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Powering Productivity— Mapping Method Report

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Powering Productivity— Mapping Method Report

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Economic
and Social
Research Council

POWERING PRODUCTIVITY
—EXPLORING THE LINKS BETWEEN ENERGY, WELLBEING AND PRODUCTIVITY
ES/S015124/1

www.cusp.ac.uk/powering-productivity

The Centre for the Understanding of Sustainable Prosperity is funded by the UK's Economic and Social Research Council (ESRC). The overall research question is: What can prosperity possibly mean in a world of environmental, social and economic limits?—We work with people, policy and business to address this question, developing pragmatic steps towards a shared and lasting prosperity.

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1 | About this report

This report describes the integration of mapping methods and desk-based research used in the ESRC funded *Powering Productivity* research project. The project applied a mixed method combination of thematic literature review with expert elicitation within a participatory systems and knowledge mapping process to survey and visualise the evidence base and the links between 1) energy and productivity and 2) wellbeing and productivity. The report describes the value of applying systems-oriented design mapping methods to synthesise and visualise knowledge from different domains to communicate complex ideas. After theorising systems mapping methods, the report explains how applied participatory mapping methods were used to enable the co-production of systems maps, to inform the development of two static and interactive knowledge maps, and to inform two literature reviews. This is followed by reflections on these processes. The conclusion provides a summary of methodological achievements, challenges and recommendations.

2 | Project Overview

The research design consisted of a combination of thematic literature reviews with participatory systems mapping workshops with subject experts. Two distinct research projects were conducted, each with its own workshop: 1) Energy and Productivity (workshop in July 2019) and 2) Wellbeing and Productivity (workshop in September 2019). The information gathering and co-production activities were followed by the development of two reports and the design of interactive knowledge maps as freely available resources online. The research was developed to ensure that the mapping processes captured relevant and useable knowledge. Stages in the research design are illustrated in Figure 1.

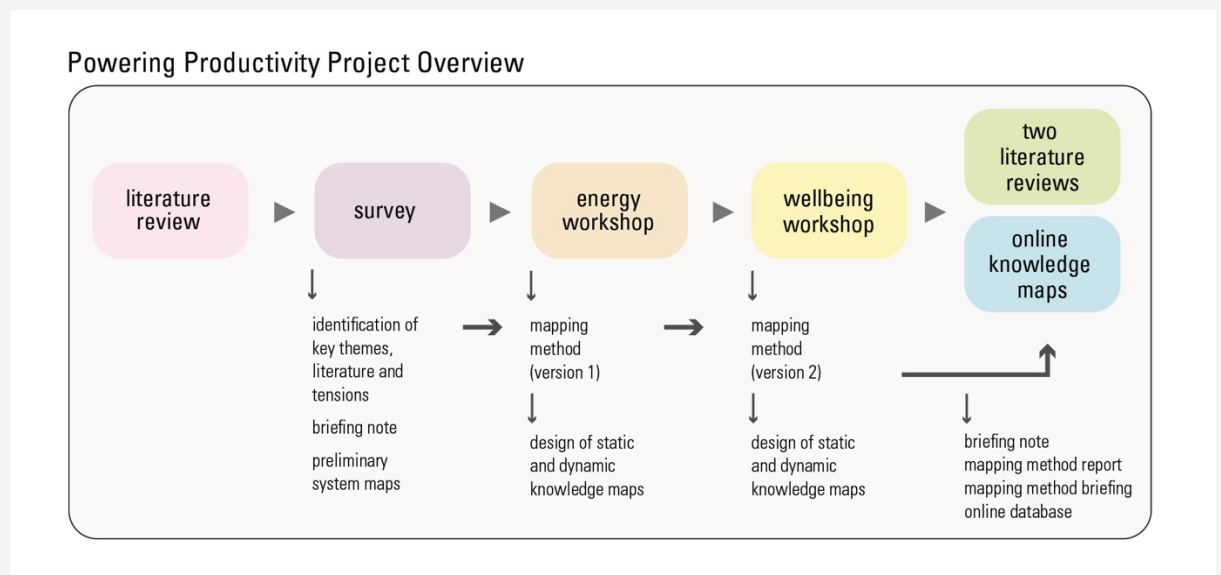


Figure 1. Research design

The mapping processes began with questionnaires sent to potential participants/experts to identify key themes, literature and research groups, exploring energy and productivity and then wellbeing and productivity in the UK. Participants were initially drawn from the networks of team researchers, and contacts at the ESRC. Recruitment then followed a snowballing methodology. In total, 58 people were invited to participate in the energy study. Of these 32 completed the survey, and 12 (not including research team members) attended the workshop. 53 people were invited to participate in the wellbeing study. Of these 20 completed the survey, and 7 (not including research team members) attended the workshop. Participants were asked:

1. *What do you believe are the 3 key themes in well-being/energy and productivity research?*
2. *What are the 3 key articles, books, or grey literature we should consult for our literature review?*
3. *Are there any key authors/research groups you think we should approach to be part of this project?*

Survey responses informed the development of initial literature reviews (carried out by the review teams, based at the University of Surrey). Based on these initial searches, briefing notes and preliminary system maps were produced. The mapping methods research group (located at the Loughborough University) organised and facilitated the two participatory systems mapping workshops. The workshops brought together experts from diverse academic disciplines. Participants were asked to read the briefing paper ahead of the workshop and to come prepared to contribute to participatory mapping processes.

The aim of the workshops was to facilitate interdisciplinary discussions and capture key themes using systems mapping methods. Ahead of the workshops, participants were sent a briefing note summarising the results of the surveys and preliminary literature searches. At the workshops, participants worked together to create foundational structures to visualise knowledge. Specific attention was paid to significant relationships and tensions within the themes under investigation. Workshop participants created the visual frameworks that later informed the development of two knowledge maps as final deliverables. The initial system maps co-produced at the workshops were refined in an iterative process with feedback from the wider research group at the University of Surrey. Out of this process came the static knowledge maps which were then transformed into interactive digital visualisations. The literature review group used the initial maps to guide their writing and searching processes. Here, the maps and accompanying discussions were particularly useful in highlighting new linkages.

3 | Transdisciplinarity with Systemic Design

The relationships between energy and productivity, and wellbeing and productivity are inherently interdisciplinary. Communicating across disciplines can be difficult due to different disciplinary vocabularies, assumptions, epistemologies and priorities embedded in distinct disciplinary traditions. Systemic design offers visual strategies to bridge disciplinary silos. The system-oriented design community has developed mapping strategies that capture complexity by visualising relationships,

dynamics and tensions across knowledge traditions. Systems oriented design (Sevaldson, 2013) combines design practices and systems work in ways that are especially well-suited to capture complex interactions across domains, sectors, spaces and scales.

