What is Quantitative Story Telling?

Enabling a new use of science for transdisciplinary reflection on sustainability challenges

Overview

The field of 'Post-Normal Science' highlights the need to think differently about how we produce and use science to support decision-making, particularly when facing complex and urgent sustainability challenges. Quantitative Story Telling (QST) responds to this challenge: it is a methodology designed to help scientists work with stakeholders to prompt reflection on, and potential reframing of, sustainability problems.

QST is a cyclical, iterative process that balances both 'semantic' phases – work with stakeholders to understand how issues are framed - and 'formal' phases – work to quantify these issues. QST incorporates data and expertise arising from different disciplinary perspectives (e.g. social and natural sciences) as well as from stakeholders themselves.

Why do we need QST?

We have many analytical tools and methods to probe different aspects of sustainability challenges, but these tools rarely enable a systemic overview of interlinked issues. It is also rare to reflect on the application of these tools and the accompanying knowledge production processes. As such, many existing methods and tools do not enable a full appraisal of the system nor the quality of evidence in terms of its utility within decision-making processes for sustainability. This selective approach risks causing a very partial understanding of problems, interests and uncertainties involved in sustainability. In contrast, systemic approaches can generate overwhelming complexity that discourage stakeholders from engaging with the issues.

The expected outcomes from QST reflect post-normal ideas about the role and relevance of science, and the scale of current sustainability challenges. As a result, QST is not especially concerned with refining specific aspects of scientific evidence, but instead questions whether existing science-policy consensus ignores existential threats by taking a too partial or narrow view of the challenges faced. The process of QST aims to help scientists and stakeholders to reflect on the situation and its causes e.g. potential problems of policy inertia, the importance of articulating hidden conflicts, and the processes shaping evidence use. Thus, QST can help governance in complexity: providing a structure to navigate complexity rather than trying to control it.

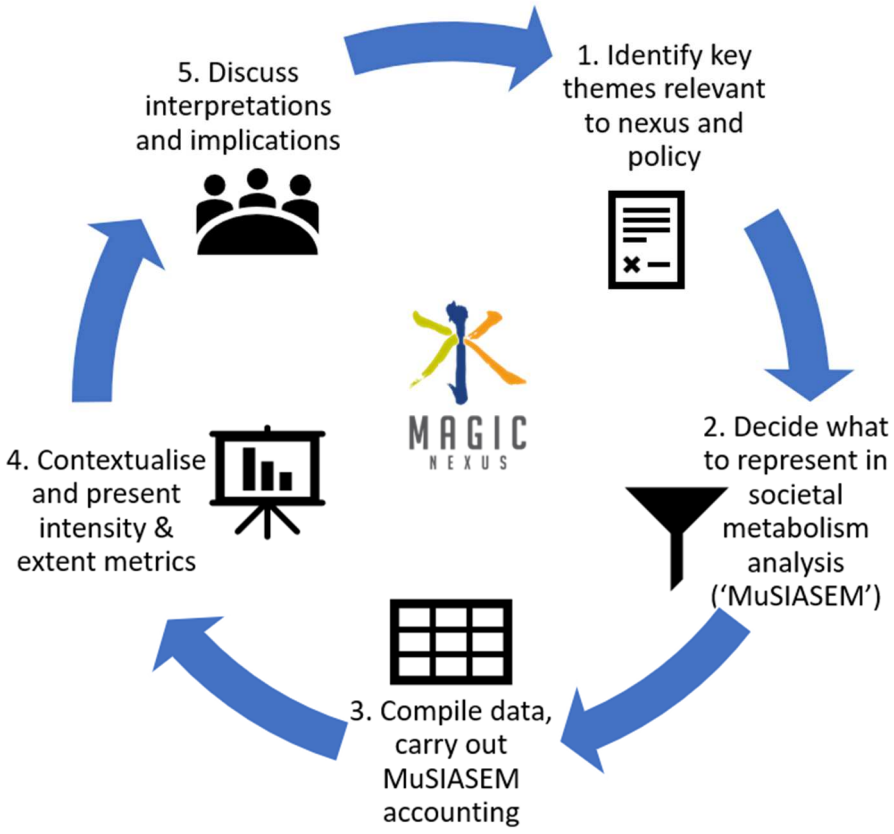
Post-Normal Science (PNS)

Post-normal science (PNS) is an approach to improving the uses of science, especially for issues where "facts [are] uncertain, values in dispute, stakes high and decisions urgent"[1]. In contrast to modernist expectations of how science facts can be used, PNS brings attention to the process of science and knowledge (co)production, its (non)uses and consequences.

PNS recognises multiple, legitimate, non-commensurate perspectives. It encourages the process of science production and use to be carried out with an "extended peer community" rather than seeing non-scientists as passive recipients of scientific knowledge. PNS emphasizes the need for rigorous examination of current framings and interests that dominate decision-making, and their consequences in terms of priorities, perspectives and problems that are articulated (and importantly, what are not articulated). Such reflections and reframings are particularly important when facing complex sustainability challenges which require transformative systemic change [2,3].

What happens in QST?

QST is a cycle. In this diagram, the top represents both the start and potential end point of the cycle, but successive iterations are desirable.



1. Identify key themes relevant to stakeholders. This part of the cycle can draw on analysis of documents as well interviews to identify the issues and ideas of relevance to stakeholders. This establishes if and how problems are represented, and which actors are involved. The outputs shape and initiate the formation of 'Mixed Teams' comprising non-academic stakeholders as well as researchers.
2. Decide what to represent in the analysis. This entails progressively moving from higher-level priorities – i.e. the type and number of themes to analyse – towards decisions on the specific aspects of systems that will be represented – semantic definitions. Further choices also shape the analysis – i.e. setting system boundaries, scales of analysis, functional and structural types, and indicators. The result is a specific shared understanding of what will be analysed.
3. Compile data and carry out 'societal metabolism accounting' (SMA). SMA highlights the 'funds' and 'flows' of resources associated with different activities using MuSIASEM to produce accounting matrices: details of this method are described in a companion briefing[4]. These matrices are generated from quantitative data organised by the SMA framework such that it becomes a complete formal representation of the system of interest. SMA can be used both to explore the current state, in diagnostic mode, or possible alternatives, in simulation mode.
4. Contextualise and present summary metrics that can be used to assess the system's feasibility (within biophysical limits), viability (within socio-economic limits) and desirability (compatibility with societal norms and aspirations). The process of summarising and communicating the outputs also aims to convey uncertainties and sensitivities arising from all parts of the analysis.
5. Discuss interpretations and implications. This stage sees deliberation and interpretation of the significance of the outputs of the QST analysis with stakeholders, and the shaping of any further cycles – with either new themes or alternative cases.

Although these steps are described sequentially, there may be occasions to move backwards and forwards around the cycle to modify the analysis. The intention is not to pursue ever-greater depth of analysis, but to complete the QST cycle and generate meaningful outputs that stimulate deliberations with stakeholders.

Key messages

- QST is a methodology that can support transdisciplinary analysis and reflection on complex sustainability challenges through allowing deliberation on how whole systems are represented, and what metrics mean.
- Many applications of QST have been carried out within H2020 MAGIC, ranging from analysing innovations such as electric vehicles[5], through to appraising the sustainable agriculture in relation to the Sustainable Development Goals[6]. To view all examples, please visit http://magic-nexus.eu/documents-repository

References

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