



# **Science-policy-practitioner labs: Co-creating leverage points for transformative pathways**

## **Deliverable D2.2**

31st August 2025

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### **TRANSPATH**

#### **Transformative pathways for synergising just biodiversity and climate actions**



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## **Preface**

This Deliverable summarises our stakeholder-led and informed Fuzzy Cognitive Mapping (FCM) exercises across two regional case studies in East and West Europe. Our goal with the creation of FCMs was to develop understandings around how stakeholders who are already engaged in sustainable and potentially transformative activities think about their role in these processes, and the concepts (enablers and disablers) that influence these transformative initiatives. The FCMs enabled the co-creation of future pathways, which outline the support needs and concepts of our sustainability agents. This document summarises these FCMs and pathways, outlining a plan for the future, and gives insight into methodological reflections around the construction of FCMs under different scenarios and contexts. These build on and input into our Navigation Toolkit from WP1, D1.1, and reflect a 'state of play' summary on the key considerations and methods required for FCMs when studying sustainability transitions and transformative change together with locally-embedded stakeholders.

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## Summary

This deliverable summarises our stakeholder engagement across two regional case studies from Czechia and England, UK. Our purpose was to understand different perspectives across stakeholder approaches to sustainability initiatives that had the potential to be transformative and were associated with agricultural land, and to identify the core challenges, enablers and disablers associated with the realisation of these initiatives.

Our work developed a spectrum of approaches to developing Fuzzy Cognitive Maps (FCMs), that is, complex mental models for stakeholders' sustainability preferences and for how they perceive systems and sustainability initiatives to work and change. Our spectrum for building FCMs consisted of group-based approaches (the Czech case), narrative-based construction (the English case), and an experimental third way - a meta, aggregate approach to building an FCM that drew from studies that were previously conducted in Western Europe and published in peer-reviewed literature.

The Czech case unpacked the possibilities, barriers and trade-offs involved in enabling sustainability transformations in the land and energy sectors with 'change agents' from these fields. Over the course of two workshops, stakeholders mapped their theories of change via a group-based FCM, and developed concrete pathways for action aimed at realising change within their respective sectors.

The English case explored the transformative potential and role of farm clusters, that is farmer-oriented networks that collaborate to deliver landscape-scale conservation. Here, a narrative interview approach was used to construct an FCM capturing key enabling and constraining factors that influence the long-term viability of these groups. Building on the model findings, a follow-up workshop engaged farmer cluster members to create practical pathways intended to help the group better adapt to changes in the agricultural sector and shifting farmer capacities.

The Western European aggregated case investigated key elements that affect landscape quality by bringing together a large number of case study FCMs into a single model. The aggregate FCM provided valuable insights into identifying pathways towards increasing landscape quality, identifying key concepts, key relationships and a set of potential pathways forward for interventions in Western European landscapes.

The contributions of this deliverable are threefold: conceptually, our three case studies demonstrate how potentially transformative systems or values change can emerge through locally-responsive and practical collective action and engagement, in contrast to sudden, crisis-driven systems overhaul. Methodologically, we explore a range of approaches to building an understanding of stakeholders' mental maps through Fuzzy Cognitive Mapping and present an overview of key considerations to researchers considering these approaches for enabling sustainability transformations. These form the basis of innovative methodological experiments and guidance to sustainability researchers who need to better understand and unpack stakeholders' values and theories of change. And practically, we explore the tensions involved in recruiting and engaging stakeholders with a diverse range of values and capacities in participatory processes. These findings lay the groundwork for our next phase of research into the trade-offs and needs required for the maintenance and support of networks seeking to scale complex sustainability transformations.

## List of abbreviations

|       |                               |
|-------|-------------------------------|
| EE    | Eastern Europe                |
| EU    | European Union                |
| FCM   | Fuzzy Cognitive Mapping       |
| NGO   | Non-Governmental Organisation |
| T-lab | Transformative Laboratory     |
| WE    | Western Europe                |
| WP    | Work Package                  |

## 1 Introduction to FCMs and the co-creation of transformative pathways

The TRANSPATH project aims to tackle complex sustainability issues through the creation of contextualised transformative pathways across East and West Europe. Here, transformative pathways are understood as a set of actions and strategies that are designed in a purposeful and reflexive manner to enable progress towards achieving biodiversity gains and carbon neutrality (see D2.1 for more detail).

Co-designing grounded transformative pathways requires engaging with a wide range of stakeholders working in different sectors. A variety of methods and tools have been developed to support the co-creation of pathways with diverse groups (see D1.2). In Work Package 2 (WP2), we adopted the ‘transformation lab’ (T-Lab) approach as a methodological anchor, providing a shared framework around which different case studies could experiment with context-specific workshop designs (Charli-Joseph et al., 2018; Pathways Network, 2018).

The research approach was informed by two prior TRANSPATH tasks. D2.1 Roadmap for Science-Policy-Practitioner Lab Processes outlined the usefulness of Fuzzy Cognitive Mapping (FCM) for initiating pathway discussions and shaped the design of the individual case study workshops. D1.2 Transformation Navigation Toolkit provided the initial conceptual framework and ethical guidance for both cases (see Box 1 for a summary). In turn, the implementation of the two case studies offered an opportunity to apply and critically test the toolkit’s framing and ethical principles in practice.

The aim of this deliverable is to report on WP2’s stakeholder-led and informed Fuzzy Cognitive Mapping and pathway development across the two regional case studies from East and West Europe. First, we outline the three different approaches adopted in each case study to building an FCM out of stakeholders’ mental models. Second, we present the methodological approach and outcomes of the pathway workshops in East and West Europe. Third, we reflect on the associated trade-offs in relation to stakeholder engagement and social learning based on the different approaches to constructing FCMs. Fourth, we detail initial reflections on promising leverage points across the two empirical cases in Czechia and England in preparation for task D2.3 which will identify cross-scale leverage points developed across regional case studies for Europe.

**Box 1: Key ethical principles and best practices of participatory research to be followed in transformation labs (based on Barth et al., 2017; Bentz & O'Brien, 2019; Chambers et al. 2021; Chaves, 2018; 2022; Norström et al. 2020; Moore et al., 2018; Popa et al. 2015; Reed 2008; Wals, 2010; Wilner et al. 2012) (for more details see deliverable 1.2).**

- ✓ **Co-production and co-development:** focusing on the co-production of knowledge among transformation lab participants and on the co-development of understandings, options and solutions; embracing mutual learning among the participants.
- ✓ **Deliberation:** careful consideration and discussion as the core principles of the transformation lab interactions.
- ✓ **Sharing:** making room for experiencing positive stories and harnessing passions and emotions.
- ✓ **Constructive dissensus (as opposed to forced consensus):** enabling dialogue that productively harnesses dissonance and disagreement and fosters the ability to change perspectives.
- ✓ **Reflexivity:** foster reflexivity when exploring how problems are defined, by whom, and what plans or actions should follow. Make room for bottom-up, collective, and critical reflection, and enable counter-hegemonic thinking to break away from taken-for-granted and locked-in frames.
- ✓ **Empowerment:** nurturing the empowerment of the transformation lab participants to act on the envisioned and deliberated options and solutions.
- ✓ **Contextuality:** being sensitive to contextual differences and facilitate linking abstract knowledge with concrete cases.
- ✓ **Facilitation:** ensuring a well-performed facilitation of the process.
- ✓ **Flexibility:** the possibility to adjust the transformation labs process based on the interactions with the lab participants, intermediate results and emerging situations.
- ✓ **Impact and innovations:** nurturing the potential of transformative real-world impacts of the research process; encouraging innovations towards a fundamentally different, more safe and just future and alternative pathways of development towards this future.
- ✓ **Networking:** to foster and think in innovative ways about the different connections and opportunities between stakeholders, sectors, regions, countries at a number of scales.
- ✓ **Managing power imbalances and including marginalized voices:** making sure that power imbalances are reflected and incorporated in the design and facilitation of the transformation labs; embracing and emphasizing **equity** while avoiding bias and marginalization of various groups.
- ✓ **Respect:** making sure that stakeholders' time and capacity investments are respected and used effectively; ensuring that the objectives of the transformation lab process are clearly communicated from the start.
- ✓ **Transdisciplinarity:** ensuring that the transformation lab stakeholders are an inherent part of the research process as both its participants and co-designers; making sure to involve the participants from early on in the research process based on a thorough and systematic stakeholder analysis.
- ✓ **Trust:** embracing the importance of building trust between all participants of the transformation lab process.

Box 1. Key ethical principles for the design of T-Labs developed in Work Package 1 Transformation Navigation Toolkit (D1.2).

## 1.1 Mental models and Fuzzy Cognitive Map (FCM) analysis

Mental models are representations of how people understand reality. Usually built around a central concept or guiding question, they describe the schemes and frameworks within which people explain and predict “how things *really* work” (Jones, 2011). In mental model research, both qualitative and quantitative comparisons can be made between the conceptual models of different individuals or groups looking at the same system.

Fuzzy Cognitive Mapping (FCM) is a participatory social-ecological systems mapping tool that allows us to understand and visualise these mental models. FCM produces semi-quantitative models based on stakeholder knowledge of how variables are interrelated in the system and interact. There are two broad types of variables: those that connect to each other, known as ‘concepts’, and drivers, which influence other concepts but are not influenced themselves. Concepts are interconnected in positive (reinforcing) and negative (balancing) ways, where everything affects everything to some degree. Drivers are understood as those concepts that are *relatively* unaffected by other elements of a system, but are of key importance to the overall system (dis)function in the sense that they influence other variables. They are often starting points (endemic) or external variables, such as ‘government funding’ or ‘environmental policies.’ The first stage of our stakeholder engagement involved developing an understanding of what these concepts and drivers were from the vantage of our research participants.

A key strength of FCM research is the ability to model mental maps as dynamic outputs. The dynamic output demonstrates how individual relationships are connected across a system, as well as how each element might respond to the weakening or strengthening of other elements in the system. This highlights how even seemingly simple systems can exhibit strong nonlinear behaviour (for a detailed overview of FCM and its potential, see D2.1).

FCM is a valuable and appropriate tool to use when we want to include and understand the perspectives of different types of stakeholders who live or work in a given system, who may have different views and/or interests. An FCM allows us to capture and engage with both qualitative (e.g., cultural attitudes or concepts, trust in government) and quantifiable concepts (e.g., number of jobs, weather patterns, rainfall) that affect the complex system we are investigating, and what might be required to change or influence it. FCMs thus provide a relatively simple approach for combining and taking into account the different types of knowledge, views and convictions that are held and represented by stakeholders that we engage with.

In short, FCMs allow us to:

- Look at the schemes, frameworks and interrelations within which we think.
- Understand in detail the theory of change of others.
- Recognize the mental schemes and frameworks of others.
- Illustrate what these mental models can lead to in dynamic ways.

## 1.2 Different ways of building an FCM

There are many different ways of constructing an FCM (van der Sluis et al., 2019; de Jong and Kok, 2021; Jetter and Kok, 2014). This report details three approaches to FCM design, where stakeholders are involved at one or more stages in the modelling process. These are: i) group-based FCMs (which involve gathering stakeholders together in a workshop setting to collectively map their understandings of the system at stake); ii) narrative FCMs (which derive system maps from in-depth semi-structured interviews); and iii) meta-analysis FCMs (which

combine already existing individual or aggregate FCMs in one overarching system description).

In the following section, we further outline how these different approaches were applied across our respective case studies.

## 2 FCM Case studies

This section details the creation of FCMs across the three East and West European case studies in WP2. Sections 2.1 and 2.2 describe the three different approaches to cognitive mapping adopted within the project: group-based, narrative-based, and a meta-analysis of pre-existing FCMs. Section 2.3 describes the process of creating a dynamic model from the final numerical form, that is, the agency matrices of each FCM. The dynamic output shows how the system responds to adjusting the strength of individual elements (concepts) in the cognitive map, providing insight into possible future system states.

### 2.1 Eastern Europe: Czechia and the group-based approach to FCM

#### Overview of approach

The Czech case study followed the group-based approach to FCM creation, with a first workshop held in Prague on 23<sup>rd</sup> May 2024. The overarching aim was to enable invited stakeholders to share experiences about their transformative processes within the energy-land-food nexus in the Czech context. The workshop was attended by ten representatives from transformative initiatives, networks, and social enterprises that each advocate for transformative change towards a more sustainable energy sector and food system.<sup>1</sup> For the purposes of the workshop, transformative change was defined as change that is fundamental and systemic, taking place across scales (from personal and local to national or global), while having positive impacts on society and the environment.

Invited stakeholders to the workshop worked either in the food/land sector, or in energy. For this reason, participants were split into three groups, with two focused on the land (and related) sector, with a third group made up of participants solely from energy. These three groups were asked to create mind maps of the transformative change mechanisms that best reflected their experiences and perceptions. The workshop also included a lecture by Matěj Malecha from the design and innovation studio *Pábení* on the Doughnut model: a safe and fair space for humanity, which was thematically linked to the TRANSPATH project. As an output from the workshop, we were able to present participants with a dynamic output model of their FCM.

#### Method

The selection of the concepts used in the workshop was based on qualitative interviews with stakeholders that were undertaken in late summer/early autumn 2023. The main themes of the interviews were transformative goals of the initiatives and their responses to broader systemic issues, as well as proven actions that supported transformative change. Other

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<sup>1</sup> In order to preserve the anonymity of the participants, we do not mention the specific organisations.

themes included concepts that influence transformative change, both positively (called enablers) and negatively (called disablers) from the stakeholders' experiences.<sup>2</sup>

Based on the thematic analysis of the interviews, concepts were identified that stakeholders held to influence transformative change in their respective sectors. The final list of concepts was generated through a multi-step process that involved filtering the extracted concepts (including clustering similar ones) and testing their applicability to the FCM method within the project team. A questionnaire was also sent out to the participants prior to the workshop, which allowed us to pre-select concepts common to all working groups. Table 1 lists the concepts and their definitions. In total, there were 33 concepts, coded accordingly (C0-C31, CA, CB - see below).

The concepts covered a range of social, political, cultural, and psychological phenomena related to transformative processes in society. Concept C0, common to all three groups, represents the concept that directly responds to the central question we seek to answer with the FCM approach and to which all other concepts relate. Concepts C1-C5 represent pre-selected concepts that were used in all three groups. These pre-selected concepts allowed us to subsequently compare their impact on transformative change in the energy sector and food systems.

The concepts CA and CB emerged during a plenary discussion of the concepts with participants prior to creating the FCM maps ('CA Ability to meet needs in a non-monetary/non-market way' and 'CB Level of understanding of the sector by society'). The concepts were further included in group work to develop the FCM maps. Apart from the mandatory pre-selected concepts, each group selected an additional 10 concepts according to their preferences. Throughout the exercise, the "Food System 2" group also added a concept 'FX Active mainstream pressure', which was included in their FCM map.

Table 1. List of concepts for creating FCM system maps in Czechia

| concept   |   | Definition of   |
|-----------|---|---|
| <b>C0</b> | <b>The level of transformative change in the energy/food/land sectors</b> | Degree of major changes towards greater sustainability and equity in the energy/food/agriculture sector. Transformative change is characterised by being systemic, taking place across scales (national, regional, local) and having positive impacts on society and the environment.   |
| <b>C1</b> | <b>Creating transformative communities</b>                                | Creating transformative communities within the energy/food and agriculture sectors (strengthening cohesion, cooperation, interconnectivity).  |
| <b>C2</b> | <b>Public support for transformation</b>                                  | The degree of debate in society that supports issues of social, economic and environmental transformation towards sustainability.   |
| <b>C3</b> | <b>Actors' conformity</b>   | The degree of inclination of society to maintain the status quo. It is linked to the inability of actors to respond to new situations (e.g. adaptation/flexibility to adopt new ways of thinking vs. persistence in outdated ways of thinking; including generational change that allows for new perspectives on different topics). |

<sup>2</sup> For key outcomes of the qualitative interviews, see Deliverable 2.1 (Suchá et al, 2023; available at: <https://transpath.eu/storage/app/uploads/public/66a74f39e/66a74f39e23cc291746737.pdf>).

|            |  |   |
|------------|--|---|
| <b>C4</b>  | <b>Level of personal enthusiasm/<br/>determination</b>           | Having the passion and other personal qualities (e.g. enthusiasm, determination, fearlessness and willingness to take risks) that enable actors to engage in long-term transformative action.                                 |
| <b>C5</b>  | <b>Decentralisation of the energy/food/land sectors</b>          | Decentralisation, localisation and building self-sufficiency within the energy/food and agricultural sectors.   |
| <b>C6</b>  | <b>Actors' cooperation</b>                                       | The degree of cooperation between different actors in society, including networking.  |
| <b>C7</b>  | <b>Inspiring others</b>  | Inspiring others through examples of good practice.   |
| <b>C8</b>  | <b>Fair remuneration</b>   | Ensuring pay equity in transformative initiatives.  |
| <b>C9</b>  | <b>Legislation supportive of transformation</b>                  | The presence of legislation at the national level that supports transformation in the energy/food and agricultural sectors.   |
| <b>C10</b> | <b>Political support</b>   | The degree of support by political representation or specific politicians.  |
| <b>C11</b> | <b>Implementation of EU policies</b>                             | Transposition and implementation of European legislation into the Czech legislative environment.  |
| <b>C12</b> | <b>Efficiency of pro-transformative lobbying</b>                 | Effectiveness of lobbying by social actors supporting the transformation.   |
| <b>C13</b> | <b>Efficiency of anti-transformative lobbying</b>                | The effectiveness of lobbying by social actors benefiting from the status quo.  |
| <b>C14</b> | <b>Professionalization of transformative initiatives</b>         | The process of professionalization of initially informal transformative initiatives.  |
| <b>C15</b> | <b>Bureaucracy</b>   | The amount and intensity of administrative processes and procedures.  |
| <b>C16</b> | <b>Sectoralism/Siloing</b>                                       | The tendency of the state to address issues within only one sector.   |
| <b>C17</b> | <b>Openness of governance processes</b>                          | The level to which social governance processes are open/accessible for actors to participate/shape them (e.g. actors' input in the development of new policies/legislation).  |
| <b>C18</b> | <b>Power of small actors</b>                                     | The influence of smaller social actors and their ability to defend their interests against those of large companies/organisations (e.g. small farmers/energy cooperatives vs. large agricultural companies/energy companies). |
| <b>C19</b> | <b>Linking producers with consumers</b>                          | Connecting consumers/consumers with producers.  |
| <b>C20</b> | <b>People's ability to afford sustainably-sourced products</b>   | The ability and willingness of people to pay for goods and services produced in a sustainable and equitable way.  |
| <b>C21</b> | <b>Accessibility of finance for transformative initiatives</b>   | The extent to which funding (e.g. grants) is available for transformative initiatives.  |
| <b>C22</b> | <b>Fair price levels</b>   | Value recognition as a prerequisite for ensuring fair prices along production chains for producers and consumers.   |
| <b>C23</b> | <b>Society's relationship to nature/ Human-nature connection</b> | Perception of the extent of inseparability of humans and nature (human and nature as one).  |
| <b>C24</b> | <b>Public trust in transformative initiatives</b>                | Public confidence in the transformative initiative as a means to achieve transformative goals and within the organisation itself.   |

|            |   |   |
|------------|---|---|
| <b>C25</b> | <b>Evidence base on transformation</b>                          | Availability of empirical evidence and data on the mechanisms of transformative processes (evidence from practice that the transformation mechanisms work).   |
| <b>C26</b> | <b>Communication of transformative change</b>                   | Intensity of communication of transformative change.  |
| <b>C27</b> | <b>Public education</b>   | The level of education of different parts of society on different topics related to the transformation towards a more just and sustainable future.  |
| <b>C28</b> | <b>Co-optation of transformative topics</b>                     | Level of co-optation/Co-optation of transformative topics by actors trying to keep the status quo.  |
| <b>C29</b> | <b>Sensitivity to certain topics and terms</b>                  | High sensitivity of society to certain topics and concepts, e.g. the topic of land and agriculture, community, solidarity, or topics perceived as politicized.  |
| <b>C30</b> | <b>Individualism</b>  | Prioritising individual solutions over collective ones.   |
| <b>C31</b> | <b>Global crises</b>  | The impact of emerging global crises on the practicalities of everyday life and on social paradigms. For example, the Covid pandemic has created a specific environment that has accelerated some transformative processes (e.g. enabling people to set up new ways of communicating at work, to pause and reflect on their lives, to strengthen their relationship with nature, etc.). Similarly, the energy crisis caused by the war in Ukraine has made visible/opened up some neglected issues, e.g. energy self-sufficiency and the need for renewable and community energy sources. |
| <b>CA</b>  | <b>Ability to meet needs on a non-monetary/non-market basis</b> | Meeting the needs of society in ways other than money-dependent ways.   |
| <b>CB</b>  | <b>Society's level of understanding the sector</b>              | A deeper understanding of how the sector functions in society (e.g. pricing in agriculture, energy distribution).   |
| <b>CX</b>  | <b>Active mainstream pressure</b>                               | Used by the food systems group as a concept on uptake in policy and implementation  |

The construction of the FCMs took place in several steps during the workshop. It was based on a central concept representing transformative change processes (C0 The level of transformative change in the energy/food/land sectors). Subsequently, FCMs containing related concepts, including their linkages through feedback loops, were developed by each workshop group. Relationships between concepts were captured in two steps: first, the presence/absence of a relationship and its type (positive or negative) was defined, followed by assigning a value to the relationship representing its strength (on a 3-point scale of ---, --, -, +, ++, +++).

