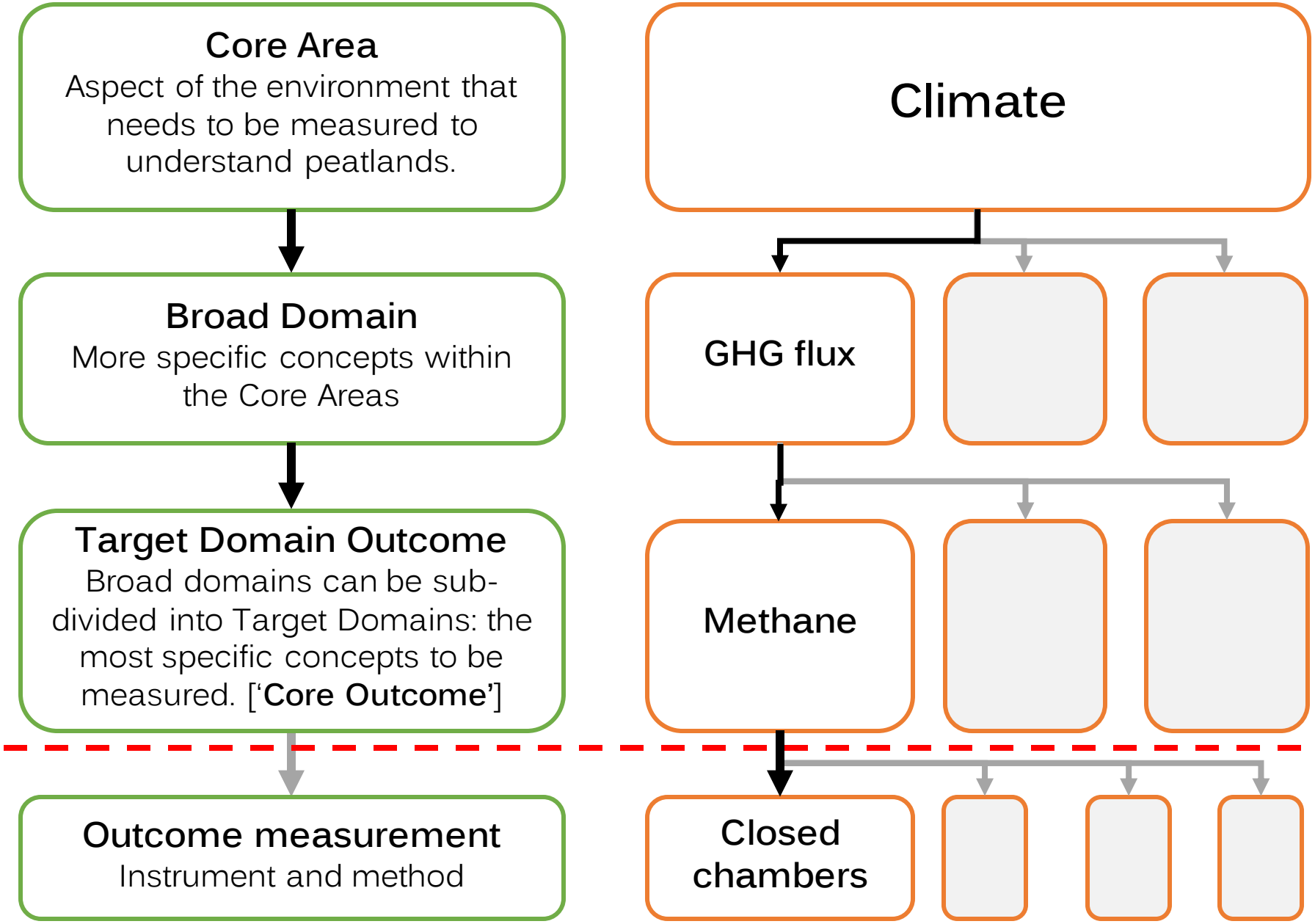
Focused on biophysical domains in three Core Areas to cover the main functions of peatlands:
• Climate
• Biodiversity
• Hydrology
The identification of social, economic and cultural domains was left for future work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Outcome measurement
Instrument and method
Climate
GHG flux
Methane
Closed chambers

Four step method to generate, agree and vote on core domain sets:

1.
Identify peatland experts to participate

Stakeholder analysis to identify peatland experts, followed by a snowball sample

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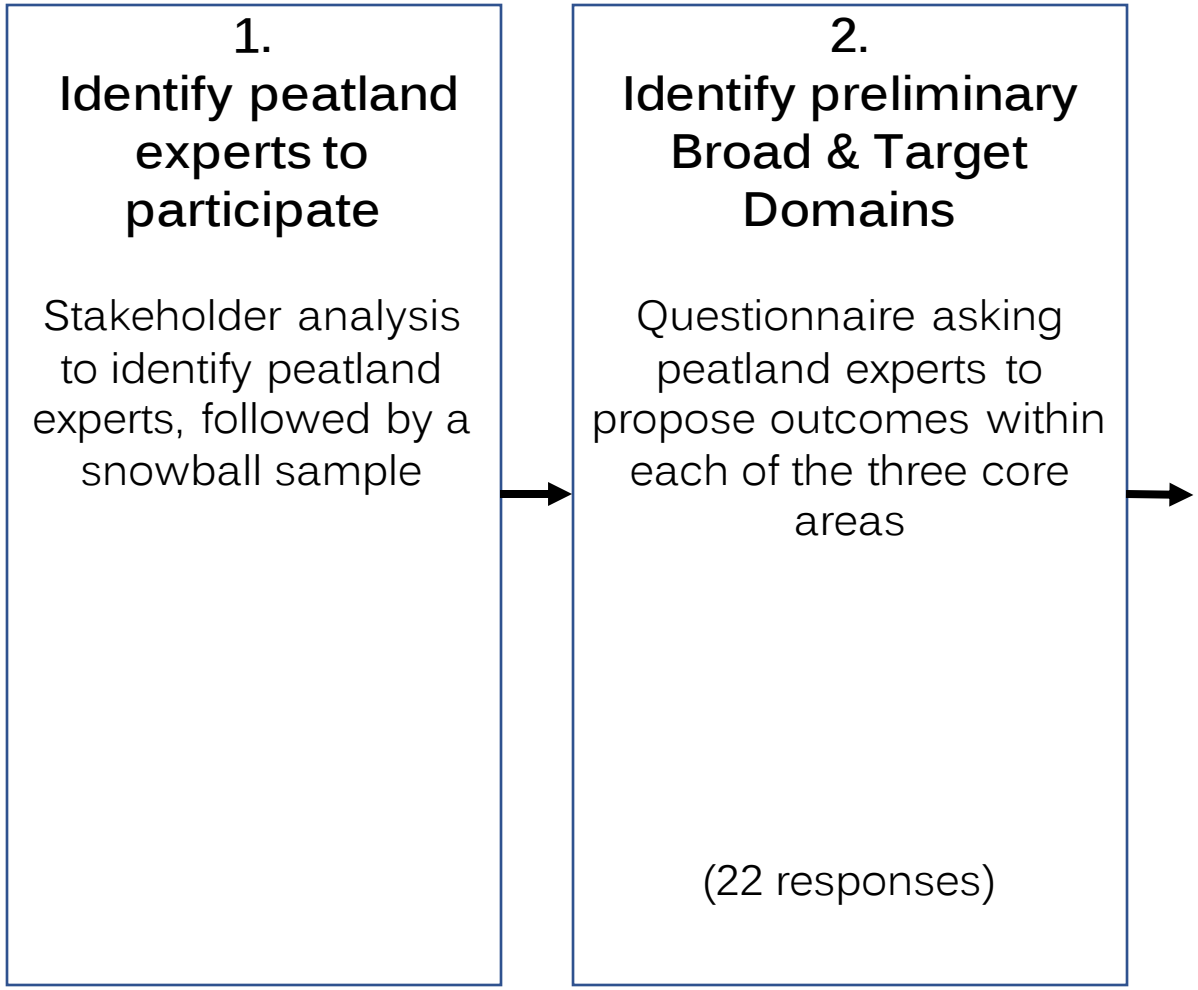

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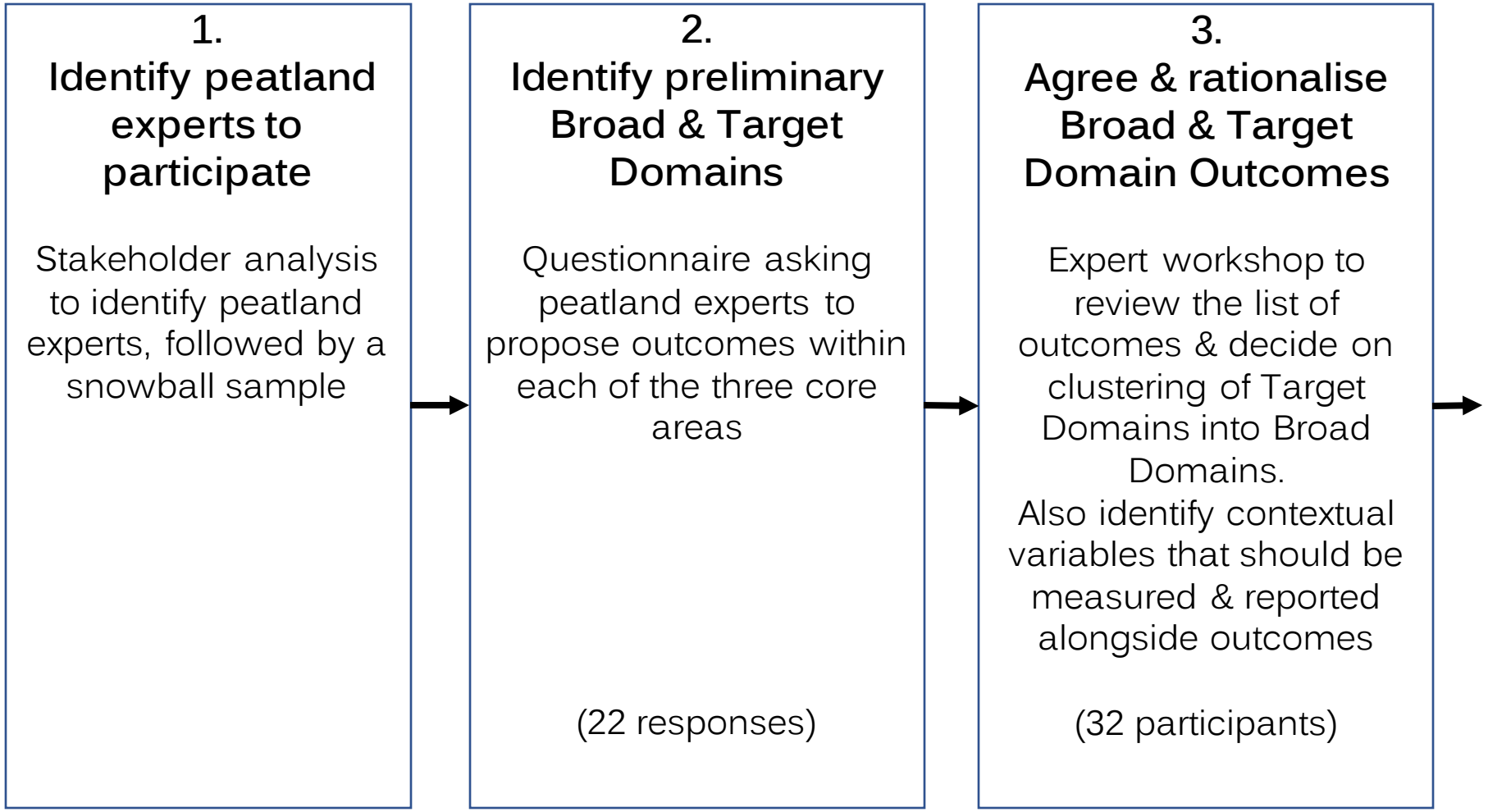