This project uses participatory systems mapping methods in the systemic design traditions. Systems mapping facilitates interdisciplinarity discussions and knowledge exchange. Two workshops created spaces to bring participants from diverse academic contexts together to co-create systems maps. With interdisciplinary expertise available at each workshop, a process was designed to review what information should be prioritised, organised, visualised and documented in the maps. During the workshops, the maps functioned as a focus for criticism, discussion and a catalyst for the emergence of new ideas. Participatory mapping enables actors with different backgrounds to see connections that they had not previously imagined. The mapping workshops helped to integrate knowledge from different domains in ways that would be difficult to achieve through a standard literature review.

4 | Systems Mapping Methods

Systems mapping is an umbrella term that refers to different strategies for synthesising knowledge within complex system approaches. Systems mapping uses visual strategies and devices to graphically display relationships between elements, spaces, actors and ideas – to reveal contextual and dynamic information. System-oriented designers and lay-designer participants use systems mapping methods to support relational reasoning (Corner, 1999, 251), make visible what is otherwise inaccessible (Ibid, 225), facilitate sense-making and help to build shared-understanding across knowledge boundaries (Comi, Bischof, & J. Eppler, 2014, 8). Mapping is a means configuring and reconfiguring existing conditions in ways that facilitate the emergence of new ideas (Boehnert 2018, 371-372). Ultimately systems mapping aims to increase the quality of knowledge on issues of complexity.

Participatory mapping exercises enable knowledge exchange where system maps provide a common conceptual focus. The use of visuals in mapping practices can increase mutual understanding, foster experiential knowledge, and allow participants to connect tacit with explicit knowledge in ways that nurture new capacities to externalise tacit knowledge (Comi et al., 2014, 7; Mengis, Nicolini, & Swan, 2018, 298). The systemic design methods in this research supports the integration of ideas, data and evidence with other forms of knowledge by involving different stakeholders (O'Donnell,

Atkinson, Freebairn, & Rychetnik, 2017, 206). Systems mapping is made more robust by including contributions from all stakeholders, fields and sectors relevant to the themes or problems under investigation. System-oriented design comprises of a variety of mapping methods, including participatory gigamapping and knowledge mapping.

4.1 Gigamapping

Gigamapping is a systems approach to mapping that aims to increase the richness and diversity of knowledge on issues of complexity. Gigamaps are large-scale maps that work across different layers and scales to display relationships. Gigamapping creates and captures dialogue across communities, disciplines and sectors that is particularly well-suited to capture dense information, dynamics and complex relationships (Jones & Bowes, 2017, 230; Sevaldson, 2011, 2, 4; 2015, 3). The participatory design of extensive systems maps aim to display states of affairs and build problem fields or *problematiques* (Sevaldson, 2015, 3). Gigamapping is an open and participatory mapping method that creates rich contextual information by avoiding preconceived structure. Systemic design facilitators facilitating gigamapping do not strive for refined, logical and ordered maps – but to reflect the messiness of wicked problems. This mapping practice is used in management, academia, knowledge organisation, planning and implementation. Design facilitators are not looking to achieve consensus within the gigamap, but rather to acknowledge multiple perspectives and dynamics in intersecting systems (Sevaldson, 2015, 5). The maps can function as a basis to uncover leverage points, tense relationships and opportunities for interventions. Mapping is used in this project as a means to visualise key research areas and tensions at the intersection of energy and productivity, and wellbeing and productivity. An example of a gigamap is illustrated in figure 2.

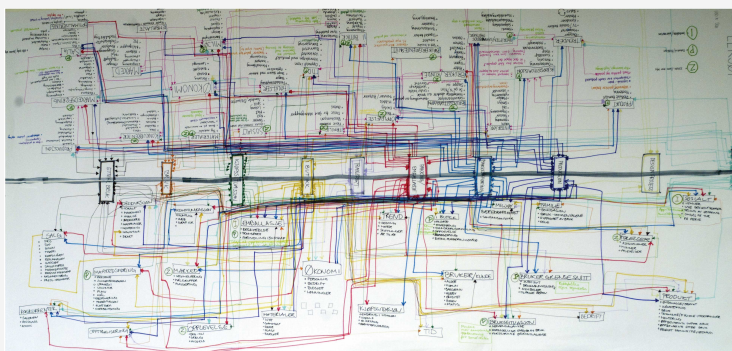


Figure 2. Gigamap example (image sourced from systemsorienteddesign.net)

4.2 Knowledge Mapping

Knowledge mapping is a method that graphically represents elements from different domains in a structured manner to reveal relationships (Hashemi et al. 2013, 45), to suggest particular narratives and to develop meaning (Robinson & Petchenik, 1976, 74). Organising complex information in ways that generate meaning make it easier to become applied (Boehnert, 2018, 176). Knowledge maps “capture not just (descriptive) facts or numbers, but contain also prescriptive and prognostic insights, principles, basic assumptions and relations. They are used as communication devices in order to trigger sense making activities and to motivate viewers to re-construct meaning” (Eppler & Burkhard, 2007, 113). Examples of knowledge maps are: concept maps, mind maps, cognitive maps, topic maps, causal loop maps and flow maps. Knowledge maps can also include other graphic means to convey knowledge, such as visual metaphors and heuristic sketches.

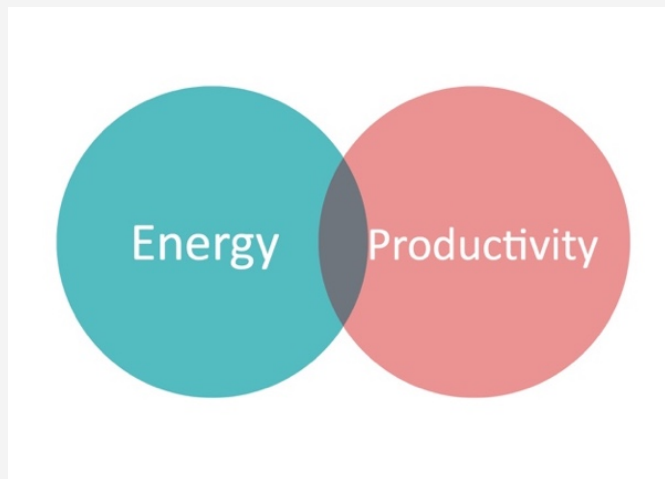
The knowledge mapping method in this project combines the participatory system mapping elicitation phase (which used gigamapping and other visualisation techniques) and a representation phase (post-workshops). The gigamaps developed in the workshops were used as the basis for static knowledge maps that later became (by means of a design process) interactive online knowledge maps. With this method we co-produced new ways of representing knowledge generated at the workshops and then new means to transfer knowledge by means of online knowledge maps.

4.3 Systems Mapping Workshops

The two mapping workshops facilitated in-depth discussions of the themes identified in the initial literature review, and created space to capture insights on large sheets of paper. Systems-oriented design strategies were adapted in the two workshops to enable participants to visualise their ideas on key relationships and tensions in the intersection of energy and productivity, and then wellbeing and productivity. The first workshop used a bespoke gigamapping process that was revisited and further refined for the second workshop (Figures 5 and 12 summarise these processes). Changes were proposed to give more structure to the mapping processes in workshop two. Reflections on processes are presented in sections 5, 6, and 8.