After the workshop, the FCMs created by each working group were photo-documented and digitally redrawn in Miro and Vensim software, including the notes (see Figures 1, 2 and 3).

A part of the construction of FCMs is also their subsequent checking to detect possible problems that could lead to errors in the resulting analysis, for example, due to the duplication of relationships between concepts. The TRANSPATH project team checked the redrawn maps after the workshop and identified several types of problems that were subsequently corrected (e.g., the correction of missing feedback loops and overlapping variables).

During the workshop, the TRANSPATH project team converted the FCMs into a numerical form using a scale of +0.3, +0.5, or +0.8 (or their negative equivalents) and based on that produced a dynamic output presenting the FCM results to workshop participants (see 2.3 below).

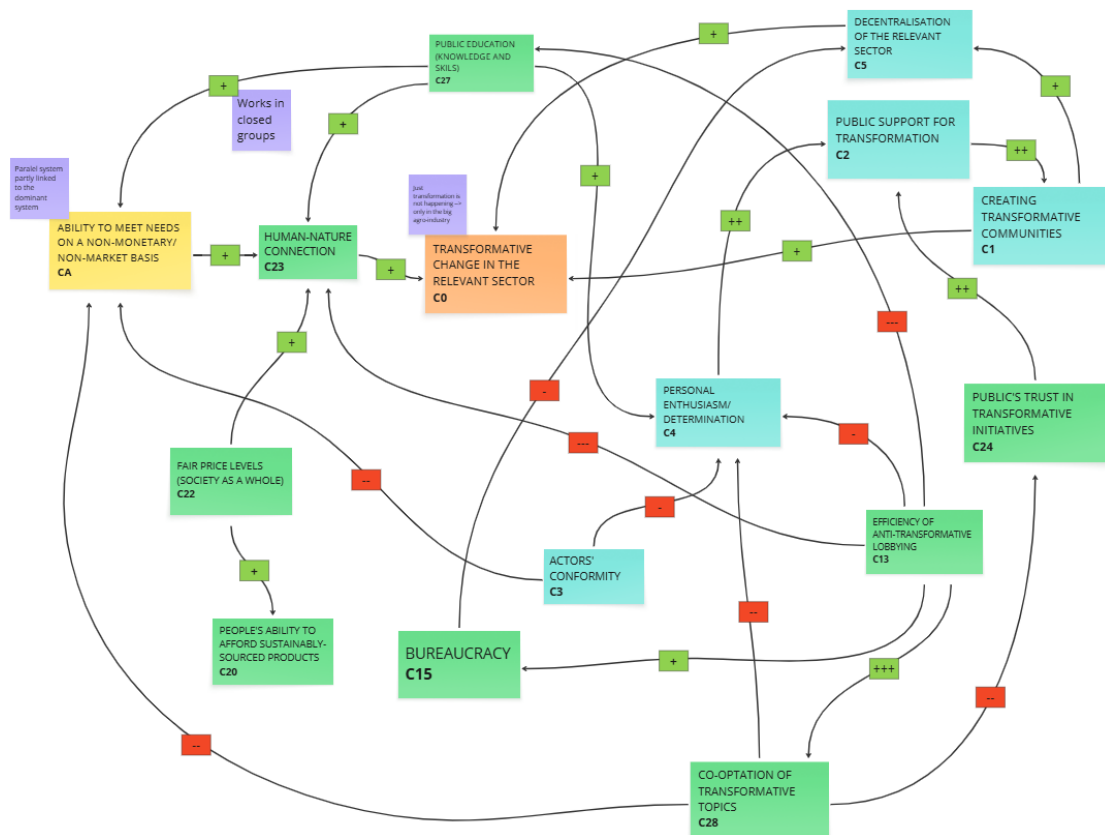


Figure 1. Digitally redrawn version of the system map of the group "Food system 1" (software: Miro). The spatial layout and colours have been kept as close as possible to the original created during the workshop.



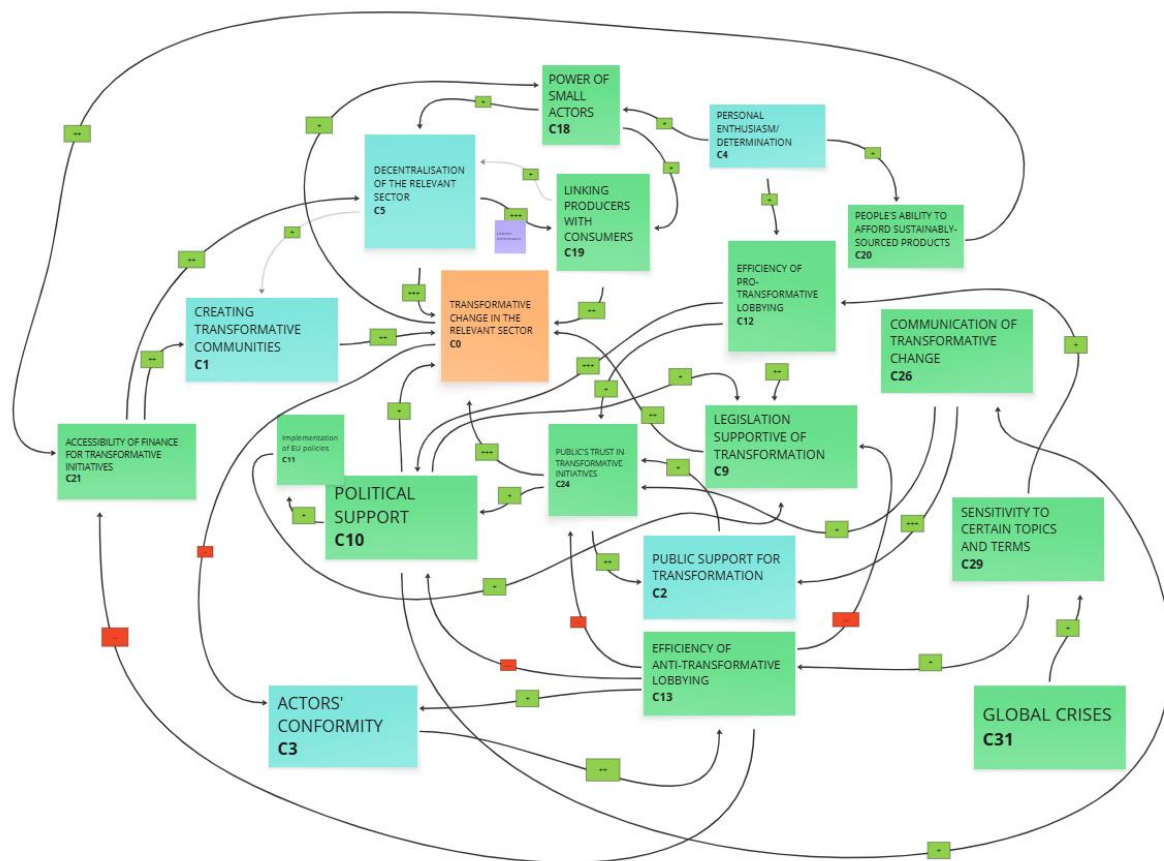


Figure 3. Digitally redrawn version of the system map of the group "Energy" (software: Miro). The spatial layout and colours have been kept as close as possible to the original created during the workshop.

## 2.2 Western Europe

The two Western European case studies followed separate approaches to developing Fuzzy Cognitive Maps and their pathways.

In the original proposal, work in the Western European case study was planned to mirror activities in Eastern Europe, with a regional case study, co-producing FCMs and pathways. This work was executed as planned in the English case study, for which information about stakeholder selection and engagement is available in Appendix 1.

In addition, we explored the possibility of constructing an aggregate FCM for the geographical region of Western Europe, based on existing research from the area. Multiple studies existed across Western Europe that used the exact same method and the same tools to build their FCMs, and these offered a unique opportunity to experiment with building an FCM at the Western European scale, synthesising information from multiple local and regional FCMs. This activity was not a part of the originally proposed work in TRANSPATH, and has to be seen as a first exploration of the potential higher-scale emergent properties of complex systems, both in terms of important factors and in terms of pathway elements.

The rationale to include this additional activity was twofold: First, transformative change processes are scale dependent, and an aggregated FCM for the whole of Western Europe offers a possibility to understand dynamics at the supranational scale. Second, there is a very large diversity of social, economic, political, cultural, and environmental characteristics across

Western Europe. Comparing multiple cases offers the possibility to study to what degree local/regional cases can be aggregated and what common factors and processes surface at a higher level of aggregation.

### **2.2.1 England: narrative approach to FCMs**

The English FCM was produced in four steps. First, semi-structured interviews were conducted with key stakeholders. Second, a list of concepts that make up the variables of participant's mind maps were agreed upon through analysis of the overall interview dataset by the project team. Third, relationships between concepts were defined, and the strength of relationships between these concepts estimated and assigned. Fourth, a dynamic output was created.

#### **Overview of approach**

In the UK, farmers are no longer only tasked with producing food. As land managers, they are today asked to maintain rural landscapes and provide ecosystem services across the water-energy-food nexus: for flood prevention, water quality, climate mitigation, as space for outdoor recreation, and as fundamental components of national 'green' infrastructure (Hodge, 2024; Cairns and Krzywoszynska, 2016). These are a lot of responsibilities and challenges - as well as emergent opportunities - for individual farmers to navigate. Exacerbating this context, direct government support in the form of payments and advice have drastically changed and reduced since the UK left the EU.

In response to these changes, neighbouring farmers are increasingly forming groups called 'clusters', to help and support each other. These groups have predominantly emerged from landscape-scale conservation initiatives and aim to build rural community and farmer-to-farmer cooperation and knowledge. They are framed as promising vehicles to deliver more holistic, farmer-led decision-making that is attuned to local priorities, interests and opportunities.

Focusing on the transformative potential and role of farm clusters, the English FCM used a narrative-based approach to understand the needs, barriers and opportunities available to groups experimenting with these novel forms of local environmental governance in East Anglia.

A narrative-based method was chosen to construct this case's FCM. This approach foregrounded the preferences of key stakeholders, who were unable or reluctant to participate in a six-hour workshop. This approach is particularly useful amongst time-poor stakeholders, as individual maps can be developed from individual in-depth interviews that lasted between 45-60 minutes, in contrast to the time requirements of constructing a group-based FCM. The current state-of-the-art approach to co-producing FCMs through interviews asks stakeholders to draw a mental map using a predefined list of concepts in response to leading questions about causal connections between concepts (Özesmi and Özesmi, 2004). However, studies suggest that this structured approach can be unsuitable for participants without training in systems thinking (Van Vliet, 2011; Jetter and Kok, 2014). Questions also remain about the extent to which such methods limit stakeholders' ability to convey their lived experiences of a given system through more familiar forms of narrative storytelling, which may not only be a more comfortable medium for participants to impart their perspectives, but additionally result in a qualitatively richer understanding and dataset for researchers.

Our main aim was to identify and understand the linkages between concepts that enable or constrain the long-term success of farmer clusters. Between March and April 2025, we

conducted 20 scoping interviews with rural network leaders in England and an additional 20 semi-structured interviews with farmer cluster leaders in East Anglia. The interview guide was designed to elicit participants' perceptions of key system concepts and the relationships between them, and the resulting data formed the basis for constructing an aggregated FCM for analysis.

## Method

To create the FCM, we first conducted semi-structured interviews with 20 farm cluster leads in East Anglia. Six interviews were conducted in-person and 14 took place over Teams. Participants were asked to detail what the needs, barriers and opportunities available to farm clusters in the region were from their perspective. To complement the interview data, we presented interviewees with a survey designed to elicit their preferences regarding support for the farming sector.

Second, the project team coded the interview transcripts using the software Atlas.ti. A quotation was considered relevant to a concept, and thus coded, if it reflected a perception of how farmer clusters currently sustain momentum over the long-term. An initial shortlist of 30 concepts was refined to 16 (2 more were subsequently removed during the post-processing of the FCM, detailed below), through collaborative review by two members of the research team with expertise in fuzzy cognitive mapping and rural development (see Table 2). Following the qualitative aggregation approach established by Özesmi & Özesmi (2004), similar concepts were grouped together and assigned a new label and definition, ensuring that individual concepts were accurately captured. The concept list covered a range of social, political, cultural, and physiological concepts related to the long-term sustainability of collaborative farmer initiatives.

As a third step, the transcripts were re-coded to assign concepts to quotes and to identify perceived relationships between concepts. These relationships could be either positive or negative in orientation. Similar to the Czech approach, relative weights were assigned to the relationships using a 3-point scale of +0.1 (weak), +0.3 (medium), or +0.5 (strong) or their negative equivalents, depending on the strength of feeling expressed in the quotation and the relative importance of the relationship within the interview as a whole, as judged by the research team. Discrepancies were resolved through discussion to enhance reliability in what is an inevitably subjective process.

Table 2. List of concepts for creating FCM system maps in England

| Concept                               | Definition of   |
|---------------------------------------|---|
| <b>C0</b>                             |   |
| <b>Cluster longevity</b>              | The maintenance of farm clusters into the long-term.  |
| <b>C1</b>                             |   |
| <b>Financial support for clusters</b> | Sufficient financing to clusters to support both core cluster functions (e.g. coordination, communication, administration) and specific collaborative projects. This includes public, philanthropic, membership fees and private sources. |
| <b>C2</b>                             |   |
| <b>Community buy-in</b>               | The extent to which cluster members are invested in the purpose of the cluster, trust and respect the lead  |

|            |   |  |
|------------|---|--|
|            |   | facilitator(s), and actively participate in its activities - including events, collaborative projects, and shared decision-making.   |
| <b>C3</b>  | <b>Facilitator skillset</b>                                 | The ability of the lead facilitator to drive the cluster forward. This includes the skill to secure funding, engage a broad spectrum of farmer members, organise relevant activities, and sustain momentum through motivation, time and (often unpaid) effort.           |
| <b>C4</b>  | <b>Cluster leads' responsiveness to farmer perspectives</b> | The extent to which cluster leads or steering groups actively listen to, engage with, and reflect the diversity of farmer voices within the cluster in their decision-making processes.  |
| <b>C5</b>  | <b>Place-based ecological focus</b>                         | The cluster is organised around a distinct ecological or geographical feature (e.g river catchment or a wetland), providing a unifying environmental identity and scope for creating habitat connectivity.   |
| <b>C6</b>  | <b>External collaboration</b>                               | The degree to which the cluster actively coordinates with external organisations that have shared ecological, economic or social goals (e.g wildlife NGOs, local authorities, catchment partnerships, or universities.)  |
| <b>C7</b>  | <b>Metrics to prove and legitimise activities</b>           | The availability, quality and visibility of empirical data or case studies that demonstrate the environmental and economic benefits of cluster activities to farmer members, funders and external organisations.   |
| <b>C8</b>  | <b>Inter-cluster collaboration</b>                          | The extent to which cluster leads or members exchange knowledge, co-host events, jointly pursue funding, or advocate collectively.   |
| <b>C9</b>  | <b>Responsiveness to changing conditions</b>                | The ability of a cluster to reflect on its own performance, learn from experience, and adapt its practices or governance structure over time, and respond to new opportunities.  |
| <b>C10</b> | <b>Leadership succession planning</b>                       | The presence of strategies to sustain leadership beyond a single individual e.g co-facilitation models or spreading responsibilities.  |
| <b>C11</b> | <b>Administration</b>                                       | The perceived intensity and complexity of the administrative tasks required to maintain a farm cluster. This includes securing funding, fulfilling reporting obligations, managing communications with funders and intermediaries, and coordinating with farmer members. |
| <b>C12</b> | <b>Farmers' willingness to experiment</b>                   | The extent to which farmers are open to trialling new approaches, challenging conventional practices and embracing innovation.   |
| <b>C13</b> | <b>Reliability of funding streams</b>                       | The extent to which cluster funding streams are consistent and predictable, and allow for long-term  |

|            |                            |  |
|------------|----------------------------|--|
|            |                            | planning. This includes funding for specific projects (e.g cluster hedgerow mapping) and funding for core operational costs.   |
| <b>C14</b> | <b>Government guidance</b> | The presence of public policy that provides clear guidelines for what farmers should be doing, whether for agri-environment or good environmental conditions or engagement with private actors. Includes all guidance that can be followed that allows farmers to work collectively within the system. |

Finally, individual cognitive maps were combined into a single numerical matrix (see Figure 4). To reconcile differing weightings for perceived relationships, we applied a majority rule: where most stakeholders described a relationship with a particular orientation and strength (e.g. weak positive), that value was assigned in the aggregated matrix. In cases of equal weighting distributions, the intermediate value was selected. This majority-based (median) approach avoids the dilution and cancellation effects common in averaging aggregation techniques, and thus better preserves stakeholder logic within the final FCM (de Jonge and Kok, 2021). Relationships mentioned in only one or two interviews were excluded to ensure the FCM best represented the consensus view of the group.

| Concepts   | C0  | C1  | C2   | C3  | C4  | C5 | C6  | C7  | C8  | C9   | C10  | C11 | C12 | C13  | C14 |
|--|-----|-----|------|-----|-----|----|-----|-----|-----|------|------|-----|-----|------|-----|
| C0: Cluster longevity                            |     | 0   | 0    | 0   | 0.3 | 0  | 0   | 0   | 0   | -0.3 | 0    | 0.1 | 0   | 0    | 0   |
| C1: Financial support for clusters               | 0.5 |     | 0    | 0.5 | 0.1 | 0  | 0   | 0   | 0   | 0    | 0    | 0   | 0.3 | 0.5  | 0   |
| C2: Community buy-in                             | 0.5 | 0.1 |      | 0   | 0   | 0  | 0.5 | 0   | 0   | 0    | 0    | 0   | 0   | 0.5  | 0   |
| C3: Facilitator skillset                         | 0.5 | 0.5 | 0.5  |     | 0   | 0  | 0.3 | 0.3 | 0.3 | 0    | 0.3  | 0.3 | 0   | 0.5  | 0   |
| C4: Leads' responsiveness to farmer perspectives | 0.5 | 0.3 | 0.5  |     | 0   | 0  | 0   | 0   | 0   | 0    | 0    | 0   | 0   | 0    | 0   |
| C5: Place-based ecological focus                 | 0   | 0   | 0.1  |     | 0   | 0  | 0   | 0   | 0   | 0    | 0    | 0   | 0   | 0    | 0   |
| C6: External collaboration                       | 0.3 | 0.3 | 0.1  |     | 0   | 0  | 0   | 0   | 0.3 | 0    | 0    | 0   | 0   | 0    | 0   |
| C7: Metrics to prove and legitimise activities   | 0   | 0.3 | 0.5  |     | 0   | 0  | 0   | 0   | 0   | 0    | 0    | 0.3 | 0   | 0    | 0   |
| C8: Inter-cluster collaboration                  | 0   | 0.3 | 0.3  | 0.3 |     | 0  | 0.1 | 0   | 0   | 0    | 0    | 0   | 0   | 0    | 0   |
| C9: Responsiveness to changing conditions        | 0   | 0.5 | 0.3  |     | 0   | 0  | 0   | 0   | 0   | 0    | 0    | 0   | 0   | 0    | 0   |
| C10: Leadership succession planning              | 0.5 |     | 0    | 0   |     | 0  | 0   | 0   | 0   | 0    | 0    | 0   | 0   | 0    | 0   |
| C11: Administration                              | 0   | 0   | 0    | 0   |     | 0  | 0   | 0   | 0   | 0    | 0    | 0   | 0   | 0    | 0   |
| C12: Farmers' willingness to experiment          | 0   | 0   | 0    | 0   |     | 0  | 0.3 | 0.3 | 0   | 0    | 0    | 0   | 0   | 0    | 0   |
| C13: Reliability of funding streams              | 0.5 | 0.5 | -0.3 |     | 0   | 0  | 0   | 0   | 0   | 0    | -0.3 | 0   | 0   | -0.3 | 0   |
| C14: government guidance                         | 0.3 | 0.5 | 0.3  |     | 0   | 0  | 0.3 | 0   | 0   | 0    | 0    | 0   | 0   | 0.3  | 0.3 |

Figure 4. UK aggregate FCM matrix.

The aggregate FCM was digitally redrawn in Miro (see Figure 5), and a quote log was created for traceability, and to record justifications for relationship weightings.

