EKLIPSE energy request: draft methodological protocol v2-04.07.2018

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Summary

We recommend an expert consultation approach with aspects of Fuzzy Cognitive Mapping and Delphi process to address the request. The outputs will consist of a diagrammatic conceptual model of the interlinkages between EU energy policy efforts and sectors, focussing on trade-offs and synergies with the SDGs.

Workflow

Twelve individuals/institutions were identified in the Document of Work as likely possessing relevant expertise to address the request. We would suggest aiming to contact 30 people, due to likely attrition. We anticipate that it would be challenging to identify a larger number of participants, as well as to condense and integrate the resulting models. A snowballing method may be used to increase the number of participants, i.e. asking for further recommendations from contacted individuals. It would also be useful to circulate a call for recommendations within the entire EKLIPSE consortium.

We propose the use of a fuzzy cognitive mapping procedure including elements of a Delphi approach, in which individual experts prepare influence diagrams which are then dicscussed, revised and combined. This will be implemented either through a workshop, or remotely. The steps involved in the workflow are summarised in Figure 1.

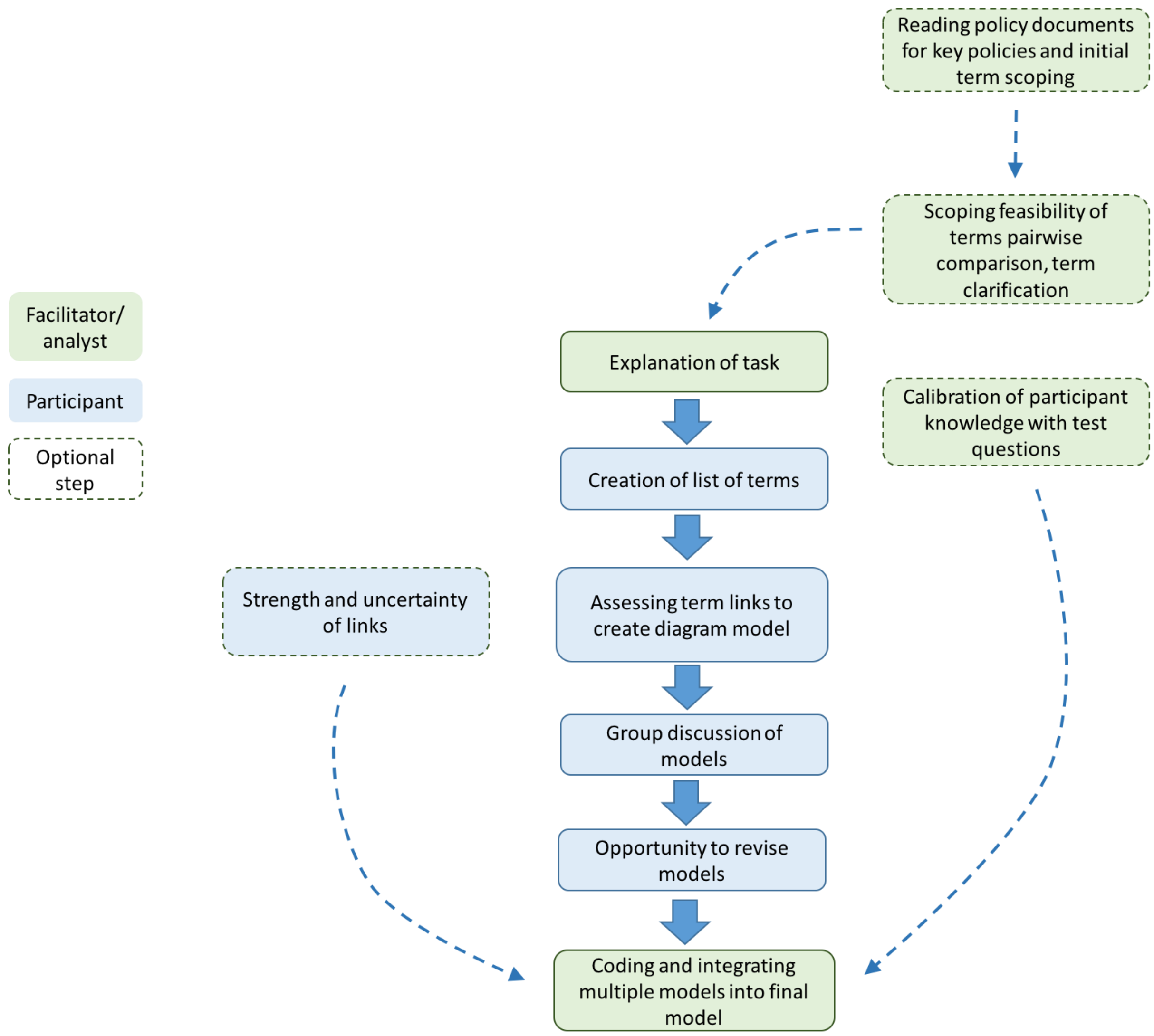

Figure 1: The proposed method is an iterative expert-based consultation to produce a conceptual model diagram of the interactions of EU energy policies on SDG targets and overseas biodiversity.