5 | Workshop One: Mapping Energy and Productivity

The first workshop was held on 3rd July 2019, with a duration of six hours. Twelve participants attended the session. The majority were energy specialists or economists. The energy experts ranged in focus from those with engineering backgrounds to those who focussed on social science and policy aspects of energy provision. Economists came from a variety of schools of thought, including ecological, post-Keynesian and mainstream. A policy maker, a natural scientist with a background in climate modelling and a system dynamicist were also present.



Figures 3a+3b Initial visualisations in preparation for Workshop One: Energy and Productivity Venn diagrams.

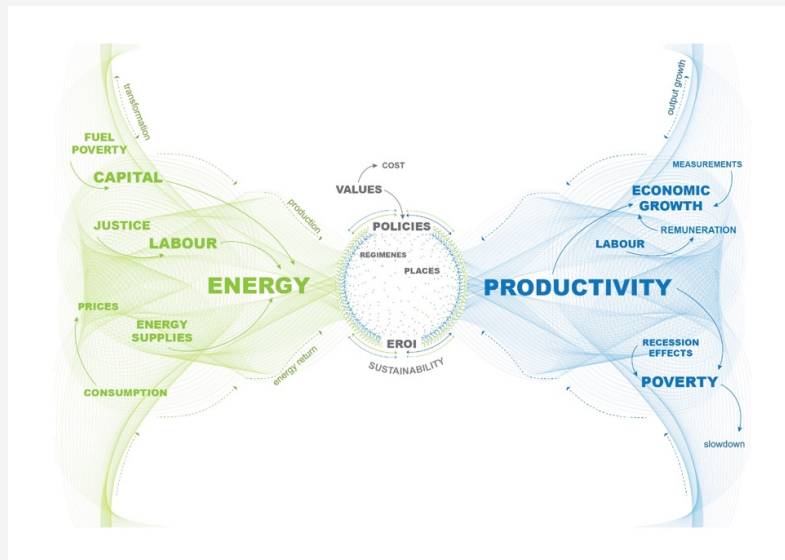


Figure 4. Initial visualisation of Workshop One: Energy and Productivity flow visualisation

Participants received a briefing note with the initial themes and two initial visualisations (Figures 3 and 4) before the session. The workshop process included an introduction, two open gigamapping sessions, a session for analysis, plenary discussions and a debrief (see workshop process overview in Figure 5). Throughout the day, participants were prompted to add key literature and authors to extend the database. Post-it Notes were used to document this contribution.

Workshop One: Mapping Energy and Productivity

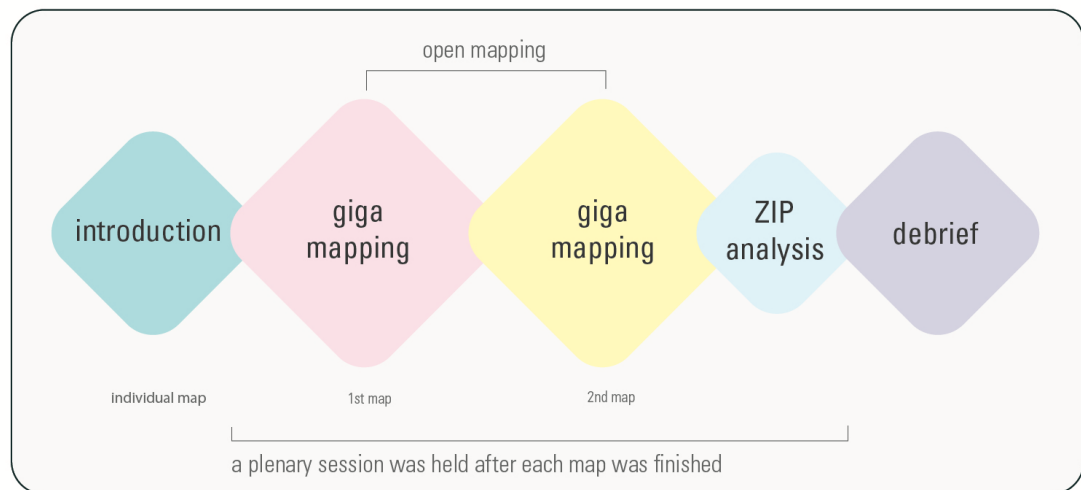


Figure 5. Workshop one process overview

5.1 Workshop One: Introduction

The workshop started with a session that included an overview of the themes and research questions, along with an introduction to participatory systems mapping methods. After short presentations on the workshop themes and mapping methods, the participatory processes started. Participants were asked to select a statement as a catalyst for the first plenary session (figure 6). The introductory session finished with time for participants to sketch their ideas individually (on their own) and then share their first individual visualisations with the room.



Figure 6. Statements presented to the participants as an icebreaker

The individual visualisations/maps gave participants time to focus on what they hoped to bring to the workshop and start making visual sense of their ideas on the research themes. This session occurred immediately after the initial slideshows where strategies of systems and knowledge mapping had been introduced. These first visualisations helped participants ‘break the ice’ with open mapping. Some examples of the individual maps are presented below (Figures 7 and 8).

5.2 Workshop One: Gigamapping

Gigamapping is a participatory process where large maps are created as intentionally vague artefacts without imposed rules or structures.

Gigamapping methods were introduced in the slideshow (see gigamap example in figure 2). Participants are encouraged to frame their ideas visually and adapt the map according to their viewpoints and priorities.

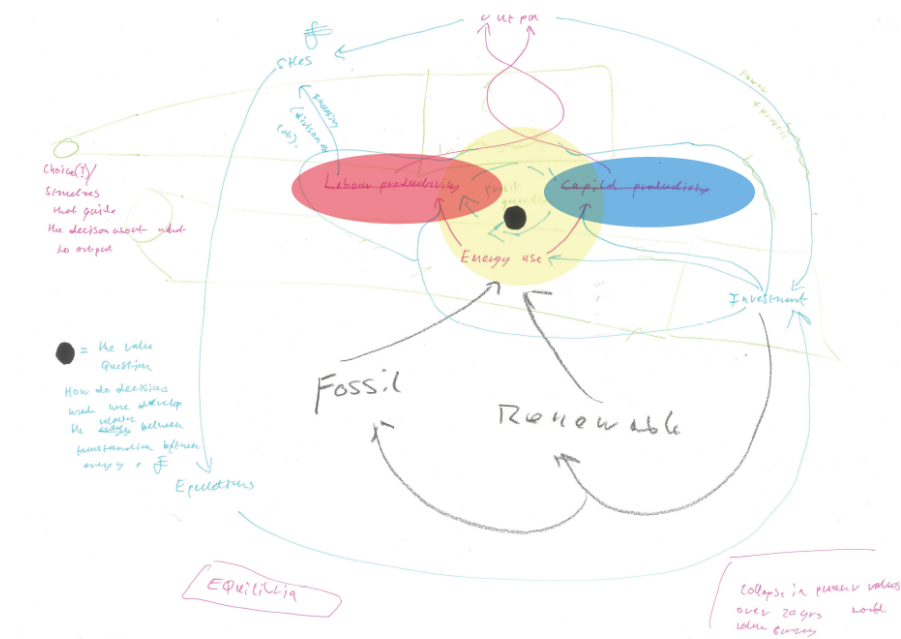


Figure 7. Initial individual sketch – 1 (with visual coding added post-workshop)