The final step of constructing the FCM was to check for possible errors that might misrepresent stakeholders' perspectives, for example, due to data input errors in the aggregate matrix or

competing relationships between concepts. Two concepts with relationships that were mentioned twice or under were removed to reduce the complexity of the map (concepts 'Consumer understanding of sectoral challenges' and 'Farmer well-being'), missing feedback loops were corrected by re-coding relationships with C0, and double arrows were removed.

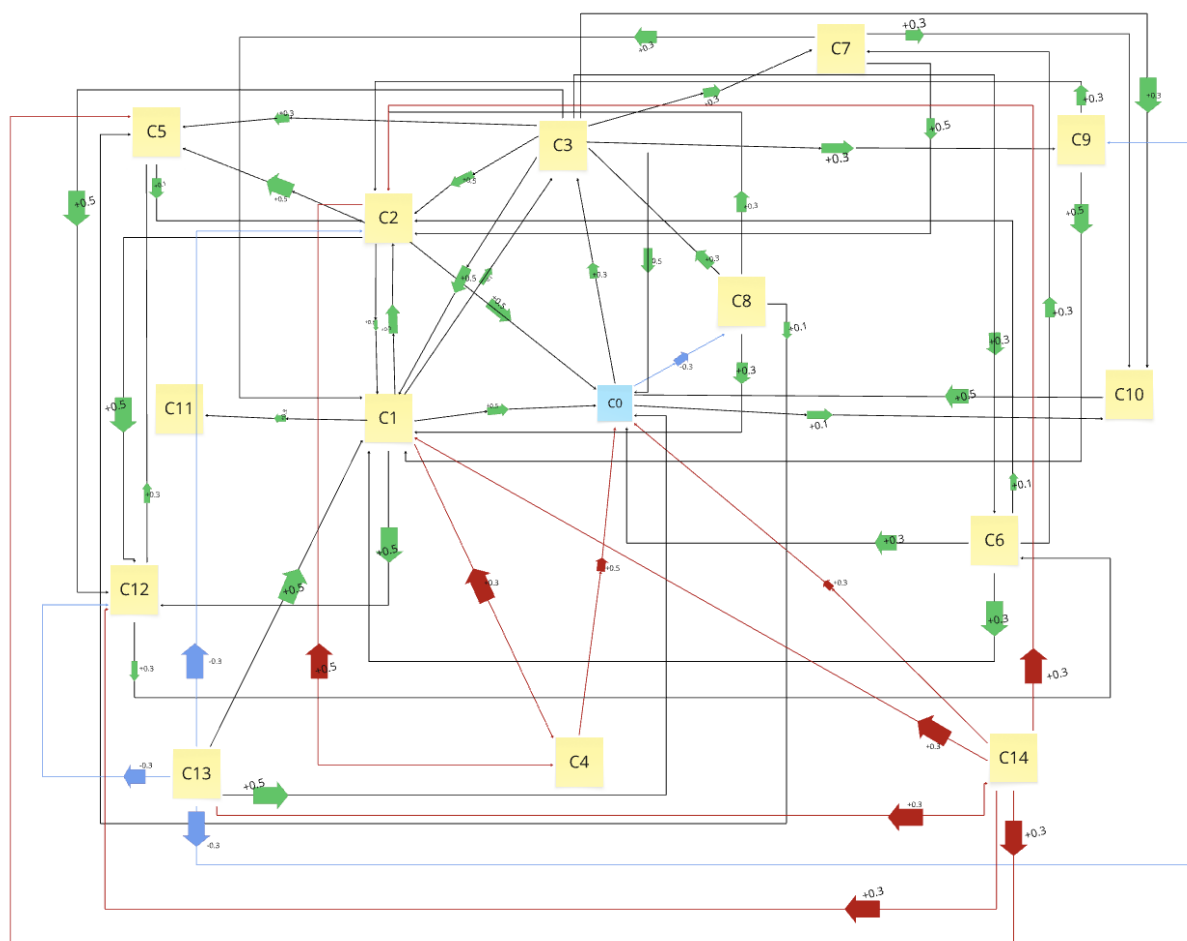


Figure 5. First attempt at a digital drawing of the English FCM. Red arrows represent drivers, blue arrows represent negative relationships, and green arrows represent positive relationships (Software: Miro).

## 2.2.2 West Europe-wide: aggregate approach

### Overview of approach

This study integrated FCMs from six previously published peer-reviewed studies that focused on case studies in Western Europe to create an integrated FCM. All studies followed the same methodology of co-producing an FCM, involving stakeholders through interviews or workshops. The number and type of stakeholders that were engaged ranged from approximately 15 to 50, with a wide variety of participating actors. Common sectors included agriculture (represented by farmers and/or farmer organisations); nature/biodiversity (environmental NGOs; policy makers); and civic society. All six studies represented the opinion of stakeholders involved in landscape conservation in specific locations across

Western Europe. Although topics differed considerably, all studies set out to develop an FCM that represented the current understanding of the systems under study. All studies focused on a particular environmental issue, including, for example, beaver reintroduction in the UK; forest grazing intensities in Spain; and climate change impacts in the Netherlands. Common elements from across the studies included: a broad variety of stakeholders that were engaged with a role and stake in the system; a broad range of factors related to landscape improvement were considered; a focus on rural processes. All studies tried to understand stakeholder understanding of a system related to landscape-level change for sustainability. Additionally, the methods that were employed were all guided by a researcher from TRANSPATH (Kasper Kok), ensuring that FCMs were produced following the same methodological steps and principles, which subsequently enabled the comparison, integration, and aggregation undertaken below. First authors of these papers were contacted during the building of our understanding of the aggregated FCM to ensure clarity and consistency throughout the process, and played an integral part in verification and FCM construction.

Table 3 provides some basic information on the six studies that were used to develop the FCM. Studies cover the Iberian Peninsula (abbreviated SP, LC, and RB), UK (BB and BV), and the Netherlands (SN). Although not representative for the whole of Western Europe, the six studies do cover different issues related to landscape change in landscapes across Western Europe.

Table 3. Characteristics of six case studies included in the aggregate FCM

| Study     | Focal issue                               | Country         | Reference                   |
|-----------|---|-----------------|-----------------------------|
| <b>SP</b> | Forest grazing- Silvo pastoralism         | Spain           | Lecegui et al. (2024)       |
| <b>SN</b> | Climate smart land use Overijsselse Vecht | The Netherlands | Pedde et al. (2021)         |
| <b>LC</b> | Landscape change                          | Portugal        | Van der Sluis et al. (2019) |
| <b>RB</b> | River basin climate adaptation            | Spain           | Verkerk et al. (2017)       |
| <b>BB</b> | Development of regional bio-based economy | United Kingdom  | Penn et al. (2013)          |
| <b>BV</b> | Beaver reintroduction and conservation    | United Kingdom  | Blewett et al. (2023)       |

## Method

The FCM was produced in three steps. First, a list of aggregated concepts was agreed upon from across the six papers. Second, relationships between concepts were defined. Third, a dynamic output was produced.

A list of concepts that influence landscape quality in Western Europe was created from the six FCMs. By merging similar concepts, the initial set of 102 unique concepts identified across the six FCMs was reduced to a working set of 43 (Alizadeh and Jetter, 2017). A small workshop was held on 21st November 2024 with an FCM expert from Wageningen University & Research and one of the study's authors to finalise the concept list. Their task was threefold: (i) to review and refine the groupings and labels; (ii) to select 15-20 high-priority concepts relevant to the overarching theme of landscape quality; and (iii) to identify key system drivers. Table 4 provides an overview of the final list of concepts and drivers in the aggregate FCM.

Table 4. Final list of concepts of the aggregate FCM.

| ID  | Name                              | Description   | Occurrence | Classification |
|-----|-----------------------------------|---|------------|----------------|
| C0  | Landscape quality                 | The state of a landscape's spatial, functional, and visual structure  | 1          | Ecology        |
| C1  | Accessibility                     | Infrastructure that increases accessibility to resources  | 3          | Technological  |
| C2  | Natural resource management       | Planning, implementation, and monitoring of actions to ensure the sustainable and fair use of resources, balancing ecological health, economic needs, and social well-being | 3          | Ecology        |
| C3  | Urbanisation                      | Comprehensive process of urban growth that includes both the concentrated settlement patterns in and around major cities and the dispersed development of peripheral areas  | 3          | Social         |
| C4  | Environmental policies            | Regulations to protect, conserve environment and support sustainable development  | 6          | Political      |
| C5  | Farmers' land ownership           | Expansion of farmland owned by farmer   | 2          | Social         |
| C6  | Diversification                   | Diversification of economic activities  | 2          | Economy        |
| C7  | Agricultural intensity            | Starting level of farm input intensity, expressed in terms of labour, machinery, or pesticides/herbicides use. Mostly based on the type of farming system.                  | 3          | Economy        |
| C8  | Nature recreation and tourism     | Activities and travel experiences centered around enjoying and exploring natural environments   | 2          | Economy        |
| C9  | Biodiversity and ecosystem health | Indicates the state of biodiversity in all ecosystems and the status of the ecosystem health  | 4          | Ecology        |
| C10 | Wildfire                          | Forest fire   | 2          | Ecology        |
| C11 | Forest area                       | Forest expansion and densification  | 1          | Ecology        |
| C12 | Technology and innovation         | Development of new tools and knowledge, including the investments and strategies required for their   | 3          | Technology     |

|     |  |   |   |          |
|-----|--|---|---|----------|
|     |  | research, advancement, and application.   |   |          |
| C13 | Water quantity in natural systems              | Volume of water flowing in natural systems  | 1 | Ecology  |
| C14 | Water use and demand                           | Water use and demand for urban, tourism and agriculture   | 1 | Economic |
| C15 | Rural economy                                  | Revenue from sustainable rural industries   | 1 | Economy  |
| C16 | Nature acceptance                              | People's acceptance of nature include public opinion and lifestyle  | 5 | Social   |
| D1  | Extreme events                                 | Extreme events because of climate change  | 2 | Ecology  |
| D2  | Population                                     | Refers to both residents and tourist population   | 1 | Social   |
| D3  | Science, knowledge and environmental education | All kinds of science and knowledge. Environmental education includes social education to take action for the environment. | 3 | Cultural |
| D4  | Global market economy                          | Interconnected economic system worldwide and its consumption on natural resources   | 1 | Economy  |

The second step involved deciding which relationships to include in the aggregate FCM, the direction of causality, and the strength of each connection. To do this, we constructed an adjacency matrix. We first assigned causal signs (positive or negative), and then designated a strength to each relationship based on a scale of 0.2 to 0.3 (Weak), 0.4 to 0.7 (Medium), and 0.8 (Strong) or their negative equivalents. The weighting scales used in the individual FCMs were then adjusted to align with this aggregated format. In cases where the same relationship was described differently across the FCMs, the research team made a judgment based on a discussion of what appeared most logical for the aggregate FCM. An exception was made in determining the sign of relationships related to landscape quality. Because only one of the six FCMs used the concept “landscape quality”, we determined the sign not only from the individual FCMs but also from other literature sources, namely Rodríguez-Entrena et al. (2017) assessment of landscape quality across Mediterranean case studies.

### 2.3 Creating the dynamic outputs

For delivering the dynamic output, each case applied a computation approach that we illustrate here using a simplified example involving three concepts: C1, C2, and C3.

The initial state of all concepts is written using the state vector  $A$ , where the concepts that act as driving forces in the system map have the value 1:

$$A = (1, 0, 1)$$

We describe the strength and direction of the individual relationships in the system map using a matrix - as an example we use the matrix  $E$ .

$$E = \begin{pmatrix} 1 & 1 & 0 \\ -0.1 & 0 & 0 \\ 0 & 0.5 & 1 \end{pmatrix}$$

The resulting state of all concepts (the new state vector B) is calculated by matrix multiplication of the original state vector A with the relationship matrix E:

$$\begin{aligned} B = A \times E &= (1, 0, 1) \times \begin{pmatrix} 1 & 1 & 0 \\ -0.1 & 0 & 0 \\ 0 & 0.5 & 1 \end{pmatrix} = 1 \times (1, 1, 0) + 0 \times (-0.1, 0, 0) + 1 \times (0, 0.5, 1) \\ &= 1 \times (1, 1, 0) + 0 \times (-0.1, 0, 0) + 1 \times (0, 0.5, 1) \\ &= (1, 1, 0) + (0, 0, 0) + (0, 0.5, 1) = (1, 1.5, 1) = (1, 1, 0) + (0, 0, 0) + (0, 0.5, 1) \\ &= (1, 1.5, 1) \end{aligned}$$

The calculation of the new state vectors can be repeated in individual steps indefinitely. During this process, four situations can occur: (i) the system "implodes" - all concepts converge to zero; (ii) the system "explodes" - all concepts continuously increase/decrease; (iii) the system stabilizes in a cyclic state (resembling a sinusoid); (iv) all concepts stabilize at a constant value. Ideally, the stepwise calculation should be repeated until the resulting system behaviour can be identified (usually about 20-30 steps, but the system may stabilise earlier). The resulting graphs of the system model's behaviour are called the "dynamic model."

### 3 FCM outcomes

This section outlines the FCM outputs and an analysis of the three individual case studies described above.

#### 3.1 Czech FCM

##### 3.1.1 Identified concepts for FCM creation

Each of the three working groups (two land and one energy group) selected 15 out of 33 concepts defined before the workshop and added during the initial discussion. The selection of concepts for each group is displayed in Table 5.

Table 5. Concepts used in the systems map of each working group.

| Concept  | Group "Food system 1" | Group "Food system 2" | Group "Energy" |
|--|-----------------------|-----------------------|----------------|
| <b>C0 The level of transformative change in the energy/food/land sectors</b> (mandatory concept) | ✓                     | ✓                     | ✓              |
| <b>C1 Creating transformative communities</b> (mandatory concept)                                | ✓                     | ✓                     | ✓              |
| <b>C2 Public support for transformation</b> (mandatory concept)                                  | ✓                     | ✓                     | ✓              |

|  |   |   |   |
|--|---|---|---|
| <b>C3 Actors' conformity</b> (mandatory concept)                         | ✓ | ✓ | ✓ |
| <b>C4 Level of personal enthusiasm/determination</b> (mandatory concept) | ✓ | ✓ | ✓ |
| <b>C5 Decentralisation of the energy/food sector</b> (mandatory concept) | ✓ | ✓ | ✓ |
| <b>C6 Actors' cooperation</b>  |   | ✓ |   |
| <b>C7 Inspiring others</b>   |   |   |   |
| <b>C8 Fair remuneration</b>  |   |   |   |
| <b>C9 Legislation supportive of transformation</b>                       |   | ✓ | ✓ |
| <b>C10 Political support</b>   |   | ✓ | ✓ |
| <b>C11 Implementation of EU policies</b>                                 |   |   | ✓ |
| <b>C12 Efficiency of pro-transformative lobbying</b>                     |   | ✓ | ✓ |
| <b>C13 Efficiency of anti-transformative lobbying</b>                    | ✓ | ✓ | ✓ |
| <b>C14 Professionalization of transformative initiatives</b>             |   |   |   |
| <b>C15 Bureaucracy</b>   | ✓ |   |   |
| <b>C16 Sectoralism</b>   |   |   |   |
| <b>C17 Openness of governance processes</b>                              |   | ✓ |   |
| <b>C18 Influence of small actors</b>                                     |   | ✓ | ✓ |
| <b>C19 Linking producers with consumers</b>                              |   |   | ✓ |
| <b>C20 People's ability to afford sustainably-sourced products</b>       | ✓ | ✓ | ✓ |
| <b>C21 Accessibility of finance for transformative initiatives</b>       |   | ✓ | ✓ |
| <b>C22 Fair price levels</b>   | ✓ |   |   |
| <b>C23 Human-nature connection</b>                                       | ✓ | ✓ |   |
| <b>C24 Public's trust in transformative initiatives</b>                  | ✓ |   | ✓ |
| <b>C25 Evidence base on transformation</b>                               |   |   |   |
| <b>C26 Communication of transformative change</b>                        |   |   | ✓ |
| <b>C27 Public education</b>  | ✓ |   |   |
| <b>C28 Co-optation of transformative topics</b>                          | ✓ | ✓ |   |

|  |   |   |   |
|--|---|---|---|
| <b>C29 Sensitivity to certain topics and terms</b>                 |   |   | ✓ |
| <b>C30 Individualism</b>   |   |   |   |
| <b>C31 Global crises</b>   |   |   | ✓ |
| <b>CA Ability to meet needs on a non-monetary/non-market basis</b> | ✓ | ✓ |   |
| <b>CB Degree of society's understanding of the sector</b>          |   |   |   |
| <b>CX Active mainstream pressure</b>                               |   | ✓ |   |

### 3.1.2 FCMs and their dynamic outputs

The outputs of individual group FCMs are presented here, so that their results and insights may be analysed and compared. The two food groups can be directly compared, while the energy group offers a complementary insight into the concepts (enablers and disablers) that differentially affect transformative change within a similar cultural context.

#### Group "Food system 1"

The "Food System 1" group worked with 15 concepts, among which they plotted 26 linkages (figure 6). The plotted linkages represent 12% of the total number of all theoretically possible linkages between concepts (the so-called density of the system map). This overall model density is indicative of the level of complexity of the system map. This is a standard density measure (FCM system maps usually have a density between 5-15%), indicating that an optimal number of links were included in the system map.

The group focused on co-creating FCMs for transformative change in the food system. The discussion gave great importance to concepts such as society's relationship with nature, society's conformity, and anti-transformative lobbying. Issues of fair pricing for smallholder farmers and food producers were also an important part of the discussion. From the perspective of the participants, while changes in remuneration would lead to a fairer environment between small farmers and food producers, on the other hand, it could result in higher prices for final products and thus more exclusivity of such goods. The issue of fair pricing was seen as an important aspect of changing society's relationship with nature.

Throughout the process, it emerged that the group worked with the premise that from their point of view, there were currently no changes in the food system that could be described as transformative (this is discussed and elaborated on further below). Thus, an important line of the whole discussion accompanying the development of the FCM was the question of the perspectives of the different system players and their objectives.

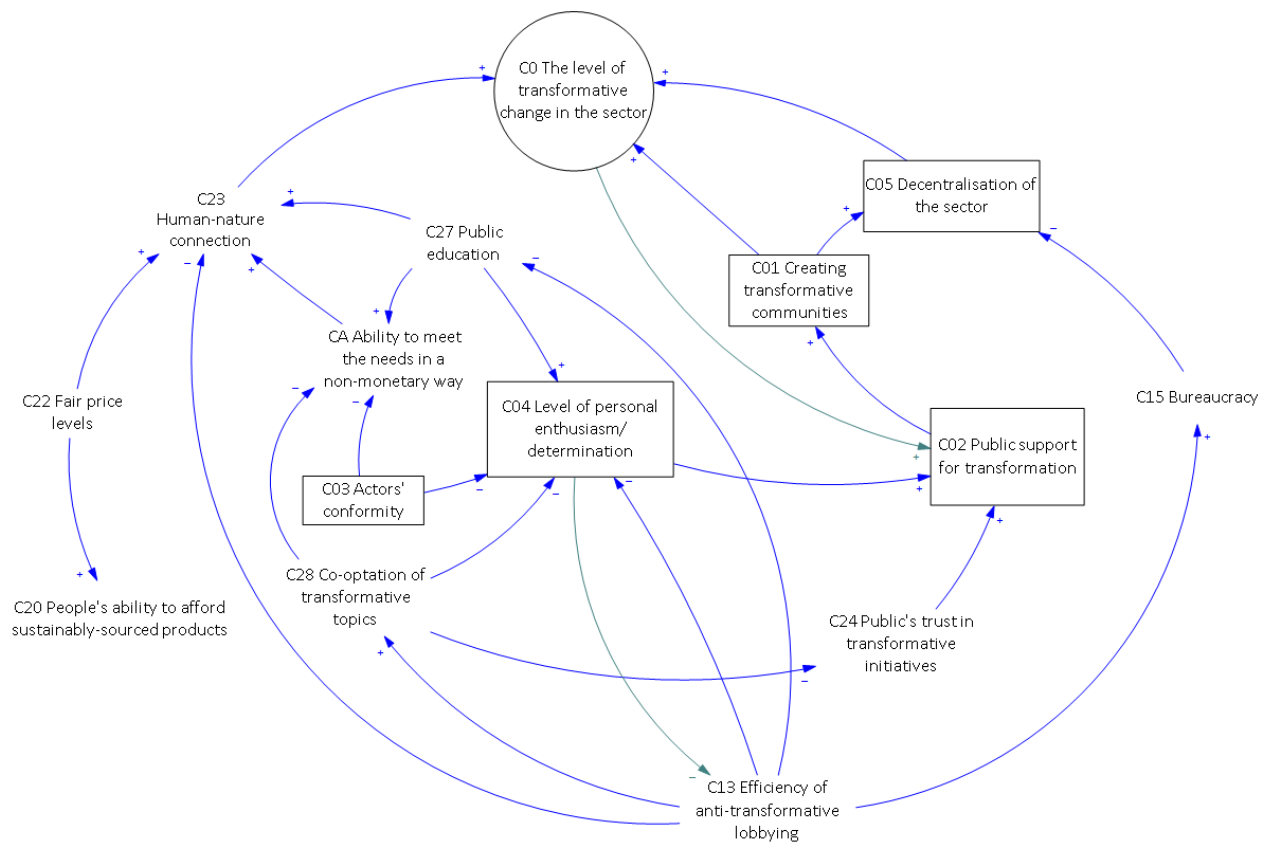


Figure 6. The final adaptation of the system map of the "Food System 1" group which was further analysed. Concepts with borders represent the mandatory concepts each group worked with (software: Vensim).