In the first step, the analyst will identify key EU energy policies from relevant policy documents, as well as the DoW. This is considered important to ensure that the knowledge of these policies, considered highly specialised, is adequately represented in the final diagram. Further, this step will facilitate the preparation of a list of terms as part of the feasibility scoping step. These terms will capture concepts from, broadly speaking, the policies concerned, the techologies involved, the biodiversity impacts, and the SDGs affected. To reduce the challenges likely to arise from integrating multiple models in later steps, the analyst will perform a process of clarifying the types of term which will be elicited from the experts. The goal will be to ensure that elicited terms fall into well-defined categories, e.g. separating processes from outcomes. This could be done by producing a first draft of the conceptual model, with the components discussed within the working group. We suggest the hiring of a research associate on a short-term contract, to carry out this step and contribute to further facilitation and analysis.

The construction of the conceptual model can be done either through first producing a list of key interacting terms, and then systematically assessing the links between each of these, or through freehand drawing of links between terms. It has been shown that pairwise comparison of terms yields more complex and exhaustive maps than freehand drawing of links (Hodgkinson et al 2014). However, with a large number of terms, pairwise comparison becomes complex and time-consuming, leading to likely participant fatigue (e.g. 10 terms have 10^2 = 100 possible interactions which must be scored). Therefore, we suggest a feasibility scoping step in which the analyst identifies a preliminary list of terms. If the resulting number is reasonably small, a pairwise comparison approach will be used. Otherwise, a freehand drawing approach will be used. We also suggest exploring the applicability of the programs available to facilitate FCM, such as Mental Modeler (http://www.mentalmodeler.org/) (Gray et al 2013, Gray et al 2015).

In the next step, the facilitator will prepare a short introduction to the task, including its conceptual scope and practical details. This will be provided to the participants, together with a list of the exploratory questions identified in the DoW to prompt consideration. These questions must be carefully assessed to avoid the influence of ambiguity in phrasing, which could affect results. Any terms which remain ambiguous must be defined.

The facilitator will then ask the individual participants to identify key terms, possibly followed by the linkages between each of them (depending on whether the method chosen is pairwise comparison or freehand/software drawing), and to use this information to construct a conceptual model diagram. This could be done either remotely, in person for all participants in parallel, or in small groups. The parallel in-person approach would require a large number of facilitators. The group approach increases the likelihood that group dynamics will affect the outcome.

The linkages will be coded using a scoring system based on Fuzzy Cognitive Mapping, assigning each linkage a score between -1 and 1. This allows an assessment of the type of effect (positive or negative) and its strength. After the completion of the diagrams, the facilitators will identify the key similarities and differences across them. They will highlight these to the participants in a discussion session, where the participants have the opportunity to engage with each other and build on each others' work. This aspect would be most suited to a workshop structure; this would be easier to facilitate, could reduce attrition, and provide an incentive for participation. However, this step could also be carried out remotely by circulating all the diagrams to the participants. This would allow anonymity of the participants, which is one of the essential components of the Delphi process. The discussion will be followed by another individual session in which the participants can choose to revise their diagrams, allowing for a degree of consensus-building and knowledge-sharing.

Differences in participant knowledge and levels of uncertainty about terms or linkages could be corrected for in a number of ways. One of these is Cooke's method, in which expert outputs are weighted through calibration with relevant test questions to which the answers are known. These questions would be prepared ahead of the workshop and carefully assessed to reflect appropriate domain knowledge. Another approach would be the addition of a confidence value to each of the linkages, estimated by the participant.

The Fuzzy Cognitive Mapping methodology offers techniques that allow for transparent and systematic integration of maps produced by multiple participants (see e.g. Jetter & Kok 2014). For each map, the variables and their relationships can be represented in an adjacency matrix. Integrating maps presents challenges including variations in concepts. One approach to tackle this would be asking participants to suggest synonyms for the terms they include, allowing for easier comparison across participants (Smithin 1980). We also hope to minimise this issue through the preliminary term clarification step. In addition, the final integrated map can then be simplified to focus on the most generally agreed components. This will be undertaken by the analyst. A term's importance in the system can be assessed via the strength of its relationship to other terms, through network centrality measurements; other graph theoretical approaches could provide additional insights (Özesmi & Özesmi 2004).

The final diagram will provide a consensus overview of participants' knowledge of the expected interactions of EU renewable energy policies with SDG targets and, in particular, biodiversity and ecosystem services overseas.

References

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