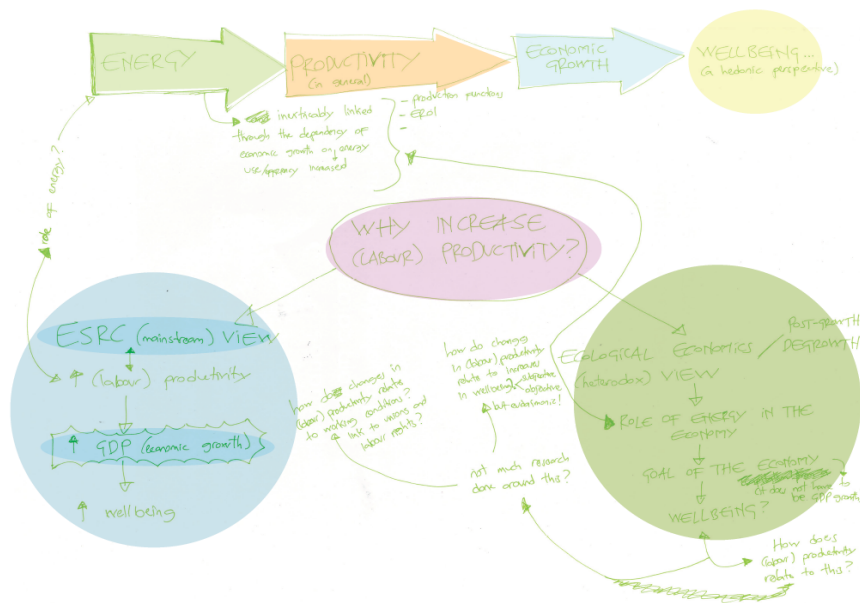


Figure 8. Initial individual sketch – 2 (with visual coding added post-workshop)

Gigamaps are developed with iteration processes to enable emergent ideas to be captured on the large sheets of paper. People who do not regularly visualise information typically require guidance when facing blank sheet of paper, and the support of systemic design facilitators is essential. Two groups were formed (created with the aim of having a diversity of backgrounds in each group). Each group had its own design facilitator. While gigamapping works best when each participant draws/writes their own

thoughts, design facilitators can encourage participation and they can also help capture the ideas of individuals who are hesitant to draw directly onto the map-in-progress. Facilitators should attempt to make ensure the map reflects all ideas in the group and that no one is able to hijack the session. Two rounds of gigamapping with plenary sessions after each were conducted.

5.3 Workshop One: ZIP Analysis

After two gigamapping sessions, a ZIP analysis method was used to attempt to reveal tension points, research hotspots and potentially identify leverage points and opportunities for interventions (Sevaldson, 2019). The ZIP method stands for **Z**oom (i.e. points that need more research/ information), **I**ntervention or **I**nnovation (i.e. something that can be done, create new relationships) and **P**ain or **P**otential (points of tension). Participants identified ZIP points in the final gigamaps with the use of translucent plastic shapes (of three different colours) that were be placed over particular parts of the map. A final plenary session was conducted to share the results of the ZIP analysis.

5.4 Workshop One: Debrief

The session closed with reflections on the day's learnings and discussions on main findings. There was also an opportunity to provide feedback on the workshop process itself.

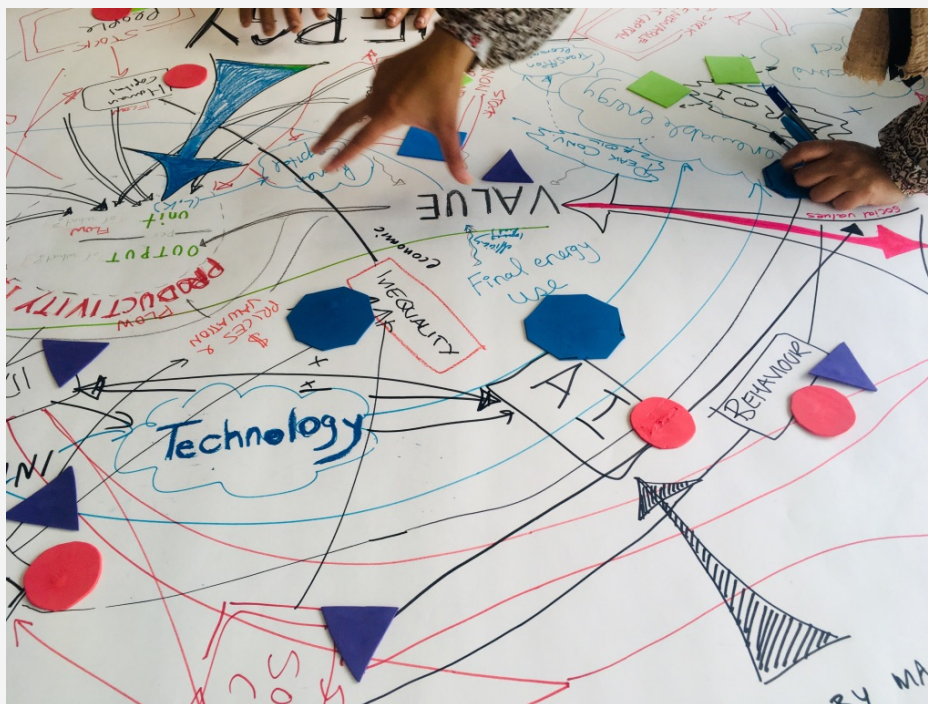


Figure 9. The final gigamap selected from the first workshop.

5.5 Workshop One: Results, Reflections and Feedback

The workshop resulted in a collection of individual maps, several gigamaps and dozens of Post-it Notes with literature suggestions and theme notes (figures 9 and 10). One of these gigamaps was chosen to become the basis of the final digital product.

The workshop day felt productive as ideas were exchanged, debated and recorded as system maps. Time limitations restricted further iterations of the maps. An extended period of introspection and reflexivity would have helped. Nevertheless, the maps reflected the expertise in the room and ideas that would not have emerged without the meeting of different disciplines in conversation.