The FCM was analysed according to three model characteristics: concept centrality, feedback loops and system dynamics (the details for feedback loops are included in Appendix 2). In what follows, we focus on the central relationships and concepts that enable a qualitative understanding of transformative change as derived from this model, which are complemented by insights from focus group discussions also held during the workshop.

From the centrality analysis (which quantifies how many incoming and outgoing relationships a given concept in the map has, i.e. whether concepts are influenced by the system's functioning more than they influence the system), the most important concepts for the first food group were:

- *C4 Level of personal enthusiasm/determination* (6 ties with a total value of 2.1): this concept, together with *C13 Efficiency of anti-transformative lobbying*, had the highest number of ties, with more incoming than outgoing ties.
- *C13 Efficiency of anti-transformative lobbying* (6 ties with a total value of 3.3): the concept with the most outgoing ties out of the whole map and no incoming ties, thus acting as a significant driving force in the model.

- *C3 Actors' conformity* (4 ties with a total value of 2.7): a concept with no incoming ties, which, due to the high number of outgoing ties, represents one of the driving forces of the model.

We then tested for the dynamism of the model by modifying the relative importance of individual concepts. Figure 7 shows the dynamic output of the basic FCM version of the system map of the "Food system 1" group. This dynamic output describes a situation where all "driving forces", i.e. concepts that influence the rest of the system but are themselves not influenced by any other concept, are considered ("switched on") in the system map. The driving forces here were the concepts *C3 Actors' conformity* and *C22 Fair price levels*. If we look at the outputs in which we disregard ("switch off") one of the driving forces, we see that the concept *C3 Actors' conformity* affects transformative change negatively. In contrast, the concept *C22 Fair price levels* has a positive effect on transformative change.

The graph further shows that the *C0 Transformative change* initially increases slightly to positive values, but soon stabilizes at zero (i.e., the same value as at the beginning of the simulation). This phenomenon indicates that the level of transformative change does not decrease in the long run, but neither does it increase, i.e. transformative change is difficult to achieve in the system. This reversal in the dynamics of *C0* is due to the influence of feedback loops and concepts that have stabilized at a negative level (i.e., at a value lower than at the beginning) include *CA Ability to meet needs in a non-monetary/non-market way*, *C4 Level of personal enthusiasm/determination*, *C2 Public support for transformation*, and *C1 Creating transformative communities*. Just around neutral (i.e., 0), but still at a negative level, concepts *C24 Public trust in transformative initiatives* and *F27 Public education* have stabilized. The rest of the concepts stabilize at a positive value.

The most influential concepts according to the dynamic output of the model are those that have the highest absolute value at which they stabilize. In the case of the basic dynamic output, these are *CA Ability to meet needs in a non-monetary/non-market way* (-0.52), *C4 Level of personal enthusiasm/determination* (-0.25) and *C20 People's purchasing power* (+0.2). The system is most sensitive to the behaviour of these concepts from a dynamic output perspective, and if the final stabilisation level of *C0 Transformative Change* is to be changed, efforts should be directed towards influencing these concepts.

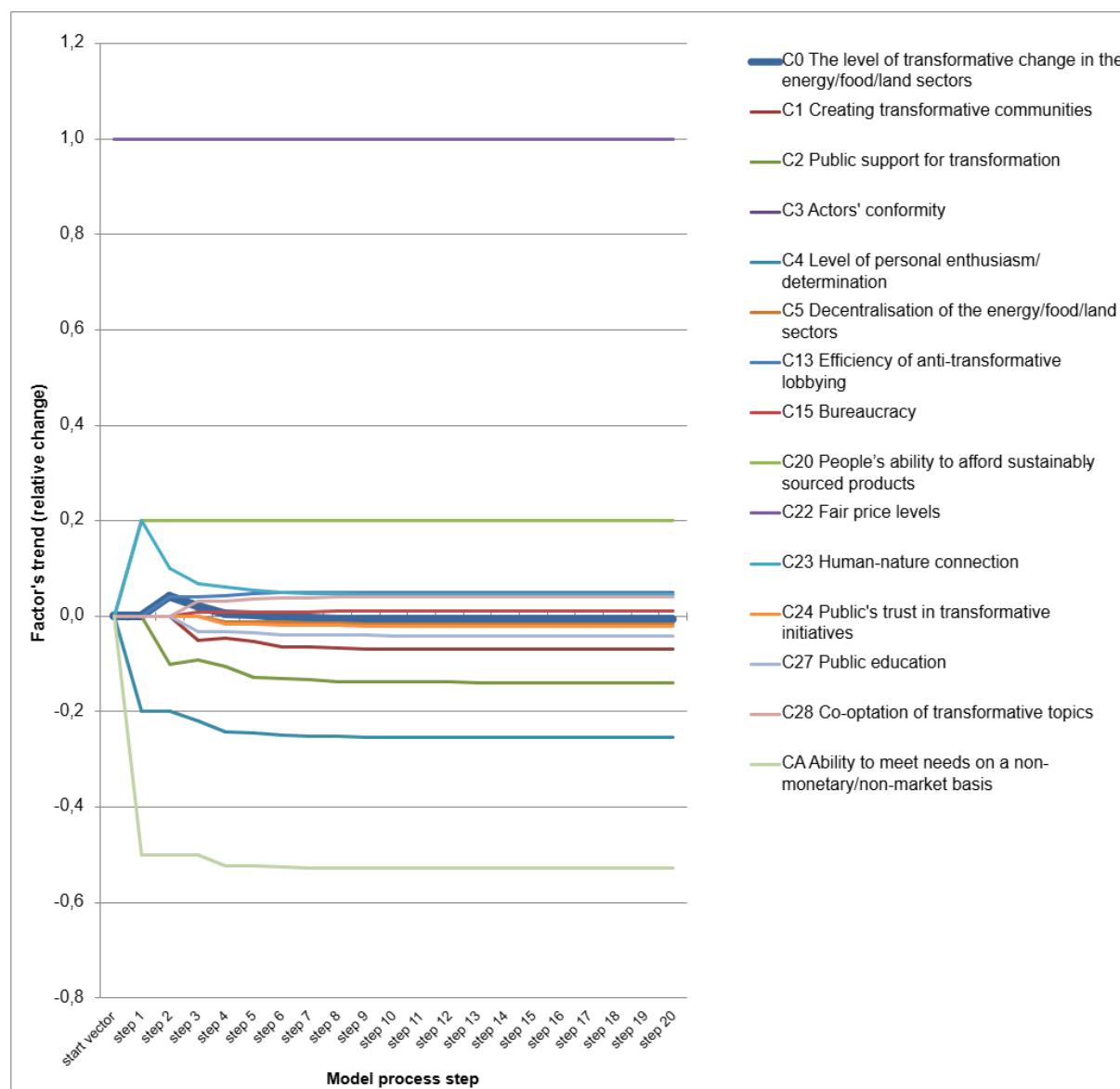


Figure 7. The dynamic output of the basic version of the FCM system map "Food Group 1".

In trying to shift the model, we removed the driving force *C22 Fair price levels* (figure 8), which caused most of the concepts to move to the negative level, where the concepts *C13 Efficiency of anti-transformative lobbying* and *C28 Co-optation of transformative topics* were the only ones that remained at the positive level. This suggests that the absence of *C22 Fair price levels* prevented the engagement of most of the drivers that could have reinforced transformative change, while not limiting the drivers that had a negative impact on transformative change. As a result in this scenario, *C0 Transformative change* settled at level lower compared to the baseline.

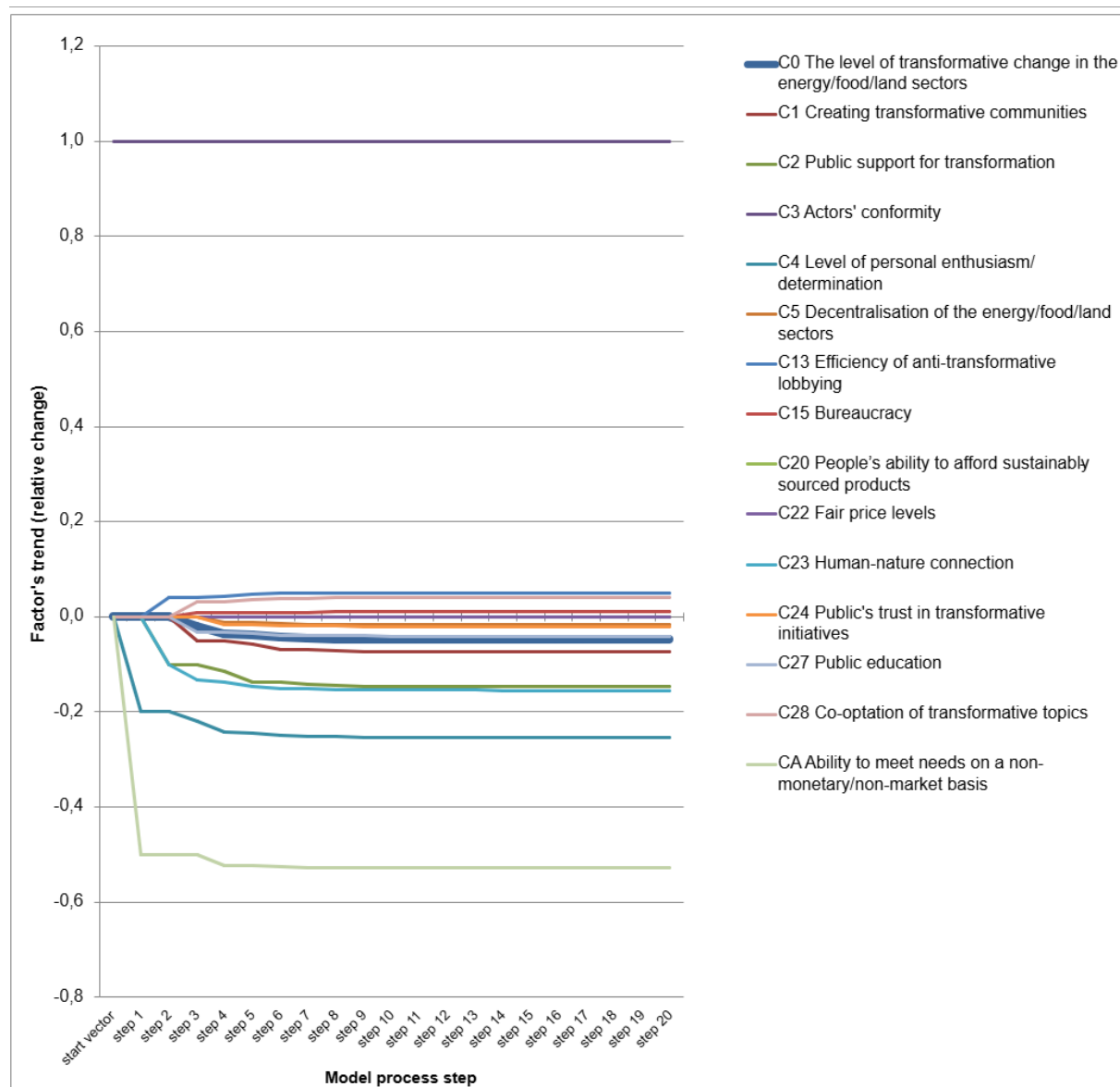


Figure 8. The dynamic output of the FCM version of the system map "Food System 1" with the absence of the driver F22 Fair price levels.

The relative importance of concepts was also evaluated, and we found that *C4 Level of personal enthusiasm/determination*, was significant in terms of all three analytical approaches. Concept *C13 Efficiency of anti-transformative lobbying* was significant in terms of two analytical approaches (centrality and feedback loops).

Other significant concepts from the perspective of at least one type of analysis were mainly concepts touching on society-wide issues, such as *C3 Actors' conformity*, *C20 People's ability to afford sustainably-sourced products*, *C28 Co-optation of transformative topics*, and *CA Ability to meet needs in a non-money/non-market way* (Table 6).

Table 6. Overall most important concepts in the "Food system 1" group.

| Concept   | Centrality | Feedback loops | Dynamics |
|---|------------|----------------|----------|
| C3 Actors' conformity                                       | ✓          |                |          |
| C4 Level of personal enthusiasm/ determination              | ✓          | ✓              | ✓        |
| C13 Efficiency of anti-transformative lobbying              | ✓          | ✓              |          |
| C20 People's ability to afford sustainably-sourced products |            |                | ✓        |
| C28 Co-optation of transformative topics                    |            | ✓              |          |
| CA Ability to meet needs on a non-monetary/non-market basis |            |                | ✓        |

**This conclusion from the "Food System 1 group" suggests that transformative change in food systems is strengthened by the level of personal enthusiasm/determination, but is also undermined by the efficiency (success) of anti-transformative lobbying. In research terms, the significance of these findings suggest that attention needs to be paid to individual, and inner-level transformations and ways of collaborating and working together, as well as to what resistance to change consists of.**

#### Group "Food system 2"

The "Food System 2" group worked with 19 concepts, among which it plotted 32 linkages (Figure 9). The plotted linkages represent 9% of the total number of all theoretically possible linkages between concepts, meaning the density of the system map falls within the optimal range.

The group focused on mapping the key mechanisms of processes related to transformative change in the food sector. The group viewed these mechanisms as both (a) higher-level pressure from the current mainstream, related to the efficiency of anti-transformative lobbying (i.e., a higher-level process inhibiting transformative change), and (b) building collaborative and transformative communities, empowering small actors, and decentralizing the food sector (i.e., a lower- or local-level process enhancing transformative change).

The overall message suggested that a bottom-up mechanism seeking transformative change in the sector faces a difficult situation, set by a top-down mechanism.

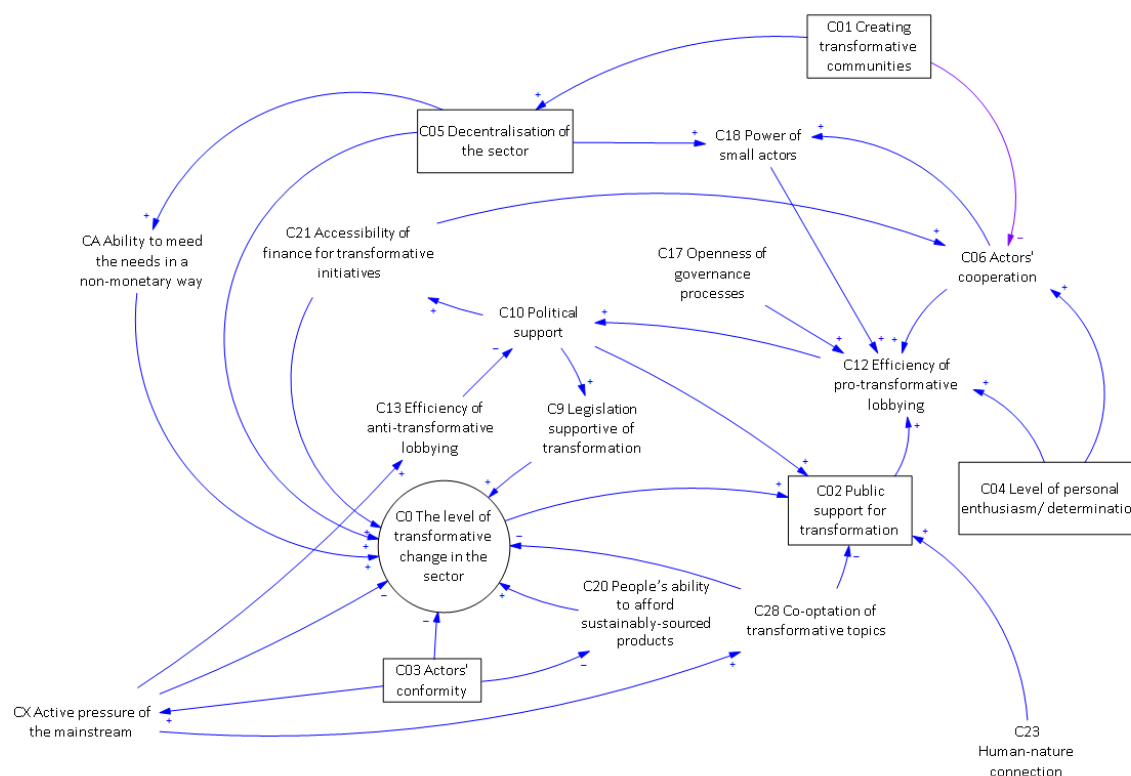


Figure 9. Final adaptation of the system map of the "Food System 2" group, which was further analysed. Concepts with borders represent the mandatory concepts each group worked with (software: Vensim).

For the second food group, the most important concepts in terms of centrality (which quantifies how many incoming and outgoing relationships a given concept in the map has, i.e. whether concepts are influenced by the system's functioning more than they influence the system) were:

- *C0 The level of transformative change in the energy/food/land sectors* (9 links with a total value of 3.0): as a central concept and the focus of the discussion, high centrality is to be expected. The concept has significantly more incoming than outgoing links, i.e. it is more influenced by the functioning of the system than it influences it.
- *C3 Actors' conformity* (5 ties with a total value of 2.9): this concept had the most outgoing ties of the whole map and no incoming ties, thus significantly influencing the rest of the model.
- *C1 Creating transformative communities* (4 links with a total value of 2.7): similar case to C3.
- *C12 Efficiency of pro-transformative lobbying* (6 ties with a total value of 1.2): this concept had a large number of incoming ties and a minimum of outgoing ties, so it is strongly influenced by the rest of the model and also affects *C0 Transformative change* as a result.

In terms of dynamic modelling, we found that that *C0 Transformative change* stabilizes at a negative value (i.e., at a lower value than at the beginning of the simulation), as do *C20 People's ability to afford sustainably-sourced products*, *C2 Public support for transformation*, *C10 Political support*, and *C21 Accessibility of finance for transformative initiatives* (figure 10). This phenomenon suggests that the level of transformative change does not decrease in the long run, but neither does it increase, i.e. transformative change is difficult to achieve in a given system. The rest of the concepts stabilize at a positive value. Thus, the simulation shows

that the driving forces in this system initially cause a decrease in the C0 concept, but a series of feedback loops reinforcing transformative change balances this trend after some time.

The most influential concepts, according to the dynamic output of the model are those that have the highest absolute value at which they stabilize. In this case, these are C12 Efficiency of pro-transformative lobbying (+0.51), C5 Decentralisation of the sector (+0.5) and C6 Actors' cooperation (+0.4) (and on the negative side, C0 Transformative change itself; -0.43). The system is most sensitive to the behaviour of these concepts from a dynamic output perspective, and if the final level of stabilisation of C0 Transformative change is to be changed, efforts should be directed toward influencing these concepts.