Four step method to generate, agree and vote on core domain sets:

1.
Identify peatland experts to participate

Stakeholder analysis to identify peatland experts, followed by a snowball sample

2.
Identify preliminary Broad & Target Domains

Questionnaire asking peatland experts to propose outcomes within each of the three core areas

(22 responses)

3.
Agree & rationalise Broad & Target Domain Outcomes

Expert workshop to review the list of outcomes & decide on clustering of Target Domains into Broad Domains.
Also identify contextual variables that should be measured & reported alongside outcomes

(32 participants)

4.
Prioritise Target Domain Outcomes & identify Core Domain Sets

Post-workshop questionnaire to identify Core Domain Sets by voting on the importance of each Target Domain Outcome. Priority outcomes are those considered a high priority by ≥70% of the respondents who scored them

(19 full responses)

Core Area = Hydrology (UK blanket and raised bogs)

Only outcomes prioritized by ≥70% participants are shown

Broad Domains

Target Domain Outcomes	Water Table	Water Balance	Hydrological Connectivity	Groundwater Flow	Surface Water	Moisture / water content	Topography
	Water table (WT) depth (direct)	Rainfall	Ditch drainage networks	Hydraulic conductivity	Overland / Surface flow	Canopy vegetation	Location of ditches, gullies & streams
	WT variation	Evapo-transpiration	Gully drainage networks	Infiltration rates	Peak flow	Change in vegetation cover)	Peatland shape and extent
	Mean summer WT depth	Discharge (from catchments)	Streamflow	Water table heights (direct)	Flooded / not flooded		Catchment Area
		Storm intensity	Network index		Change in area of water		Surface flow rates
		Water management records					Landform (microtope etc)

Hydrology - contextual variables

to enable the user to make interpretations and judgements on the peatland where data were generated. Only variables prioritized by ≥70% participants are shown

Hydrology contextual variables
Altitude
Drainage ditches
Rainfall
Site location
Time / season
Topography
Current land use & management
Site history inc. former land use & management

What’s been achieved and learning

- The Core Domain Sets identified provide the best assessment to date of consensus around core outcomes for peatlands.
- The Core Domain Sets form a list that can used to determine the most important outcomes to measure within the Broad Domains and Core Areas of most relevance to a project. It is not expected that every project would measure all prioritised outcomes from every Broad Domain across all three Core Areas.

What's been achieved and learning

- Obtaining sufficient engagement to reach consensus was challenging partially because the multi-criteria evaluation was time-consuming, given the large number of potential outcomes.
- As such, future work could revisit and refine the outcomes (and their definitions) prioritised. For example, water table depth scored 64 % agreement in the Climate Core Domain Set, and so was not prioritised as a core outcome – despite its known role in GHG emissions.
- Additional outcomes need to be prioritised for different peatland types, based on their unique ecology and the drivers of change that they are exposed to.

Going forward…

Two additional steps (not undertaken in this project) are needed to ensure that data are generated and reported in ways that can be effectively synthesised:

5. The (range of) methods required for each Target Domain Outcome
6. Reporting protocols and platforms identified to standardise open data reporting and allow the capture of contextual data (e.g. site location, habitat and environmental condition).

Thank you

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