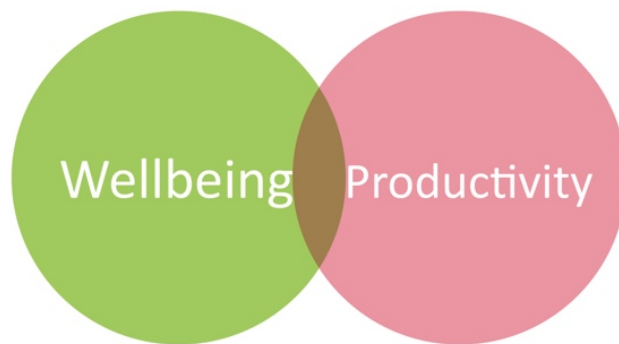
While the feedback was positive, in the second half of the day, participants expressed uncertainty and asked for more clarity on the process. In response, the facilitators used design tools to booster confidence (simple visual props such as stickers, ordering systems and the use of visual metaphors helped). One group opted to reconsider the individual sketches produced at the start of the day to ensure all views were included. The other group started a new map entirely. In both cases, the facilitators helped populating the gigamaps based on directions from individuals in the group. This is unideal and the strategy needed to be revised for the second workshop. Despite the difficulty encouraging direct participation in the sketching activities, there was significant enthusiasm in the room on the ideas that were developed and captured in the maps.



Figure 10. The final gigamap selected from the first workshop.

6 | Workshop Two: Mapping Wellbeing and Productivity

The wellbeing and productivity workshop was held on the 11th of September 2019. Eleven participants attended. The majority were either economists or psychologists. The economists represented the post-Keynesian, ecological and mainstream traditions. The psychologists were from organisational and environmental psychology. There was a design researcher with expertise in design for wellbeing and a management researcher specialising in human resource management.



*Figures 11a + 11b.
Wellbeing and
productivity Venn
diagrams*



6.1 Workshop Two: Introduction

The agenda and structure of the workshop was revised to address difficulties identified in the first workshop. In response, the second workshop included more design props and design tools. Prescriptive tools and templates from the Systemic Design Toolkit (Van Ael, Vandenbroeck, Ryan, & Jones, 2018) were integrated in two mapping sessions of this workshop. The configuration of the workshop is presented in Figure 12.

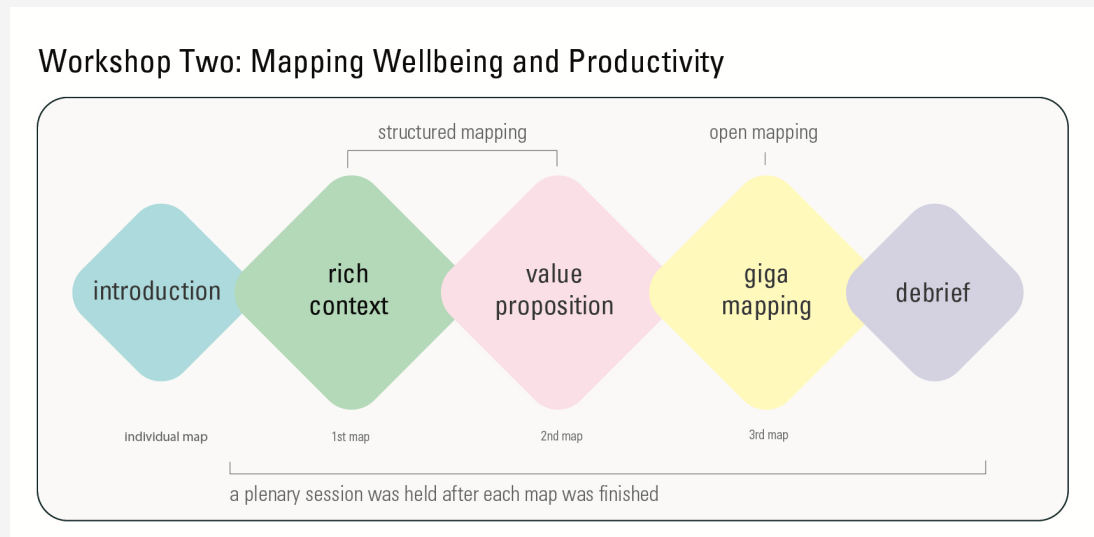


Figure 12. Workshop two process overview

As in the first workshop, participants received a briefing note with the initial themes and initial visualisations (Figure 11a & 11b). The introduction included an individual mapping session, conducted in the same way as the first workshop. Once again, the individual maps demonstrated to be a useful strategy to introduce mapping and collect initial thoughts from participants (Figure 13). Post-it Notes were used to collect new literature for the database and feed ideas into to the research process.

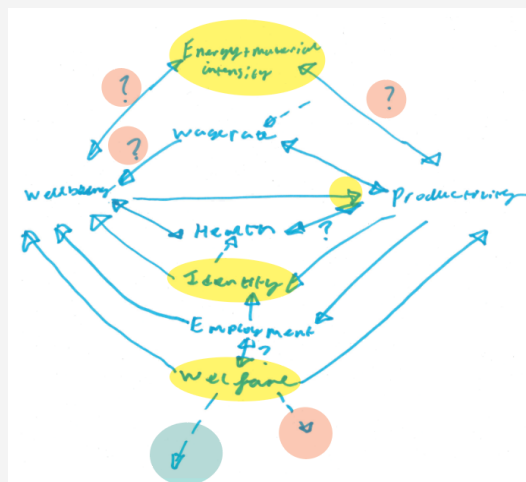


Figure 13. Individual sketch

6.2 Workshop Two: Structured Mapping

Two groups were formed for the participatory processes. Each group had their own facilitator. The design facilitation group (Joanna Boehnert and Cecilia Landa-Avila) were joined by Philippe Vandenbroeck, one of the creators of the Systemic Design Toolkit. For this workshop, participants were encouraged to change groups during the sessions if they felt so inclined (this strategy is used to make sure each person is able to participate in the conversation they consider most relevant to their own interests). The participatory session started with a structured mapping process to help participants become more comfortable with visualisation processes before the open gigamapping session. The aim was to provide guidance within structured explorations of the themes. The systemic design templates “Rich Context” and “Value Proposition” were selected for preliminary mapping exercises (Van Ael et al., 2018).