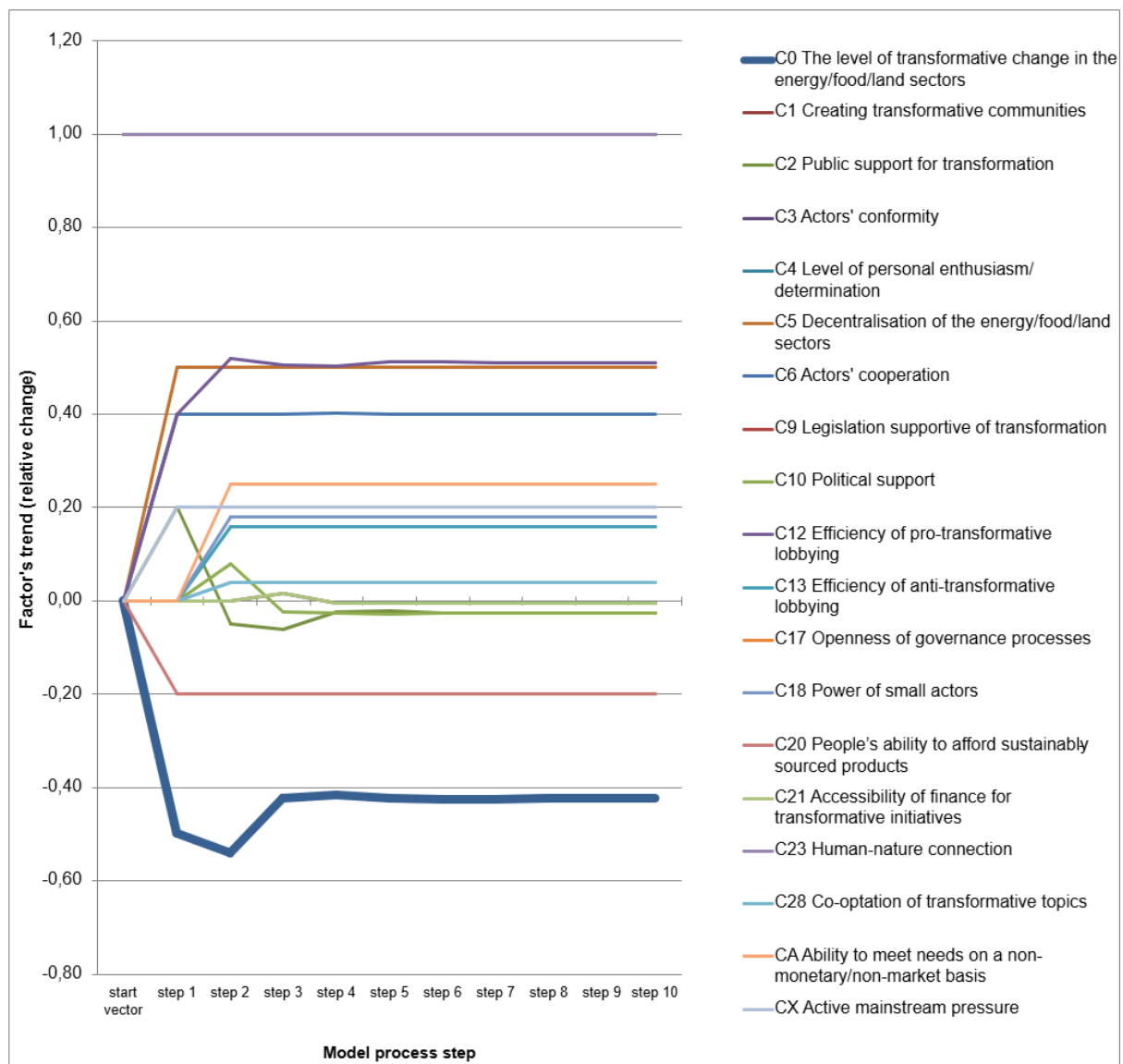


Figure 10. The dynamic output of the basic version of the FCM system map "Food System 2".

In experimenting with the dynamic model, we found that removing the driving force *C1 Creating transformative communities* resulted in a weakening of the level of transformative change. Experimental "switching off" of the role of drivers *C4 Level of personal enthusiasm/determination*, *C17 Openness of social governance processes* and *C23 Human-nature connection* showed that the absence of these concepts does not change the negative

level *C0 Transformative change* (Figure 11). The reason for this is that none of these concepts is significantly related to the rest of the system.

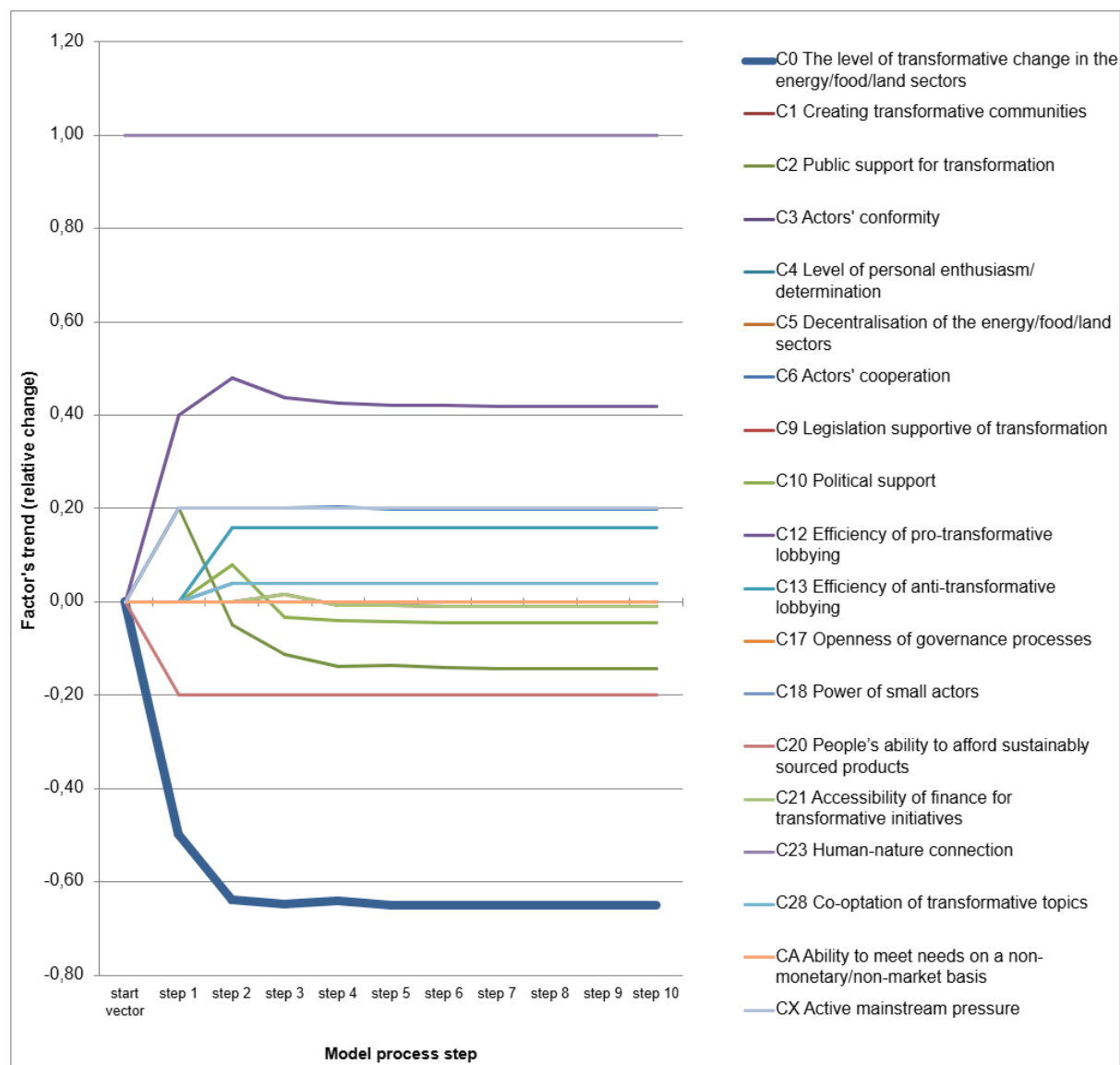


Figure 11. The dynamic output of the FCM version of the system map "Food System 2" with the absence of the C1 driver Creating transformative communities.

Table 7 shows the importance of each concept in terms of the different methods of FCM analysis of the system map "Food System 2". In terms of all three types of analysis, a single concept, C12 Efficiency of pro-transformative lobbying, was the most significant.

Table 7. The most important concepts in the "Food System 2" group

| Concept  | Centrality | Feedback loops | Dynamics |
|--|------------|----------------|----------|
| <b>C1 Creating transformative communities</b>        | ✓          |                |          |
| <b>C2 Public support for transformation</b>          |            | ✓              |          |
| <b>C3 Actors' conformity</b>                         | ✓          |                |          |
| <b>C5 Decentralisation of the sector</b>             |            |                | ✓        |
| <b>C6 Actors' cooperation</b>                        |            |                | ✓        |
| <b>C10 Political support</b>                         |            | ✓              |          |
| <b>C12 Efficiency of pro-transformative lobbying</b> | ✓          | ✓              | ✓        |

**This conclusion suggests that transformative change in food systems, from the perspective of the “Food System 2” group, is the result of opposing dynamics, where transformative change is fostered by collaboration, the creation of transformative communities, and pro-transformative lobbying, and in contrast, is slowed or blocked by societal conformity.**

### Summary: FCMs for Food Sector Groups

Bringing the results of the two groups together provides a nuanced and complementary picture. Both groups agree that transformative change is difficult and resisted by the current system in the Czech context. The two groups, being composed of different individuals with different perspectives, chose to focus on different relationships and concepts: Food Group 1 focused more on individual motivation, pricing structures, and resistance from dominant forces. Food Group 2 saw change as a struggle between grassroots efforts and institutional resistance, highlighting the need to empower collaboration and advocacy.

The two food system groups identified a set of interrelated levers – concepts that can either enable or obstruct transformative change in the food sector. While each group emphasised different mechanisms, a shared narrative emerges around systemic resistance, bottom-up empowerment, and the fragility of motivation and resources needed for transformation.

To achieve Transformative Change, Food Group 1's FCM required removing actors' conformity, while removing fair prices hurt transformation. For Food Group 2, only bottom-up resilience (cooperation, lobbying) brought transformative change back to slightly positive territory, while removing key enablers like community-building further weakened the system.

For these reasons, engaging with and transforming the lobbying landscape (who is involved, what their messaging is); engaging at local levels to empower and foster transformative communities; ensuring that leaders of these desired changes are supported and stay motivated; and that overall, attention is paid to systems' price levels and stakeholders' purchasing power (i.e their ability to afford sustainably-sourced products) - are concepts that contribute to positive shifts for transformative change overall based on these insights from experts and practitioners working in these sectors.

### Energy Sector Group

The "Energy" group worked with 19 concepts, with a final 35 links/connections between them. The plotted linkages represent (10%) of the total number of all theoretically possible linkages between concepts, indicating that an optimal number of links have been included in the system map (Figure 12).

The group mapped the mechanisms of the ongoing transformation in the energy sector towards sustainability. Compared to the other two groups, there was a clear consensus that transformative change in this sector is already underway, thanks in particular to the long-standing pressure from the European Union to implement the community energy concept into Czech legislation, as well as the energy crisis caused by Russia's invasion of Ukraine, which accelerated this implementation significantly.

The FCM map was dominated by the influence of top-down concepts that enable decentralisation and transformation of the energy sector, while highlighting the crucial influence of Czech legislation.

At the same time, the group stressed the presence of two opposing parallel systems created by lobbying – the influence of pro-transformative lobbying leading to political support for transformative change, and conversely, the influence of anti-transformative lobbying blocking this support.

Among the bottom-up concepts, the group highlighted the power of small actors enabling decentralisation of the energy sector or the actors' conformity blocking transformative change in the sector.

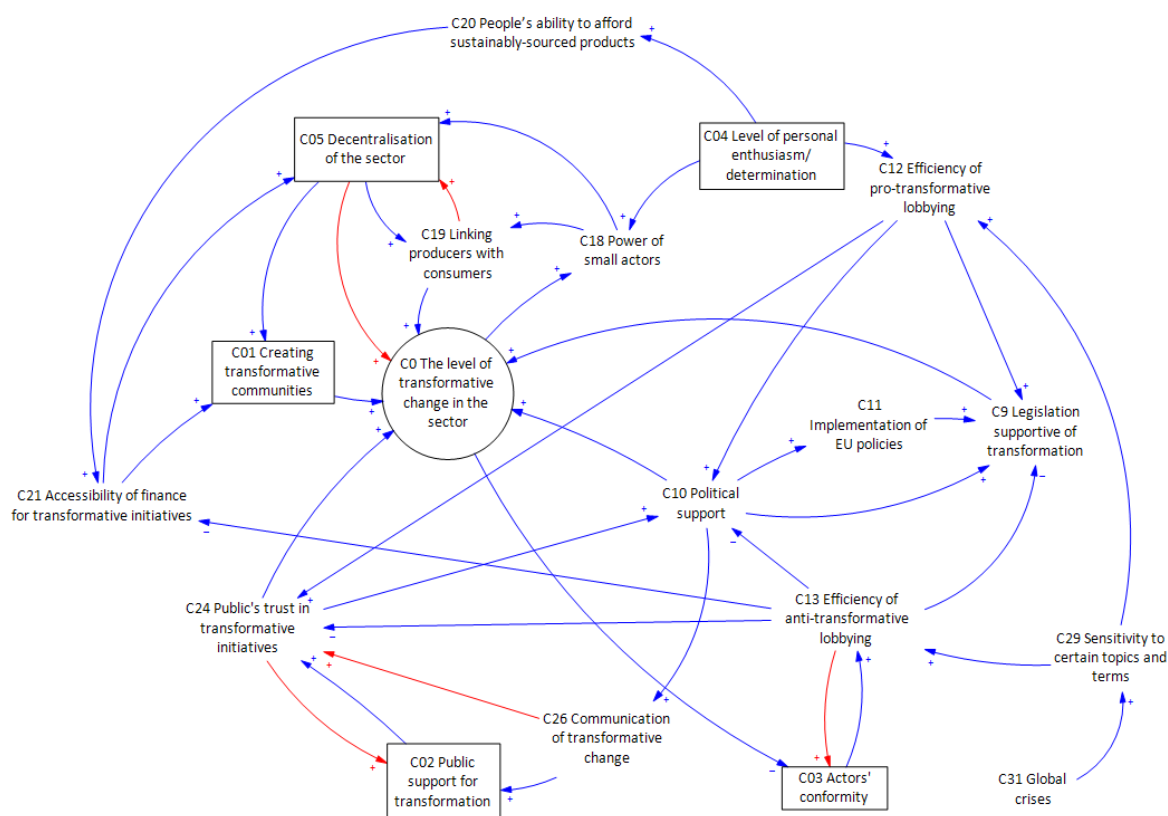


Figure 12. Final modification of the system map of the "Energy" group with removed duplicate links (highlighted in red), which was further analysed. Concepts with borders represent the

mandatory concepts each group worked with. The presence of duplicate links (duplicate causal relationships captured in the map) disproportionately increased the complexity of the map and the number of feedback loops. A modified version of the final map was produced in which the duplicate links were removed as they were reached vicariously through the retained causal pathways (software: Vensim).

The most important concepts in terms of centrality (which quantifies how many incoming and outgoing relationships a given concept in the map has, i.e. whether concepts are influenced by the system's functioning more than they influence the system) in the FCM model were:

- *C0 The level of transformative change* in the energy sector (7 links with a total value of 2.9): as a central concept and the focus of the discussion, high centrality is to be expected. The concept has significantly more incoming than outgoing links, i.e., it is more influenced by the functioning of the system than it influences it.
- *C4 Level of personal enthusiasm/determination* (5 links with a total value of 2.6): this concept had more outgoing than incoming links, thus influencing the rest of the model considerably.
- *C10 Political support* (7 links with a total value of 2.6): this concept again had more incoming than outgoing links.
- *C13 Efficiency of anti-transformative lobbying* (6 links with a total value of 3.3): this concept had the most outgoing links of the entire map and fewer incoming links, thus significantly influencing the rest of the model.

We experimented again with the dynamic potentials of the FCM model (Figure 13). Here, we found that the main drivers were *C4 Level of personal enthusiasm/ determination*, which had a strong personal influence on transformation, and *C31 Global crises*, which had a slightly negative effect. This suggests that crises are disruptive, which may be positive in terms of providing an opening or opportunity for change, however, their momentum and potential needs to be harnessed if they are not to be (or remain) too disruptive.

The graph stabilised with all concepts over time with the exception of *C3 Actors' conformity*, which stabilised at a negative value. This signifies that this concept drags the entire system down consistently, meaning that it is an important concept to influence and change for the prospect of overall improvement in the likelihood of transformative change.

The most influential concepts based on their final stabilised values were *C18 Influence of small actors* (+0.25), *C12 Efficiency of pro-transformative lobbying* (+0.24), *C0 Transformative change* itself (+0.22), and *C29 Sensitivity to certain topics and terms*. These represent high opportunity leverage points, where influencing these can shift the overall system towards or away from transformation.

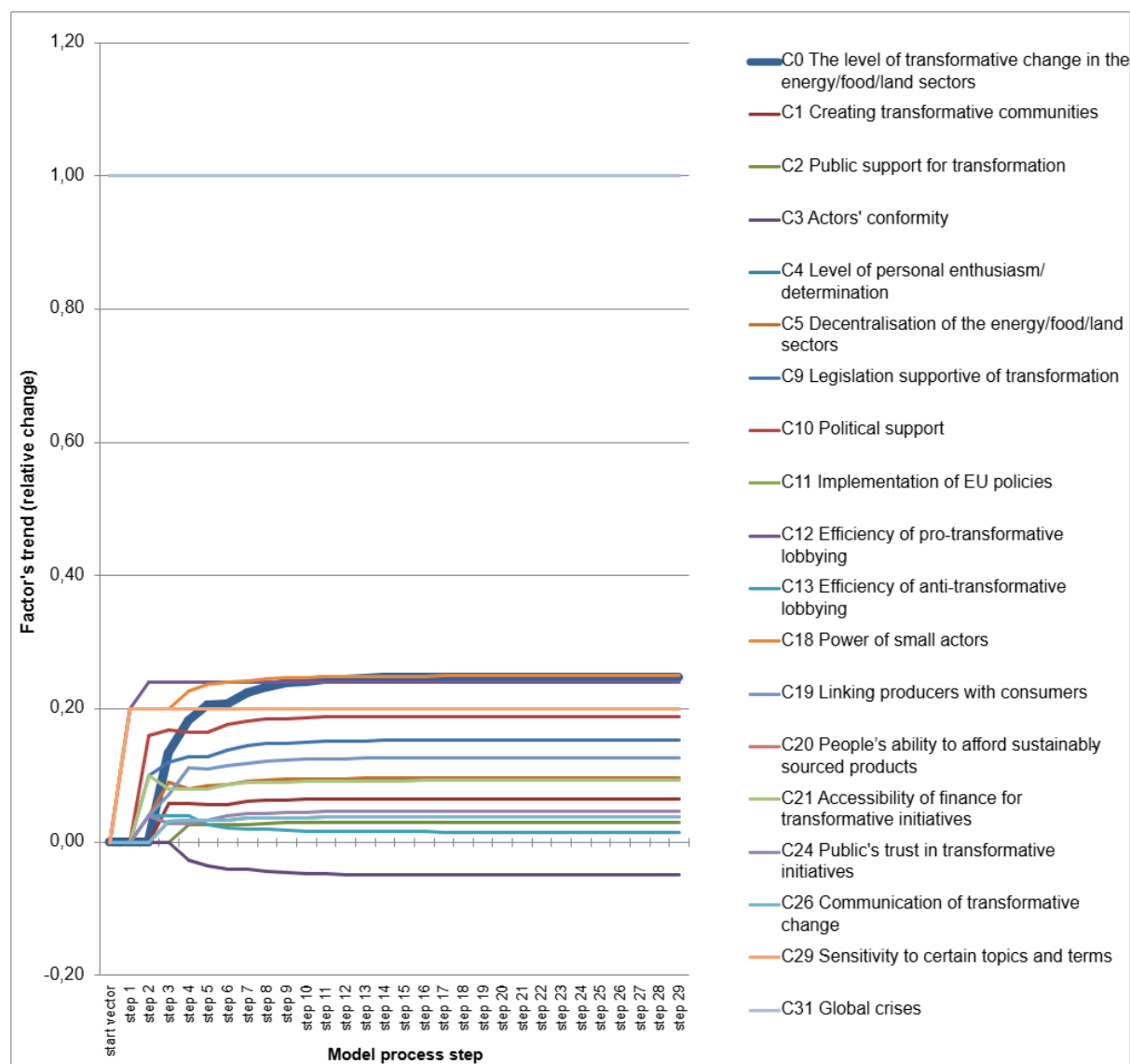


Figure 13. The dynamic output of the modified version of the FCM system map "Energy" (with duplicate links removed.)

Removing *C4 Level of personal enthusiasm/determination* led to a clear drop in transformation levels, confirming the critical role of motivation (figure 14). "Switching off" of the driving force *C31 Global crises* had the opposite effect as it actually boosted transformation, increasing the impact of small actors, supportive legislation, lobbying, and finance access, while decreasing anti-transformative lobbying (*C13*) (figure 15).

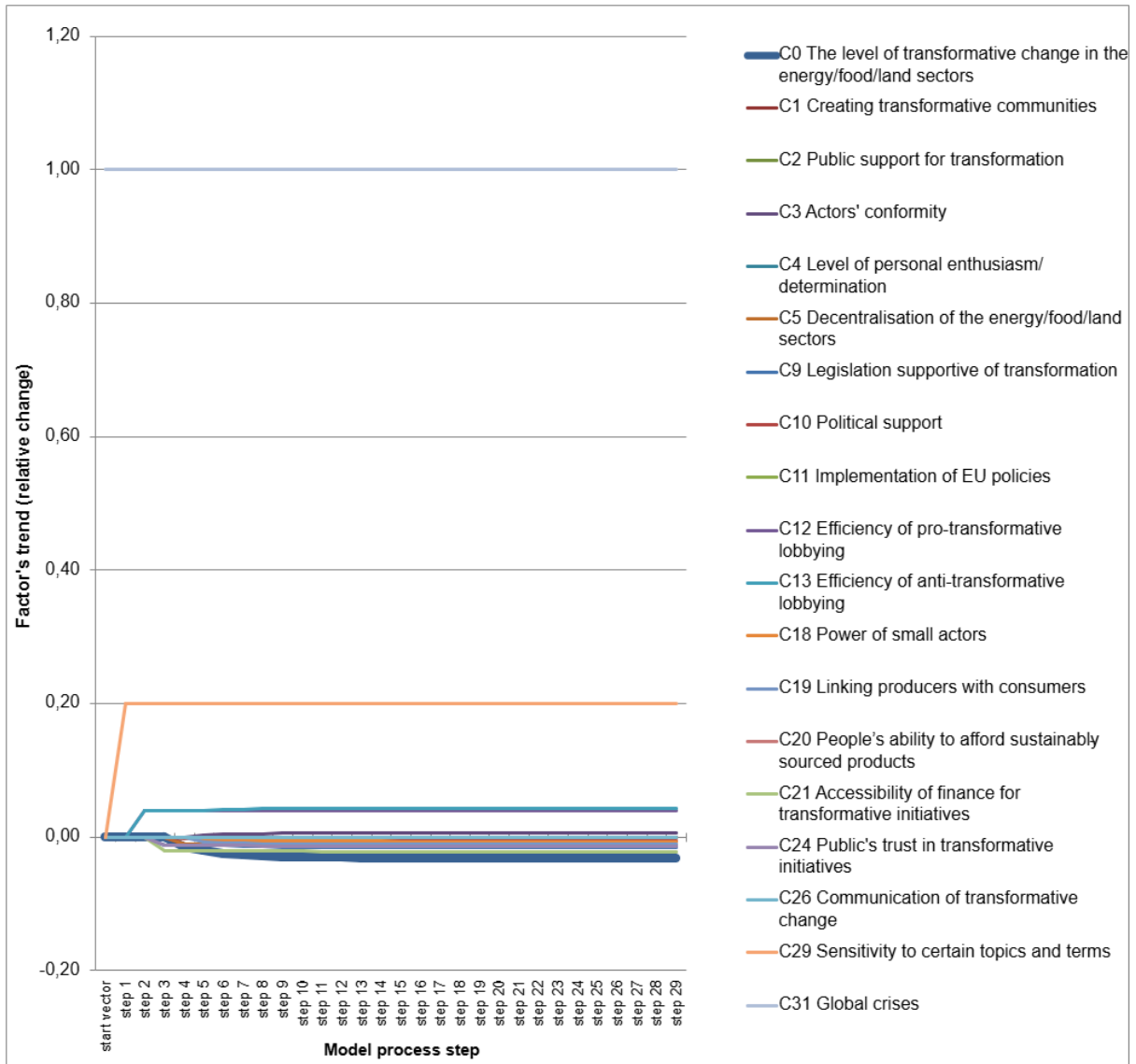


Figure 14. The dynamic output of the FCM version of the system map "Energy" with the absence of the C4 driver Level of personal enthusiasm/determination.

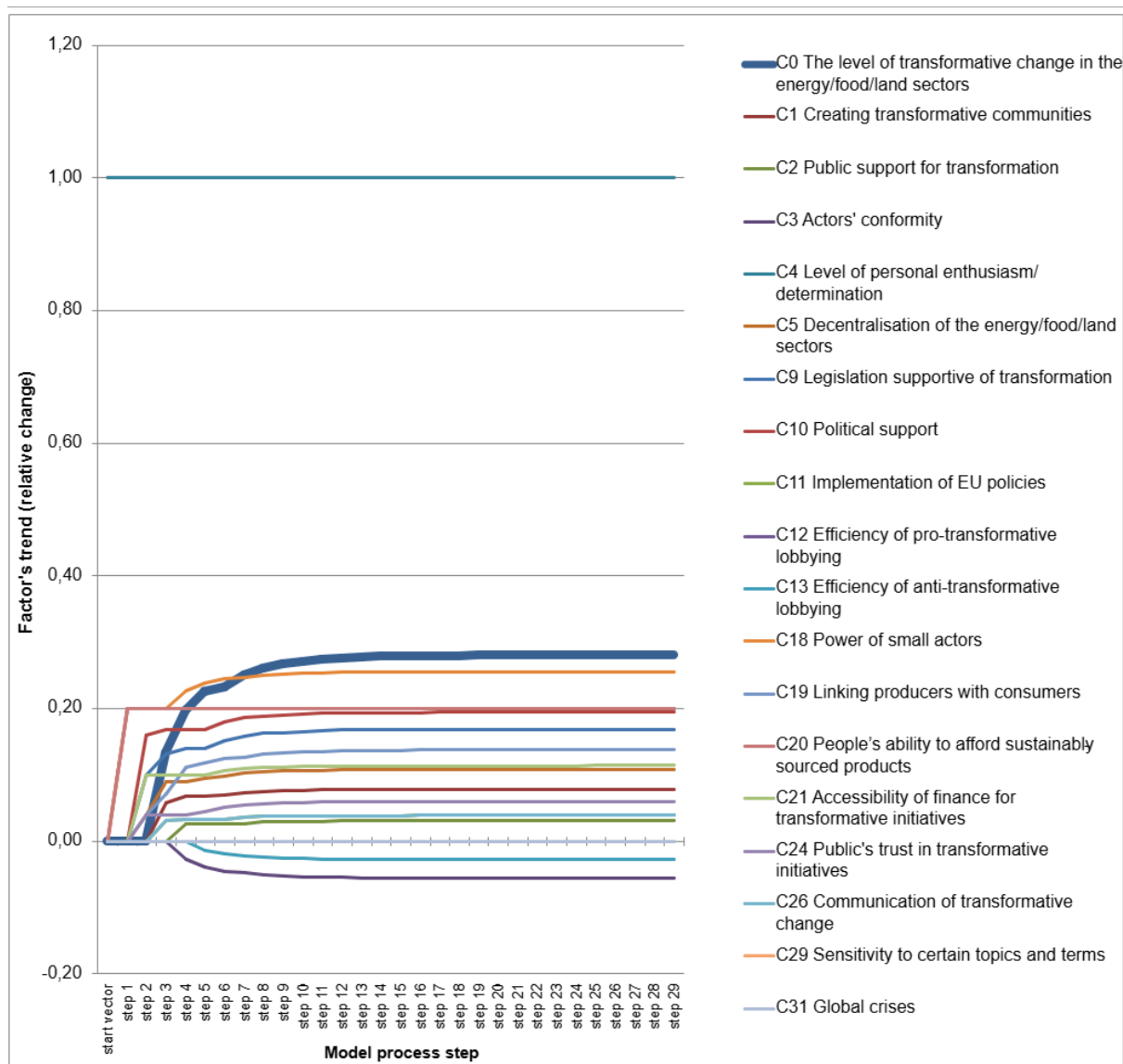


Figure 15. The dynamic output of the FCM version of the system map "Energy" with the absence of the C31 driver Global crises.

Table 8. The most important concepts in the Energy group.

| Concept   | Centrality | Feedback loops | Dynamics |
|---|------------|----------------|----------|
| <b>C3 Actors' conformity</b>                          |            | ✓              |          |
| <b>C4 Level of personal enthusiasm/ determination</b> | ✓          |                |          |
| <b>C9 Legislation supportive of transformation</b>    |            | ✓              |          |
| <b>C10 Political support</b>                          | ✓          |                |          |
| <b>C12 Efficiency of pro-transformative lobbying</b>  |            |                | ✓        |

|   |   |   |   |
|---|---|---|---|
| <b>C13 Efficiency of anti-transformative lobbying</b>   | ✓ | ✓ |   |
| <b>C18 Influence of small actors</b>                    |   |   | ✓ |
| <b>C24 Public's trust in transformative initiatives</b> |   | ✓ |   |
| <b>C29 Sensitivity to certain topics and terms</b>      |   |   | ✓ |

Overall, the energy group's FCM suggests that transformative change in the Czech energy sector emerges from opposing dynamics. On one side, transformation is supported by individual motivation, empowered small actors, pro-transformative lobbying, supportive legislation, and political backing. On the other, it is slowed by societal conformity and anti-transformative lobbying. The FCM shows that while the system holds clear potential for change, this depends heavily on reducing systemic inertia and enabling strategic shifts in the political and communication environment. Importantly, global crises alone are insufficient catalysts; rather, transformation requires intentional investment in pro-change actors, narratives, and institutions (see Table 8).

These insights and models were used to showcase a dynamic model to workshop participants, which generated a focused group discussion about relationships and reflections around these. Specific feedback loops were subsequently used to inform the development of pathways, which are explained and outlined below in section 5.

### 3.2 English FCM

Working from 20 qualitative interviews with farm cluster leads, 16 concepts were used to build the initial FCM, 14 of which were included in the final map. Two concepts were classed as system drivers, i.e., concepts with no inward arrows: *C4 Leaders' responsiveness to farmer perspectives*, and *C14 Government guidance*.

In total 54 linkages were plotted, from a total of 196 theoretically possible relationships (see Figure 16). The plotted linkages represent 27% of the total number of all theoretically possible linkages between concepts (the so-called density of the system map). This overall model density indicates a complex system (which is likely a consequence of the researcher-driven approach to identifying causal links from interview transcripts) as the density measure falls outside of the standard range (FCM system maps usually have a density between 5-15%).

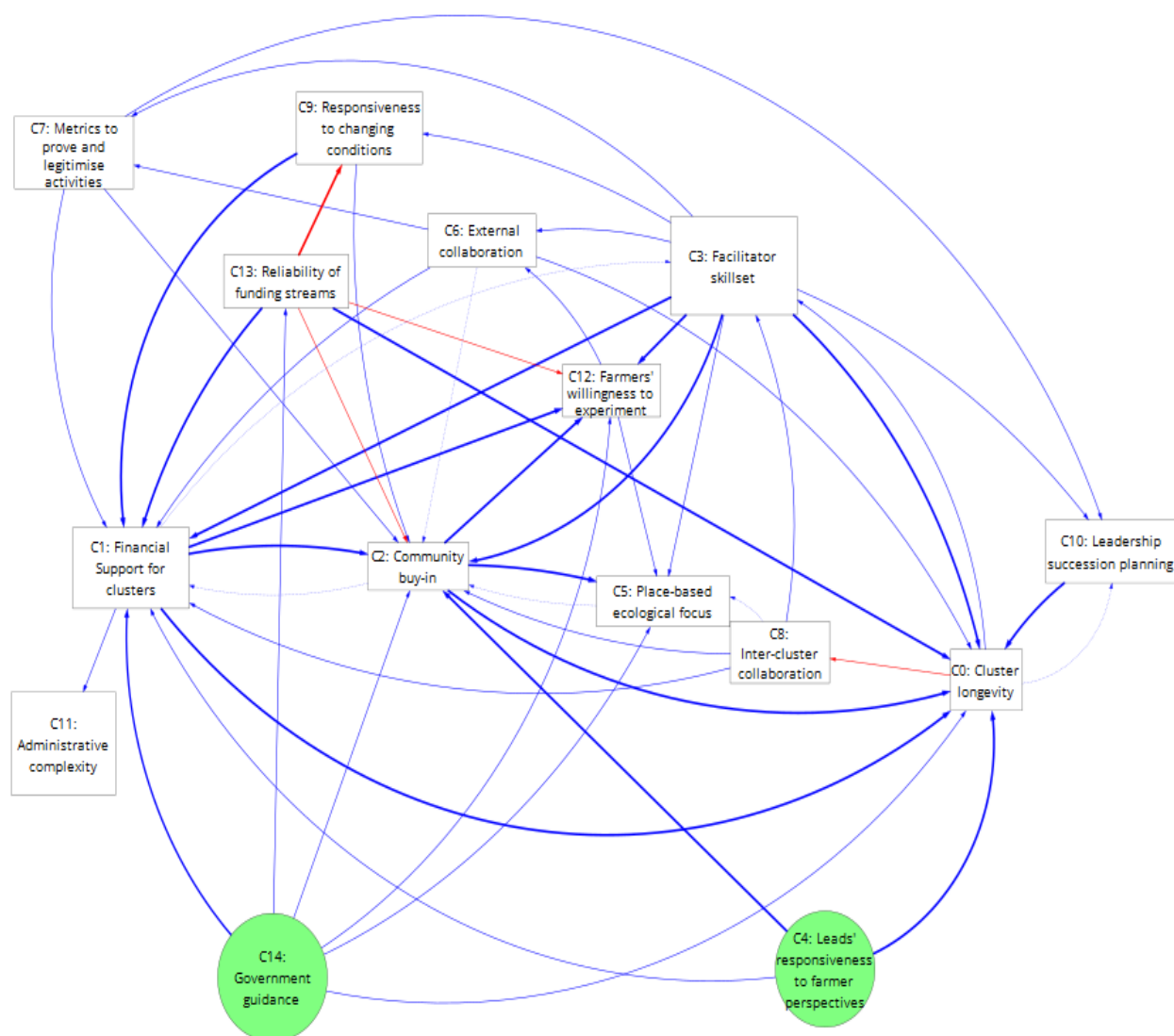


Figure 16. Final version of the system map of cluster longevity, which was further analysed. Thicker lines represent the strongest causal links (software: Vensim).

The FCM was analysed according to two model characteristics: concept centrality, and system dynamics. Below we focus on the central relationships and concepts that enable a qualitative understanding of farm cluster longevity as derived from this model, which are complemented by additional insights from the narrative interviews. Due to the short timeline for case study completion and the comparatively out-sized importance of two key concepts in the dynamic modelling, we chose not to analyse feedback loops in preparation for the pathways workshop.

From the centrality analysis, the most important concepts affecting cluster longevity were:

- *C1: Financial support to clusters* (14 relationships with a total value of 5.2)
- *C2: Community buy-in* (14 relationships with a total value of 5)
- *C3: Facilitator skill set* (12 relationships with a total value of 4.2)

- *C4: Leads' responsiveness to farmer perspectives* (5 relationships with a total value of 3.3)

These four concepts represent the foundational conditions for sustaining cluster activity.

The baserun dynamic output of the FCM stabilised with *C0 Cluster Longevity* as below 0, indicating a negative situation for farmer groups in the current political-economic climate within East Anglia (see Figure 17). In this iteration of the model, the strength of the drivers was set to reflect their current influence on cluster longevity: *C4 Lead's responsiveness to farmer perspectives* = +0.1 and *C14 Government guidance* = -0.3.

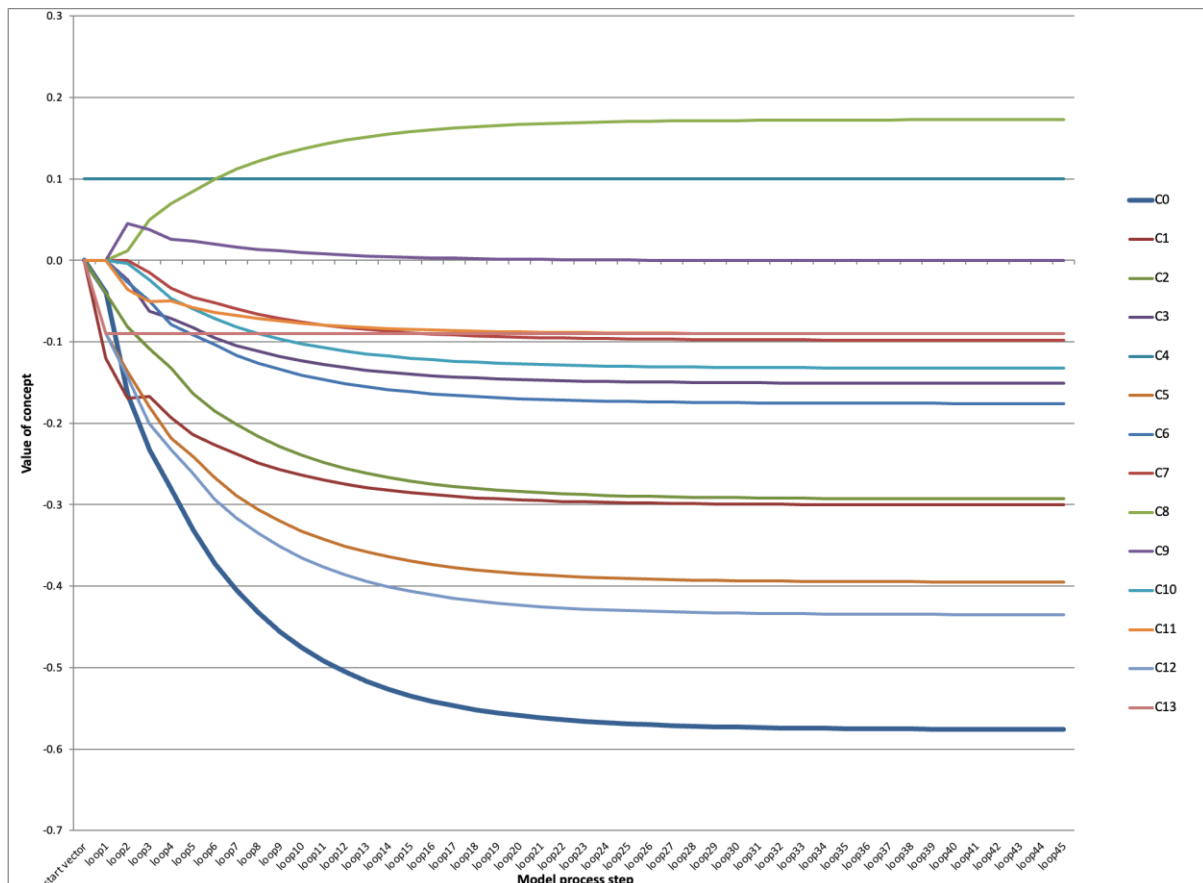


Figure 17. Dynamic output of the FCM base-run for farm clusters' longevity in East Anglia as C0.

Sensitivity analysis showed that *C8 Inter-cluster collaboration* currently plays a crucial stabilising role across the system. However, it is negatively influenced by cluster longevity suggesting that clusters may withdraw from or see less value in collaboration the more successful they become.

The dynamic output further revealed that the system is extremely sensitive to changes in individual relationships, as a result of the dense network of feedback loops - 268 in total. This indicates a responsive, highly interconnected system where small changes can produce a powerful ripple effect - both positive or negative towards transformative change..

Scenario analysis demonstrated that increasing the strength of *C4 Leads' responsiveness to farmer perspectives* – had an extremely strong, immediate positive effect on cluster longevity, even in conditions where government guidance was weak or destabilising (see Figure 18).

Strengthening the driver Government guidance was similarly beneficial to cluster longevity, highlighting that farm clusters respond well to clearly defined policies that enable long-term business planning. However, for the purposes of the pathways workshop, we were interested in levers within our stakeholders' direct control, which made Lead's responsiveness to farmer perspectives a more generative focal point for our futures and pathways planning.

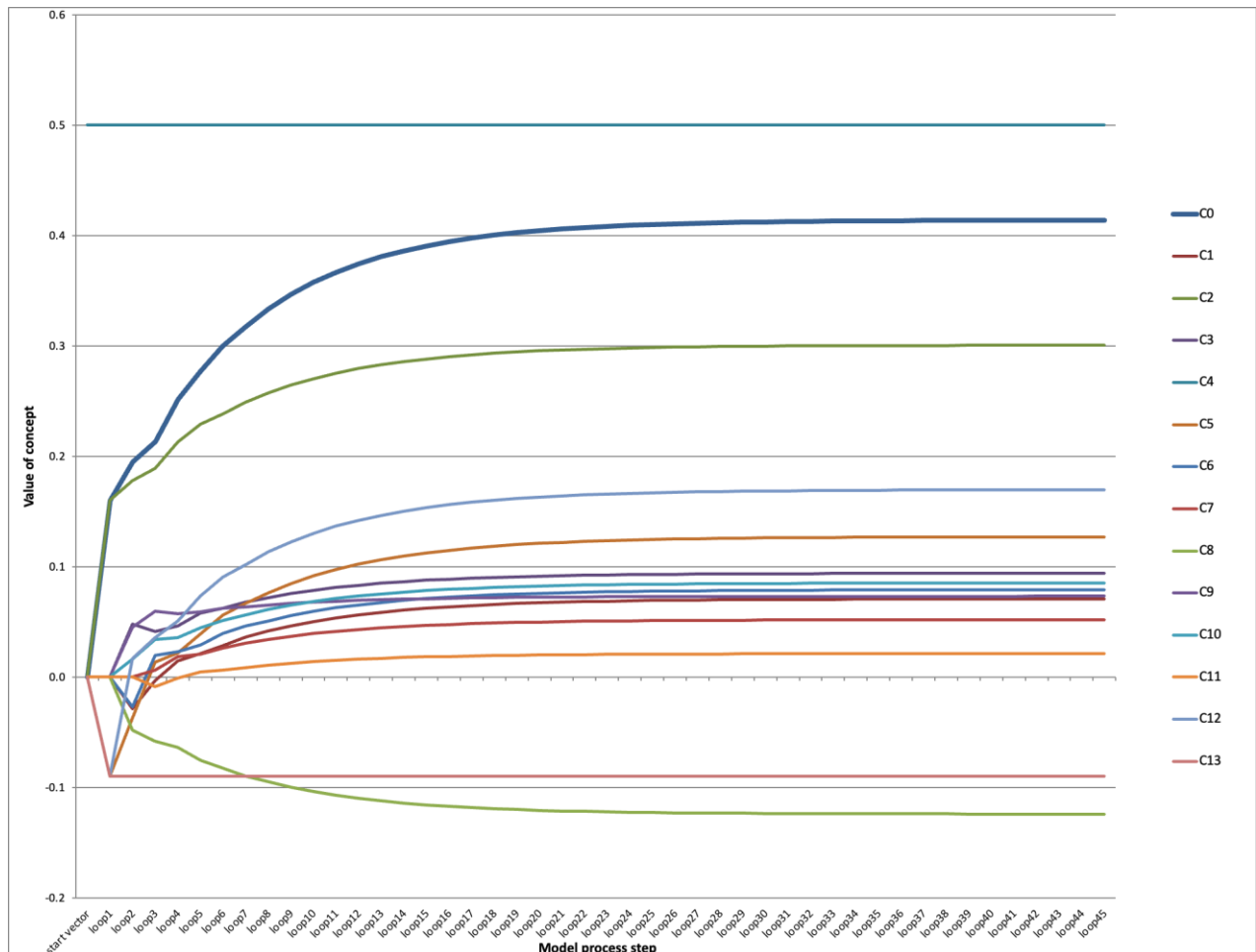


Figure 18. Dynamic output of the FCM where the driver C4 Lead's responsiveness to farmer perspectives is strengthened.