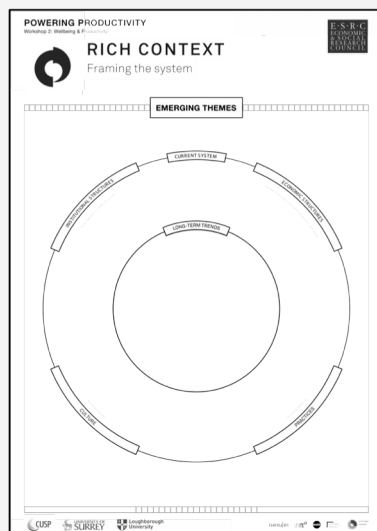


Figure 14. Rich context template

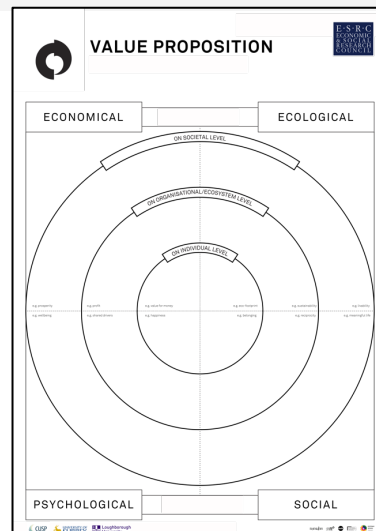


Figure 15. Value proposition template

The two templates selected from the open source *Systemic Design Toolkit* (Van Ael et al., 2018) were modified (in Illustrator™) for the purposes of the workshop. The first exercise used the rich context template. This design tool encourages the generation of shared understanding of a theme by mapping current practices, cultures, economic and institutional structures in terms of long-term trends, current conditions and emerging initiatives (figures 14-16). Participants were also prompted to identify relationships between elements. The second exercise used the value proposition template. This tool helps participants list the benefits of interventions for individuals, organisations and society (figures 15-17). The assumption was that by sketching the areas in which we look for value, new themes could potentially

emerge. The templates were both selected to encourage explorations of new links in the research themes.

6.3 Workshop Two: Gigamapping

In this workshop, the gigamapping took place after two structured mapping processes. The templates supported participants in their confidence to organise information visually. This led to more active participation in sketching and the development of denser gigamaps with a somewhat more regimented structure (see figure 18).

6.4 Workshop Two: Results, Reflections and Feedback

Results from the second workshop included individual maps, dozens of Post-it Notes (with new literature and critical authors), two rich context maps (figures 14+16), two value proposition maps (figures 15+17) and two gigamaps (figure 18).

The templates helped expand the themes that participants covered in conversation and visualisations. Customised stickers were used to help participants gain confidence and prompt them to experiment with different arrangements in the visual mapping process. Some participants found the value proposition template difficult. For others, the different scales (individual, organisational and societal) and the various dimensions (economic, ecological, psychological and social) initiated new discussions on specific themes and raised new questions.

The strategies used in the second workshop allowed participants to become more confident with visual tools and processes. The refined facilitation process also helped participants not only to identify new themes but to identify more links between elements. More participants were active in the mark making aspect of the mapping processes than in the previous workshop where design facilitators often needed to interpret and translate conversations and instructions to create visual outcomes.

The combination of structured and open mapping strategies proved to be effective. The templates enabled participants to map initial perspectives as they intersected with other ideas brought to the table by other participants. Participants faced less uncertainty with the templates and this helped expand the range of themes discussed. One group used the heading as prompts to identify new ideas. The other group decided to explore questions in each category.

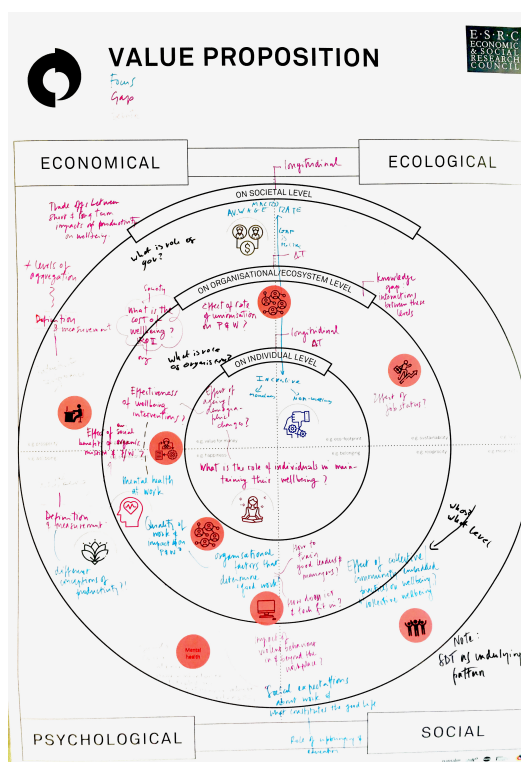


Figure 16. Rich context map – populated (top)

Figure 17. Value proposition map – populated (left)

7 | The Final Knowledge Maps

The final knowledge maps were developed based on a single gigamap from each workshop (figures 19+20). Several rounds of feedback enabled the progressive refinement of two static knowledge maps. Interactive maps were generated based on these two static maps. The online interactive knowledge maps display key themes in the intersection of energy, wellbeing and productivity and provide an ongoing resource for researchers, policy makers and the public. The maps are sharable across different platforms and available on the project website (www.cusp.ac.uk/powering-productivity).