Table 9 summarises the importance of the different concepts in terms of sensitivity, centrality, and feedback loops. Across the three types of analysis a single concept, *C4 Leads responsiveness to farmer perspectives*, was the most significant for cluster longevity. This suggests that from the perspective of farm cluster leads, the extent to which they actively listen to, engage with, and reflect the diversity of farmer voices within the cluster in their decision-making processes and activities ultimately determines the groups' longevity, and is therefore key to farm cluster's transformative potential. This relationship is also contingent on farmers being willing and able to participate and share in these networks; essentially, that clusters compose a there-and-back organisation of community buy-in.

As the key determining concept of the aggregate cognitive map, we decided to hone in on this relationship in the pathways workshop as it was the lever with the most potential to positively improve the overall system.

Table 9. The most important concepts in the FCM.

| Concept  | Centrality | Dynamics |
|--|------------|----------|
| <b>C1 Financial support to clusters</b>                | ✓          |          |
| <b>C2 Community buy-in</b>                             | ✓          | ✓        |
| <b>C3 Facilitator skillset</b>                         | ✓          |          |
| <b>C4 Leads' responsiveness to farmer perspectives</b> | ✓          | ✓        |
| <b>C5 Place-based ecological focus</b>                 |            | ✓        |
| <b>C8 Inter-cluster collaboration</b>                  |            | ✓        |

### 3.3 Aggregate WE FCM

The aggregate FCM for Western Europe was built out of 20 concepts, 4 of which are identified as system drivers: Extreme events, Population, Science, knowledge, and environmental education and Global market economy (Figure 19).

In total, 46 plotted relationships were plotted, giving the model a density of 11%. This is within the typical density range of FCMs, but is at the lower end of the range for the individual maps which ranged from 11-27%.

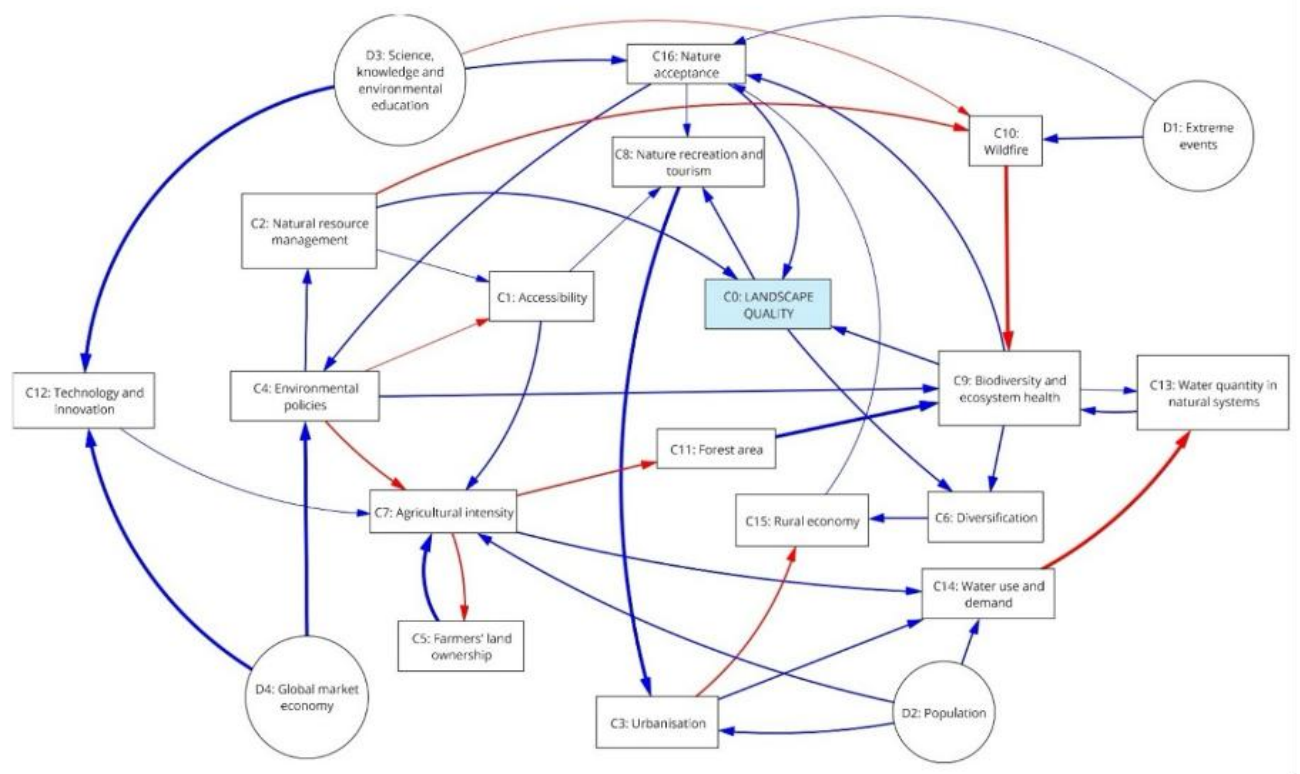


Figure 19. Fuzzy Cognitive Map for landscape quality in Western Europe. Blue indicates a positive, and red indicates a negative relationship. Circles represent drivers; the rectangular

shapes the normal concepts. The thickness of the arrows represents the strength of the relationship as weak, medium or strong.

The FCM was analysed according to three model characteristics: concept centrality, feedback loops and system dynamics. In the sections below, we outline the most important relationships and concepts that emerged from our analysis, as a foundation for interpreting how the system behaves and identifying possible levers for change.

From the centrality analysis, the most important concepts affecting landscape quality in Western Europe were:

- *C9: Biodiversity and ecosystem health* (total value of 4.50)
- *C7: Agricultural intensity* (total value of 4.3)
- *C4: Environmental policies* (total value of 3.5)
- *C16: Nature acceptance* (total value of 3.2)

To produce an initial base-run dynamic output, each driver was assigned a value of 1, simulating a scenario in which all drivers exerted their maximum positive influence. Under these conditions, landscape quality stabilised at a high positive value (Figure 120).

In this baseline scenario, agricultural intensity (C7) is influenced negatively by environmental policies (C4) and positively by population increase (D2). Therefore, its stable value is close to zero, indicating little change. Agricultural intensity can have devastating effects by increasing water demand (C14) and thus lowering water availability in natural systems (C13), while also negatively influencing ecosystem health by deforestation.

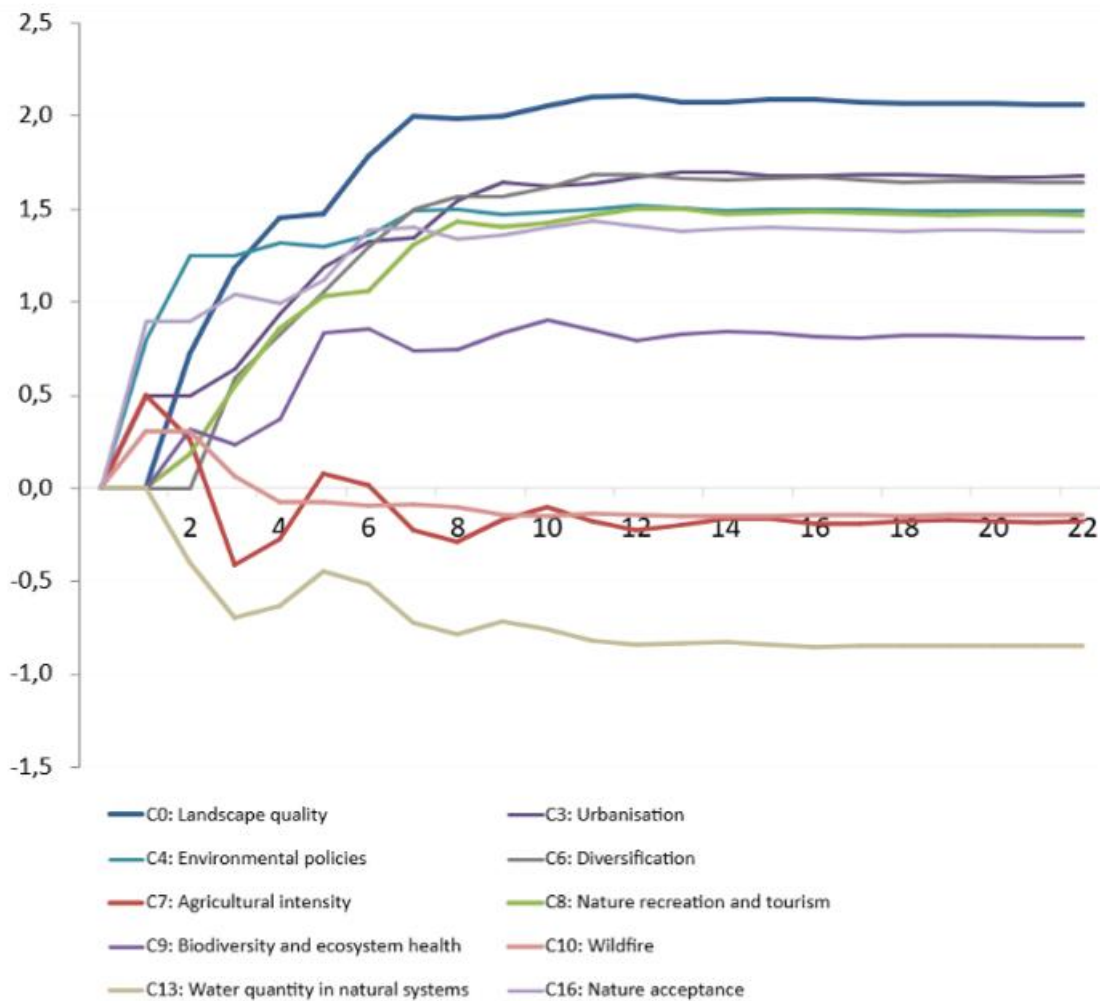


Figure 20. Dynamic output of baseline scenario from the aggregated FCM.

When both Science, education, and knowledge (D3) and the Global market economy (D4) are active at full strength, the system shows large improvements across almost all the elements of the model, including landscape quality. The only exceptions were Agricultural intensity (C7) and Wildfire (C10), both of which lessened in value (see Figure 21, Left). In contrast, when Extreme weather (D1) and Population growth (D2) are activated together, nearly all areas of the system get worse (see Figure 21, Right).

This shows that across the six cases, it is assumed that landscape quality can only improve when there are the contextual factors that enable this. Science, education, and knowledge need to be improved, which are assumed to positively influence Nature acceptance. Global market economy was characterised as growth-led, and seen as an overall necessary contextual factor, as the workings of the economy have enormous impacts on the development, potential and implementation of environmental policies. The potential impacts of the negative effects of economic growth - through technological innovation and agricultural intensity - is included as well, but is assumed to be less strong.

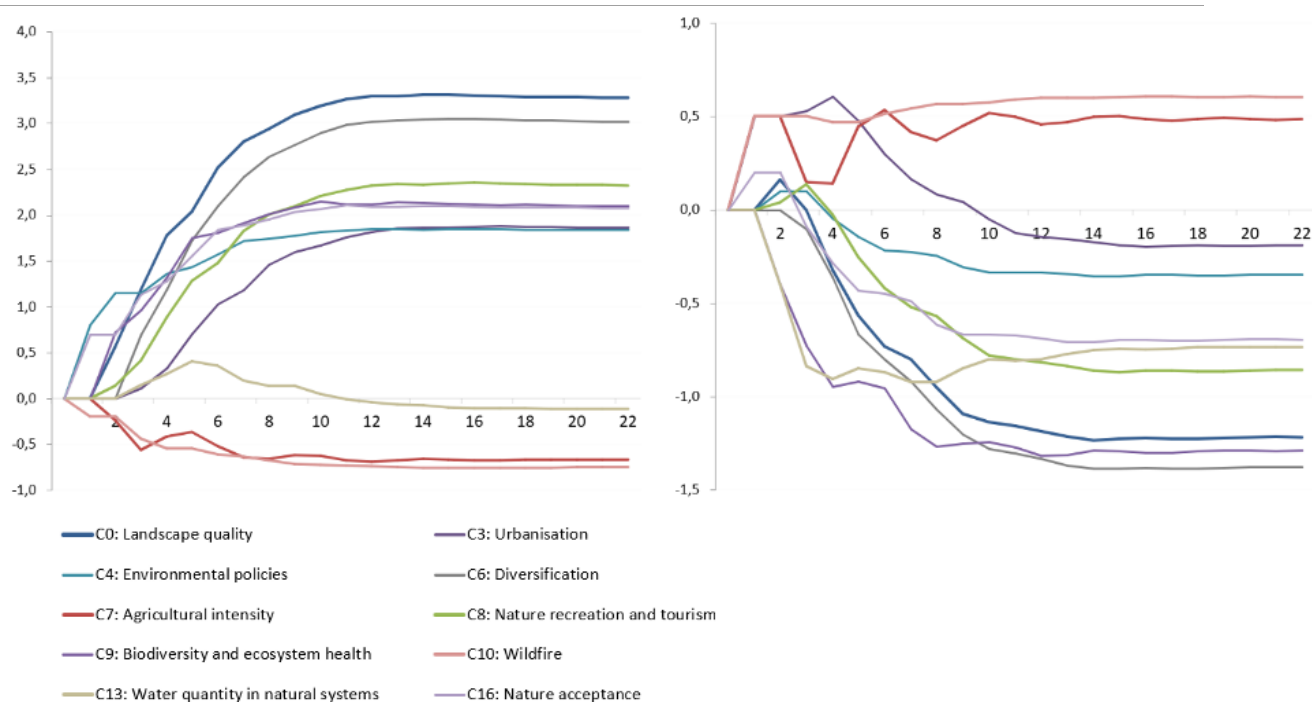


Figure 21. Dynamic output of the FCM. Left: Science, knowledge and environmental education and global market economy activated. Right: Extreme events and population activated.

The system contains 54 feedback loops, resulting in a total score of -0.14. The top three most reinforcing and balancing loops are presented in Table 10. The strongest reinforcing loop (score: 0.21) starts with environmental policies (C4), which improve biodiversity and ecosystem health (C9) and nature acceptance (C16). As these improve, they feed back into environmental policies. This loop keeps strengthening itself over time. The strongest balancing loop (-0.56) has a shorter path: farmers' land ownership (C5) positively influences agricultural intensity (C7), which subsequently negatively influences farmers' land ownership (C5).

Table 10. Key feedback loops in the aggregate FCM.

| ID              | Loop                                | Score |
|-----------------|-------------------------------------|-------|
|                 | Reinforcing loops                   |       |
| <b>R-Loop 1</b> | C4 – C9 - C16                       | 0.21  |
| <b>R-Loop 2</b> | C9 – C13                            | 0.10  |
| <b>R-Loop 3</b> | C4 – C7 – C11 – C9 - C16            | 0.08  |
|                 | Balancing loops                     |       |
| <b>B-Loop 1</b> | C5 - C7                             | -0.56 |
| <b>B-Loop 2</b> | C0 – C8 – C3 – C14 – C13 – C9 - C16 | -0.05 |
| <b>B-Loop 3</b> | C0 – C8 – C3 – C15 - C16            | -0.04 |

Two concepts stand out as most important in the FCM graph, Biodiversity (C9) and Nature acceptance (C16), both being central and present in many feedback loops. Of crucial importance in the FCM for Western Europe is the strongest (reinforcing) feedback loop:

- Biodiversity (C9) to Nature acceptance (C16) to Environmental policies (C4).

Because of the strength of these relationships, it is of overriding importance for understanding the FCM and its dynamic behaviour. As all three of these concepts are amongst the most central, they are also influenced by many other concepts, and are influenced by all the drivers. Moreover, all three have a (direct or indirect) positive influence on Landscape Quality (C0). In other words, these three concepts together are sensitive to changes in the state of external drivers and strongly determine the final state of the key concept, Landscape Quality. As shown in Figure 21, two drivers have a positive influence on the key feedback loop (Global Markets, Science and Education); two have a negative influence (Population growth, Extreme events). Figure 21 also shows how the dynamic output can 'flip', with Landscape Quality stabilising at a negative value.

Table 11 summarises the importance of the different concepts in terms of sensitivity, centrality, and feedback loops. Based on this table, biodiversity and ecosystem health (C9) and nature acceptance (C16) are the two most important concepts in the aggregate FCM.

Table 11. Summary of identification of most important concepts in the aggregate FCM.

| Concept    | Name                   | High centrality | Presence in loops | Dynamic output |
|------------|------------------------|-----------------|-------------------|----------------|
| <b>C0</b>  | Landscape quality      |                 |                   | X              |
| <b>C8</b>  | Nature recreation      |                 |                   |                |
| <b>C9</b>  | Biodiversity           | X               | X                 |                |
| <b>C12</b> | Technology             |                 |                   |                |
| <b>C16</b> | Nature acceptance      | X               | X                 |                |
| <b>C4</b>  | Environmental policies | X               |                   |                |
| <b>C7</b>  | Agricultural intensity | X               |                   |                |
| <b>C3</b>  | Urbanisation           |                 |                   | X              |
| <b>C6</b>  | Diversification        |                 |                   | X              |
| <b>C13</b> | Water quantity         |                 |                   | X              |

Overall, the FCM and its dynamic behaviour can be interpreted as follows. Landscape Quality is influenced by a large number of different factors, covering very different aspects of the system. These include social (nature acceptance, land ownership); technological (technology and innovation); environmental (biodiversity); economic (rural economy); and political (environmental policies) factors.

Four drivers were identified, two of which increase landscape quality (global markets; science and education) and two of which decrease it (extreme events; population growth). In the baseline situation, the overall effect of the drivers is positive, resulting in an increase of landscape quality. Three factors play a crucial role in determining landscape quality. The FCM graph shows how Environmental policies positively influence biodiversity and ecosystem health, which in turn positively influence Nature acceptance. All three positively influence landscape quality. When the drivers increase any of these factors, all will increase (as in the

baseline run), but when drivers decrease any of these factors, all will decrease – with opposite effects on landscape quality. The balance between these forces is delicate, and small changes to the impact of external drivers can have very strong effects on landscape quality. From the six separate studies, a picture emerges in which landscape quality will increase, mostly as an effect of global markets and science and education.

However, the extent to which this perception from West European stakeholders reflects the actual current situation can be questioned. In all individual cases, stakeholders were asked to describe the current situation of the system. Practice has shown that in many cases, stakeholders have the tendency to include relationships that are not currently in place, but have the *potential* to become important in the (near) future. Although this has not concretely been documented in any of the six FCMs that were used to construct the aggregated FCM for Western Europe, first authors of the papers that documented these FCMs indicated that sometimes desirable rather than actual processes were included. Following this logic, the two key relationships indicated above both seem to address a desirable future state, rather than the current situation. Specifically:

1. Global market economy to Environmental policies. This relationship strongly assumes that when the global economy is strong (that is, growth-led), more funds will be available to design and successfully implement environmental policies. It further assumes that other policies will not negatively influence environmental protection; nor does it take into account or question the geography of environmental impacts and economic flows.
2. Science and environmental education to Nature acceptance. This relationship assumes that when more is invested in science, (environmental) education and knowledge production, this will lead to an increase in Nature acceptance. There is an (underlying) assumption here that more knowledge will linearly if not automatically be translated into values change and political and/or social consequences associated with 'Nature acceptance'.