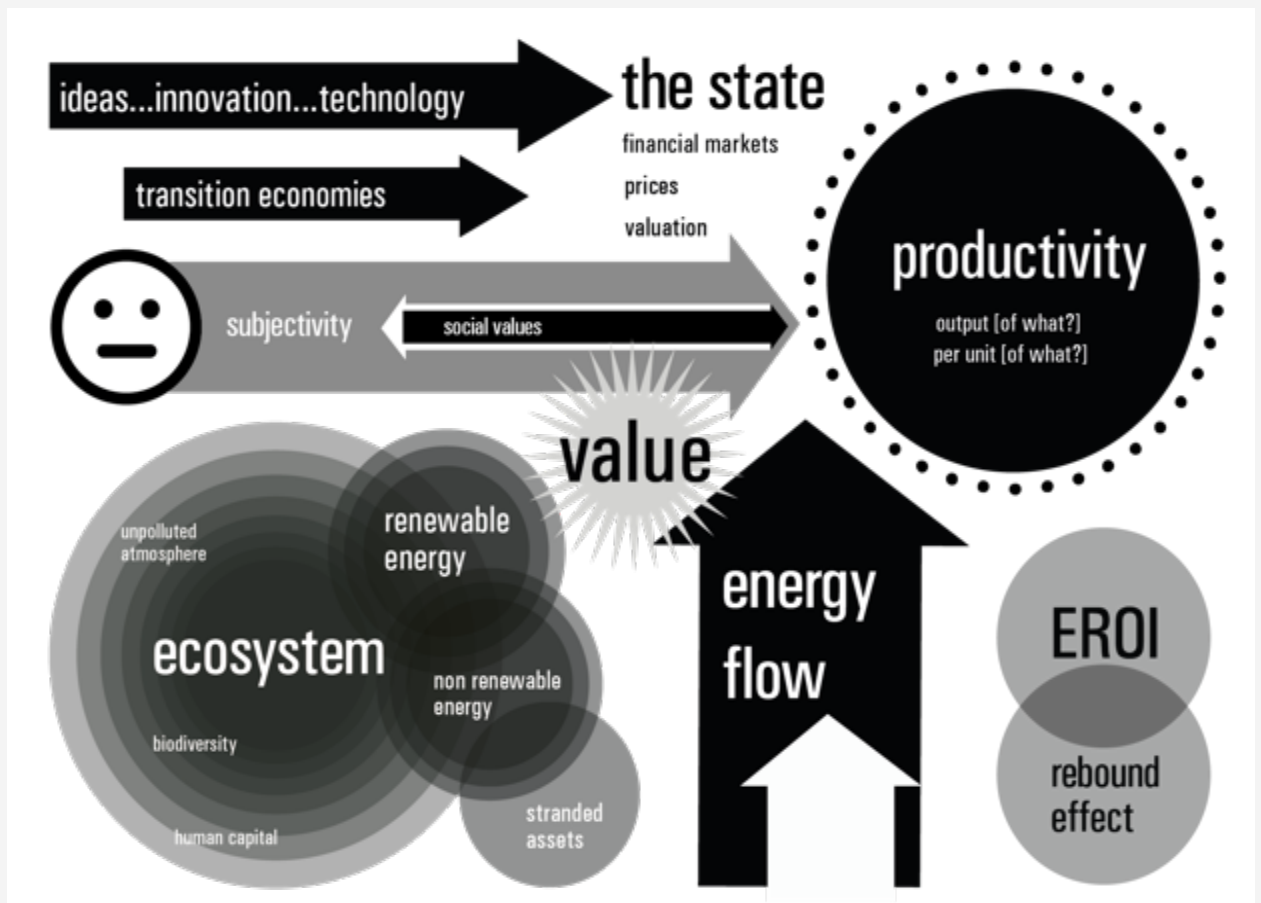


Figure 19: Energy-Productivity Knowledge Map, v.1 – [click here to access online map](http://www.cusp.ac.uk/powering-productivity).

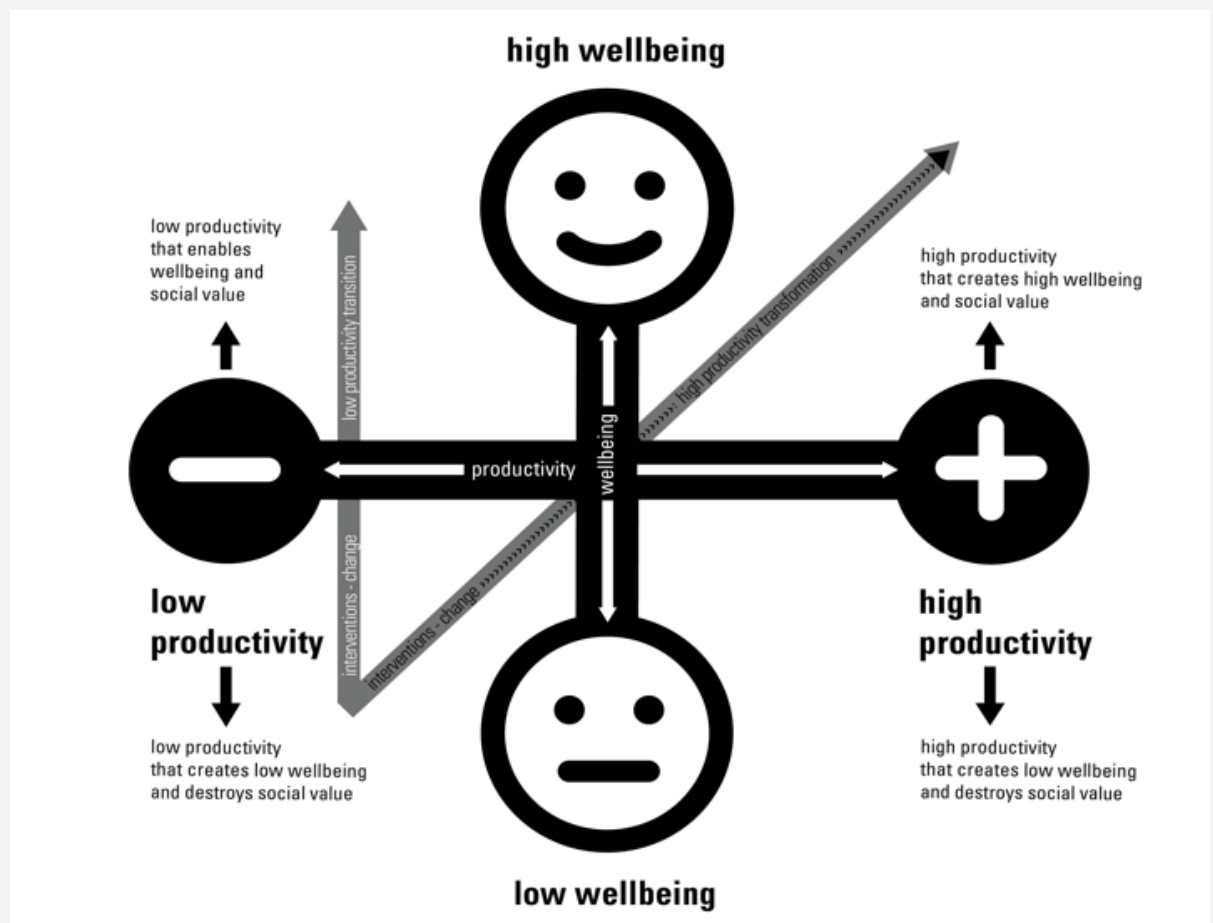


Figure 20: Wellbeing-Productivity Knowledge Map, v.1 – [click here to access online map](#).

8 | Integrating the Mapping and Review Processes

The literature reviews and mapping workshops were integrated in two ways. First, preliminary literature searches (partially based on the surveys) were used to produce briefing notes which framed initial discussions at the mapping workshops. Both briefing notes followed the same structure: identifying a number of core themes (12 in the energy project and 9 in the wellbeing project), summarising key arguments, providing indicative references and raising questions for discussion.

Secondly, the maps and discussions at the workshops were used to guide subsequent stages of literature search and write up. Workshops were facilitated by the mapping research group, leaving the literature review research group free to take notes and participate in map construction. At each workshop, two review authors participated in the mapping process. Each was in a different mapping group to ensure coverage of all discussions. This provided a level of immersion in the mapping process which

contributed to the co-production and helped to ensure the mapping process influenced the literature reviews.

The two mapping workshops played different roles in shaping the review processes. The different subject matters aside, we worked with different sets of participants and the themed meetings occurred at different points in the two review processes. Furthermore, learning from practice, we also applied slightly different workshop structures (as described in section 6).

With regard to integrating learnings, the energy workshop was slightly more challenging than the wellbeing one. We identified a number of potential reasons. First, the energy workshop occurred at an earlier stage in the review process. Consequently, the literature search was less complete, resulting in greater scope for the workshop to move into uncharted territory. The broader scope of the discussions was further driven by the diversity in participants and the controversy of the subject matter itself. Discussants had very different worldviews which on occasions created tensions – particularly notable between mainstream and heterodox economists. Additionally, there was no overall consensus on the energy-productivity relation in the room. As described in section 5, the energy workshop had fewer structured mapping processes, since we prioritised open-ended gigamapping at the time. Given the space and diversity in perspectives, it is perhaps not surprising that discussions quickly turned to fundamental concepts, such as ‘what is value?’ While all these aspects re-affirmed the need for further research in this understudied field, the breadth and complexity of conversations in the first workshop made its integration with the review process very challenging.

In hindsight, the wellbeing workshop was more targeted and consensual; partly, we think, because the review process was already well-advanced at the time. There was notably more of a shared understanding of the subject matter amongst participants, although perspectives differed on a potentially adverse relationship between productivity and wellbeing. All in all, the discussions at the second workshop were more focused and less fundamental; the workshop served more to clarify gaps and ensure all relevant literature had been covered. As a result, it was easier to incorporate workshop insights into the literature review.

It is difficult to say whether one process was more successful than the other. The energy workshop was more creative and had more breadth. These are important and desirable qualities. On the other hand, it made the review process considerably more challenging. By contrast the wellbeing workshop was probably less creative and discussions were narrower. But this gave it more focus and depth – and enabled the mapping processes to feed more easily into a review process.

9 | Conclusions

This report describes systems mapping methods and presents the process of applying these methods to visualise knowledge on the intersection of energy, wellbeing and productivity. Systems mapping can be a valuable strategy for research on complex challenges requiring interdisciplinary knowledge. This project has illustrated how co-generated knowledge maps can capture and communicate multifaceted ideas. Despite the growing interest in applying systems mapping methods to complex problems, there are few resources to support practitioners. This report concludes with a summary of the achievements, challenges and recommendations for future applications.

9.1 Achievements

—**Knowledge mapping on issues of energy, wellbeing and productivity.**

Two final knowledge maps captured perspectives of participants at two participatory workshops. These maps are available online and also function as a means to access the *Powering Productivity* research report. They hold the potential to help researchers identify meaningful pathways for new research.

—**Interdisciplinary knowledge exchange and capture.** The workshops created space for participants to collaborate, exchange knowledge and capture learnings. The mapping methods encouraged participants to discuss themes across disciplinary silos and explore gaps and tensions in the knowledge base.

—**Demonstrating the value of systems and knowledge mapping in knowledge transfer.** Integrating mapping practices into this project strengthened the knowledge base on energy-productivity and wellbeing-productivity relationships while also contributing methodological insights on the communication of complex ideas.

—**Encouraging systems thinking in the co-production of new knowledge.** In exploring and documenting strategies to visualise knowledge in a systemic way this work contributes to the systems-oriented design tradition. In documenting and disseminating systemic design strategies implemented in this project, this work supports complex problem solving.

9.2 Challenges

—**Getting diverse and relevant people involved.** Systems mapping is most effective when diverse stakeholders and disciplinary perspectives are able to work together. By encouraging assorted stakeholders to participate, systems mapping aims to capture knowledge across disciplinary silos and distinct communities. While our intention was to include more policy makers and industry experts, this proved difficult due to tight time frames and our inflexibility on dates. A potential solution to this problem would be longer project assignments with more flexibility to make workshops accessible.

—**Facilitating open mapping sessions.** Systems mapping requires skilled design facilitation. Facilitators must be able to design sessions around the research questions and also help participants engage with mapping techniques. A collegial and comfortable atmosphere must be created to encourage participation. Although facilitators can support the translation of oral expression into the visual maps, they should remain neutral and to allow, as much as possible, participants to guide conversations.

—**Engagement in mapping sessions.** Both structured and open mapping techniques bring benefits and challenges to participatory mapping work. The mixed process of the second workshop illustrates how design tools such as templates can be used to prepare participants for open mapping sessions. While open mapping allows participants to navigate freely, it works best if participants feel confident with visual processes. With participants who are not accustomed to visualisation, facilitators need to sustain the engagement and orient participants in the mapping processes. Fine-tuning facilitation processes to respond to all these variables is challenging and requires specialist tacit knowledge.

—**Engagement in day-long mapping sessions.** Six-hour workshops can be cognitively challenging. Participants showed fluctuations of motivation and active engagements during the last hours. Strategies added in the second workshop attempted to address this problem.

—**Participants mapping in short periods.** While learning-by-doing occurs within the mapping processes, an initial orientation is needed (as provided by the slideshows). This introduction needs to help participants feel comfortable with mapping processes. The initial individual mapping activities effectively created starting points for the participatory mapping session in both workshops.

9.3 Recommendations

Before the mapping sessions:

- Aim for diverse disciplinary and/or stakeholder traditions.** Recruit participants from different disciplines, traditions, backgrounds and sectors.
- Adjust time commitment to participants.** Mapping sessions benefit from engagement, so longer or multiple sessions are useful. It might be easier, however, to recruit more diverse participants to shorter workshops.
- Communicate the aims of the mapping strategy** to participants and describe how it generates value.
- Use props to encourage interaction with the map.** Design tools and devices (such as stickers and other physical props) stimulate interaction and prompt participation. Objects can represent research themes or system elements, such as stakeholders, places or ideas.

During the sessions:

- Embrace uncertainty, be flexible and adapt.** Mapping sessions can feel daunting for participants not accustomed to the uncertainty that is a feature of emergent processes such as design. Design facilitation must create space for new ideas to emerge while also reassuring participants that ambiguity is sometimes helpful in the development of new ways of thinking about complex ideas. Additionally, maps can be extensive, but a sense of ‘incompleteness’ can remain. This sensation can cause a burden in participants who might feel a need to ‘complete the picture’. Facilitators need to stimulate participation, help participants recognise the limitations of representation, i.e. the map is not the territory (Korzybski, 1931) and will never be ‘complete’. Facilitators can also adapt strategies in response to the energy in the room.
- Accommodate periods of reflection before iterations.** Making space and time for reflection helps participants develop new ideas and proposals. Send summaries of themes in advance of the workshops. If possible, allocate periods between iterations for reflection. Plenary sessions are opportunities for ideas to be shared and developed within the workshop process.
- Document processes with a different modes of data capture.** Collect data during the mapping sessions with a variety of techniques. Field notes, narratives of the maps and photographs are valuable resources to integrate into the analysis.

After the sessions:

—**Extend participation in analysis.** The analysis and interpretation of the systems maps will benefit from continued collaboration and triangulation.

10 | Deliverables

This project has generated the following deliverables, all materials are accessible via www.cusp.ac.uk/powering-productivity:

1. Two static knowledge maps: 1) energy and productivity and 2) wellbeing and productivity.
2. Two online interactive visualisations.
3. Two briefing notes, summarising key themes.
4. Two thematic literature reviews.
5. Two online bibliographic databases.
6. Powering Productivity: Mapping Methods Report (this document)
7. Powering Productivity: Mapping Methods Briefing

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