Neither of the two drivers (markets and science) have a direct relationship with landscape quality. But because of the presence of Nature acceptance and Environmental Policies in the key feedback loop, increases in either of those have a positive effect on Landscape Quality. However, while both processes can be regarded as important boundary conditions, the current positive effect on Landscape Quality is less evident. When removed from the FCM, the dynamic output 'flips' (see Figure 21, right side) and landscape quality decreases strongly, indicating the importance of these two processes. This finding laid the foundation for the pathway analysis, which are explained and outlined below in section 5.

## 4 Evaluating the construction of FCMs to support sustainability transformations

As demonstrated through our work and especially in section 3 above, there are multiple ways to create a FCM from stakeholder knowledge. Our research is in a unique position to evaluate the merits and challenges of this spectrum of approaches, as our different contexts, stakeholder capacities and research timelines all influence the possibilities and constraints of how research can be undertaken. Reflexivity around these issues also builds on the D1.1 Stakeholder Navigation Toolkit produced by WP1 within TRANSPATH. This section evaluates the three distinct approaches to building an FCM that were applied by our research teams within WP2, that is: (i) group-based creation of FCMs in a workshop setting (the Czech case); (ii) narrative-based construction of FCMs from interviews (the English case); and (iii) a desk-

based meta-analysis of existing maps (based on published research papers within a Western European geography).

Below, we present preliminary reflections on the strengths and limitations of each approach for fostering sustainability transformations across three key concerns: practicability, learning potential, and reliability of results (Jetter and Kok, 2014). Understanding when, why, and in what context different FCM methods work best can help researchers better tailor participatory research to the needs and preferences of their stakeholders – an essential step for ensuring that methodological decisions align with the capacities and interests of those involved.

#### 4.1 Group-based approaches

Group based FCMs usually take place in a workshop attended by relevant stakeholders with different perspectives on the issue under study. Typically, stakeholders are grouped according to their shared perspectives and tasked with producing separate FCMs facilitated by an expert FCM modeller. This is to ensure that stakeholders are evaluating the corresponding ‘system’ or sector within which they live and operate, and so their mental maps and views are commensurable.

The main strength of this approach is the opportunity it gives to the participants to direct the moderating researcher in real time, expressing how exactly they envision the links between the different FCM concepts and whether they agree or disagree with its particular aspects. Another potential strength of this approach to FCM construction is that the workshop setting may offer an opportunity for social learning, as stakeholders are asked to explain and deliberate their understandings of the world and agree upon key system dynamics (Jetter and Kok, 2014). It ensures a level of transparency as well, as stakeholders are able to reflect upon and know about others’ views and experiences.

Group-based FCMs also offer a number of practical advantages. Of the three approaches trialled in TRANSPATH, they require the least post-processing, namely because there is no extra integration step needed to convert individual mental models into a single adjacency matrix. This is because the mental models are essentially discussed within the workshop and agreed by consensus. This means conflicting views about the strength or direction of a relationship between two concepts can be primarily addressed through deliberation within the workshop, and only the minority requires to be resolved later by the research team, thus minimising an element of researcher-responsible bias or subjectivity in the final model. On the other hand, the preparation prior to the workshop is very demanding as eliciting and defining concepts must be done through multiple iterations to ensure that the concepts will be straightforward, mutually exclusive, and easy to understand and use during the workshop. Furthermore, the FCMs must be still postprocessed after the workshop in terms of refining the linkages between concepts and of eliminating duplicating arrows etc.

Nevertheless, the group-based FCM outcomes might raise concerns in respect to whose views and mental models are represented. In workshop settings, the loudest characters can dominate the construction of an FCM, crowding out the perspectives of quieter participants (Eden et al., 2006) – an issue that increases with group size. Furthermore, for those untrained in systems thinking and fuzzy cognitive modelling, it can be hard to check whether the final map sufficiently reflects their perspective. This poses challenges for any facilitator of the group, and underlines the importance of the facilitator for being able to manage difficult group dynamics.

One drawback around using group-based approaches to mapping mental models is the time needed for an FCM workshop: typically 6+ hours. This has implications for who can attend a workshop, and, in the context of fostering sustainability transformations, whose perspectives

are integrated into further planning around the creation of transformative pathways. This means careful stakeholder analysis and recruitment is required by the research team to ensure those with a meaningful stake or experience with the trade-offs required for any change towards sustainability goals are included.

## 4.2 Narrative interview approaches

A narrative approach to FCM uses semi-structured stakeholder interviews to create a detailed understanding of how a social-ecological system is perceived to function (Edwards and Kok, 2021).

Creating an FCM from interviews offers respondents an opportunity to carefully think through and elaborate upon their mental models in their own words and at their own pace, potentially enabling researchers to capture more nuance and detail than in group settings, or through more structured mapping techniques.

Narrative FCMs are particularly well suited to contexts where stakeholders are time-constrained or research-fatigued, as interviews typically last no more than an hour. In the approach followed in TRANSPATH, the actual construction of the FCM takes place without stakeholders' direct input after the interview, as solely the transcripts of the conversation were used to make the FCM model. Not only does this method mitigate the risk that the perspectives of quieter, less confident stakeholders are crowded out of an FCM, it also enables a wider range of stakeholders to access and explain their mental models - a crucial consideration for advancing land-based sustainability transformations where local knowledges are often under-represented in formal decision making.

However, one of the major risks of the interview-based approach is that it leaves the core of the decision-making power around constructing the FCMs with the researchers as opposed to the stakeholders. This raises questions about the balance of influence between stakeholder and researcher in shaping the final model. In narrative-based FCMs, decisions about concept selection, causal relationships, and weight assignments are primarily made by the research team, with limited direct validation by stakeholders, although this may also be possible if further iterations of the FCM are a goal of the research. In addition, a key trade-off of the narrative approach is the limited opportunity for participants to hear and engage with alternative perspectives during the mapping process, reducing the potential for social learning that can occur in workshop-based FCMs. In practical terms, narrative FCMs are also more resource-intensive: they require significantly more time to conduct, transcribe, code, and build than group-based approaches. Moreover, a significant amount of post-processing is required because most aim to present one single aggregate model of stakeholder perspectives on a given system (Jetter and Kok, 2014).

We encountered further challenges that were related to how accurately a diversity of stakeholder perspectives could be reflected within a given FCM. For example, the relationship between cluster longevity and inter-cluster collaboration was perceived very differently within our stakeholder group. Our interview data suggested that clusters that are successful run a risk that enthusiasm for collaboration goes down with newer clusters over time, as more established farm groups see less value in collaboration due these older groups gaining less in a context of time and material poverty. However, collaboration is key for the development, learning and establishment of newer clusters. Aggregated FCMs cannot capture these qualitative nuances as the model requires a consensus direction and weighting for each relationship. In making the FCM, we tried to stay as true as possible to stakeholder opinions by logging all variation on a separate spreadsheet, but these reflections and nuances could not make it into the final model.

### 4.3 Meta-analysis approaches

A meta-analysis FCM is a researcher-constructed cognitive map that synthesises concepts and relationships drawn from previously developed individual FCMs into a single aggregate model. The sources for these FCMs in our case were previously published, peer-reviewed literature that was focused on a similar environmental theme around environmental improvement (e.g., beaver reintroduction in the UK; forest grazing intensities in Spain; and climate change impacts in the Netherlands). The goal of bringing these FCMs together was to see whether i) an aggregate FCM could be built based on independent studies with a few shared, complementary factors; and ii) whether any insights or conclusions could be made about the central focus of the studies, enabling us to draw regional-level insights around landscape management.

An aggregate approach offers several advantages. Bringing together models from individual case studies offers the possibility to explore system dynamics at a supra-national scale, or even across socio-ecological landscapes or across ecological systems that share similarities. Moving beyond context-specific dynamics of a particular place or stakeholder group, aggregate approaches highlight commonalities between diverse social, economic, political, cultural and environmental settings - a particularly useful lens for researchers seeking to understand how local-level sustainability pathways might inform regional policy planning; or what shared challenges and relationships define and influence these. Moreover, by highlighting shared barriers, needs and opportunities across thematically related cases, meta-analysis FCMs can support the identification of enabling conditions at a higher scale. As a largely desk-based approach that relies on existing published studies, insights can also be drawn without the need for stakeholder engagement, making it suitable in contexts where project resources (including budget) are challenging.

However, a fundamental drawback of aggregation is that it leads to more generic concepts, and therefore also to more generic relationships and any possible conclusions. In this meta-analysis, this drawback surfaced, also because of the large diversity of individual cases. Finding common ground in the list of concepts required the formulation of rather generic concepts. Given the nature of the cases, but also the specific demands of the FCM tool, this was unavoidable. Another drawback of the meta-analysis approach is the distance between the research team and the original case studies. In cases where FCMs have been developed years earlier by different researchers, verifying the intended meaning of concepts or causal relationships becomes difficult. We undertook a verification step by contacting the first authors of selected studies, to enable greater insight into the decision-making and processes that were followed in the construction of the initial FCMs. This helps to overcome some issues around the length of time that might have passed between study publication and the current analysis, when contact with stakeholders might not be possible. Nevertheless, questions can be raised about how accurately aggregate models reflect the individual case study systems. For example, in the Western European case study, first authors of the original papers noted that desirable rather than actual relationships were included in their models, that is, their stakeholders described relationships they expected to see in the future, rather than describing the system's current state.

The exact purpose of the aggregate-FCM also needs to be clearly articulated and worked out: there are valid questions around the generalisability and scalability of local-level relationships and systems dynamics from any FCM. If these are not transparently considered, this form of modelling risks simplifying real-world dynamics and understandings, creating a false and universal 'gaze from nowhere' that modelling science has been previously criticised for (Haraway, 1998).

#### 4.4 Reflections around comparison of process

Here, the triad of practicability-learning-reliability review of individual approaches to FCMs has been complemented with the following list of considerations, where particular approaches to FCMs have been evaluated with attention to a range of factors that build on the stakeholder-engagement needs and philosophies that were captured in WP1's Stakeholder Navigation Toolkit. In deciding which modelling approach to take to understanding stakeholders' mental maps and understandings around change, researchers should consider:

1. Intended purpose of modelling and its context
2. Specific stakeholders, their capacities and limitations including considerations around capacity to include, stakeholders' power realities and imbalances
3. Facilitation and participatory cultures
4. Choices around framing and selection of concepts and vocabularies (the language and focus of the FCM), and which options work best to the development and communication of the FCM in the setting
5. The extent of disagreement or conflict there may be in the context required for making an FCM, and whether consensus is possible, or how best to achieve it
6. Whether a professional facilitator is appropriate and possible
7. Data ownership and ethics
8. Feedback possibilities and intentions with the FCM

WP1's Navigation Toolkit established that research methodologies and approaches need to take into account and reflect the requirements, interests and capacities not only of the research team, but also of stakeholders that contribute their time, energy and expertise to the research process. In TRANSPATH, we worked reflexively across three very different contexts, with stakeholders with highly variable cultures of participation, buy-in and interest and time capacities.

The way we construct FCMs shapes which voices are heard, how perspectives are interpreted, and what forms of knowledge are ultimately made visible. These are not neutral choices: they carry significant implications for the credibility and legitimacy of FCMs, especially in research that explicitly seeks to inform or foster sustainability transformations.

Although we were aware that participation in two full-day workshops can be demanding for potential participants, in the Czech case study, we opted for the group-based FCM construction for several reasons. First, although many actors operating in the food sector are familiar with each other, this does not necessarily apply to those from the energy sector. Thus, the workshop provided an opportunity to learn from each other and to build new coalitions. Second, we understood the workshop as an awareness-raising opportunity to introduce FCMs as a useful strategizing tool related to systems thinking. This was relevant given that the scoping interviews carried out in the initial phase of the TRANSPATH project in the Czech case study revealed that the actors in land and energy sectors often react to emerging situations reactively, rather than proactively. In this respect, we understood the workshop focused on FCM construction as a showcase of how strategic planning for transformative change can be approached from a system and mental models perspective. Hence, the stakeholder buy-in in the Czech case was further enhanced by the options for networking, partners seeking and getting familiar with a tool that the actors might independently use in their own initiatives.

The English case study experience of working on rural sustainability transformations with farmers highlighted that the key people we needed in the room were reluctant to give up their time for two six-hour workshops, in a wider context where the farming sector is experiencing a series of shocks and uncertainties, as well as the usual uncooperative and challenging seasonality of demands. This meant that we faced a compromise between who we could have in the room - and potentially risk a limited understanding and mental model due to the paucity

of people who could give up significant time - or we would have to choose methods that required shorter inputs. We chose the latter. Further, we made a series of deliberate choices around our language and research objectives so that they best matched the understandings and needs of stakeholders. For example, we took the research participants' lead in focusing on the potential of farm clusters and their conviction in the ability of these collectives to deliver significant change in the English farming context. This allowed us to 'translate' a number of terms from sustainability research into a very finite, specific context, which greatly aided the interest, buy-in and comprehension of workshop participants.

These considerations are crucial for sustainability researchers seeking to understand interventions and possible change based on the outcomes of mental models. If FCM modelling is the basis for designing a pathways workshop, then it is crucial that the FCM represents the opinions of key people in this change.

Research between East and West Europe has different starting points, as they have been shaped by different histories, cultures and institutions. These influence how environmental, social and political dynamics are lived and understood. This poses an interesting conundrum to researchers early on in the process, as to the intention and purpose of multiple case studies, and whether the relationships between cases are for comparative or complementary purposes. Comparison assumes a capacity to compare and contrast similarities and divergences, but that 'like for like' situations and responses make logical sense and are possible. Complementarity, in contrast, leaves room for insight into diverse approaches to similar questions, localised norms and knowledge systems, or even alternative rationality or logic that does not fit mainstream or dominant models (that tend to be defined and set by 'Western' science or cultural assumptions).<sup>3</sup> To acknowledge these tensions, our research centred stakeholder understandings and preferences for (sustainable) change, and our next phase of research (towards Deliverables 2.3 and 2.4) will lean into the different support needs and requirements that stem from some of these differences.

In the following section, we build on the insights drawn from FCMs to developing futures-oriented pathways for realising desired change.

## 5. Pathways

### 5.1 Czech pathways

#### 5.1.1 Background

The aim of the pathways workshop was to follow up with the results of the FCM workshop and to co-create transformative pathways for the energy-land-food nexus in the Czech context using key feedback loops from the co-created FCMs. The Pathways workshop was attended by nine representatives of Czech transformative initiatives, networks, and social enterprises advocating for transformative change towards a more sustainable energy sector and food systems. Four of those participants were a part of the previous FCM workshop.

In the first activity, the results of the FCM workshop were introduced, specifically the produced dynamic outputs. This was followed by a discussion about the key feedback loops, which were used as a basis for the following activities. During the discussion, the participants divided themselves into two groups based on the key feedback loops of their interest. The following workshop activities were then carried out within these two groups. The second activity of the

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<sup>3</sup> For a similar conversation from education research, see Bartlett and Vavrus (2017).

workshop was dedicated to the identification of the interventions for transformative change within the selected key feedback loops. During the third activity, participants first categorized the identified interventions and second, during the final activity, they co-created transformative pathways using these interventions. The workshop concluded with a final focus group discussion.

### 5.1.2 Methodological approach to pathway creation

Based on the system maps co-created in the FCM workshop, five feedback loops were pre-selected prior to the pathway workshop by the project team. The specific feedbacks are visually represented in turn below, and are: 'Mutually reinforcing public opinion and high-level policy-making' (Figure 22); 'The fight against anti-transformative lobbying' (Figure 23); 'Bottom-up change in the production-consumption chain' (Figure 24); 'Broad public support for bottom-up change' (Figure 25) and 'Not willing to be different from others as a barrier' (Figure 26).

#### Mutually reinforcing public opinion and high-level policy-making

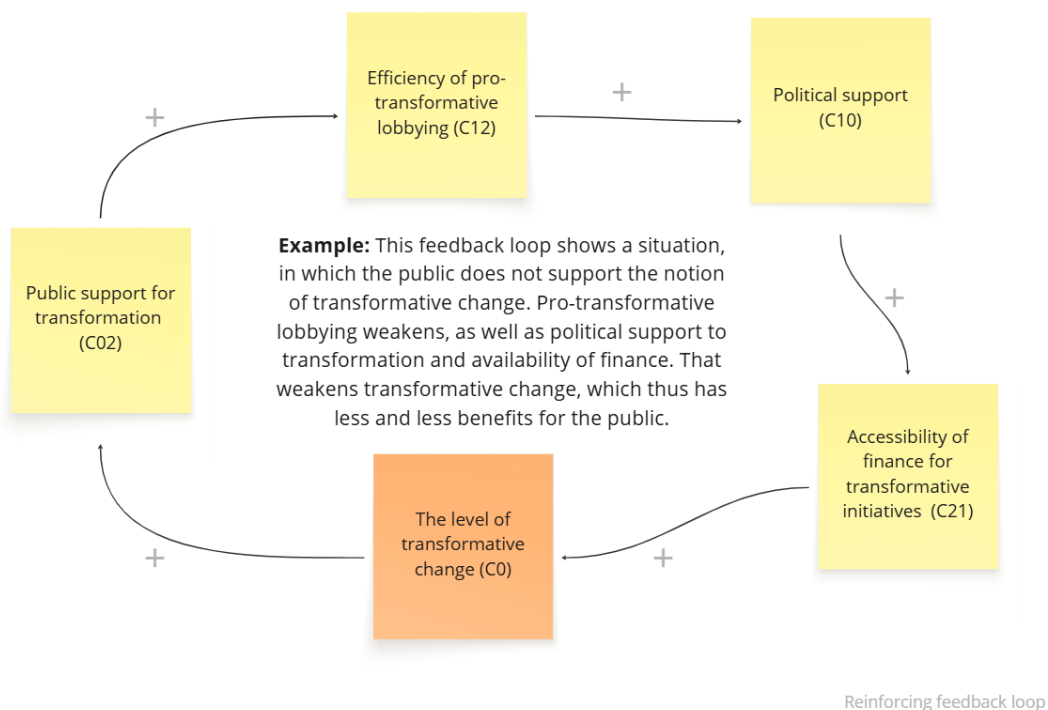


Figure 22. Key feedback loop 1: Mutually reinforcing public opinion and high-level policy-making.

### The fight against anti-transformative lobbying

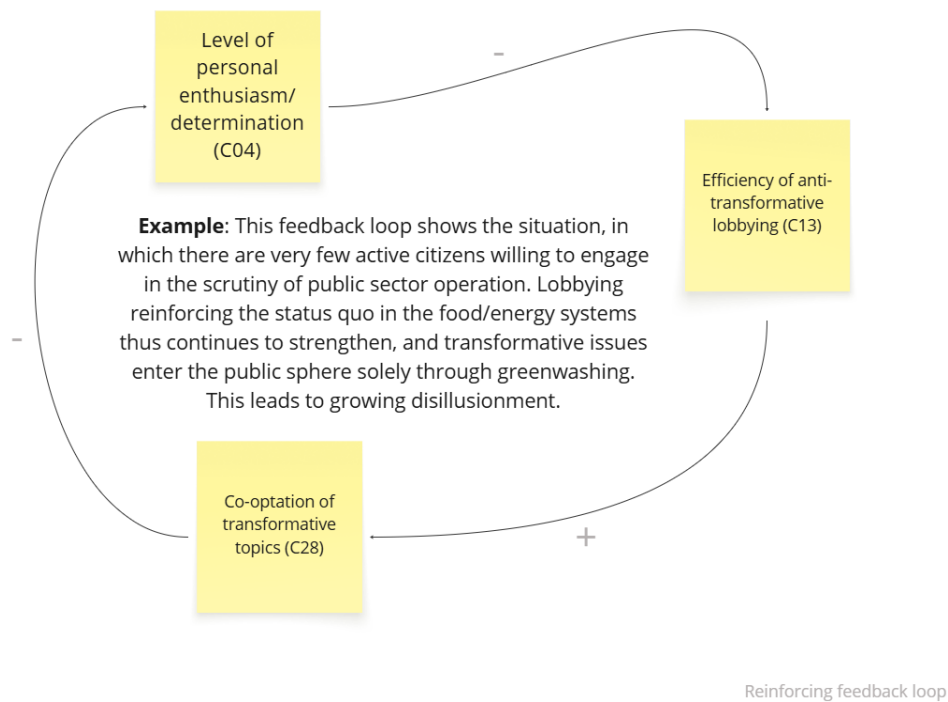


Figure 23. Key feedback loop 2: The fight against anti-transformative lobbying.

### Bottom-up change in the production-consumption chain

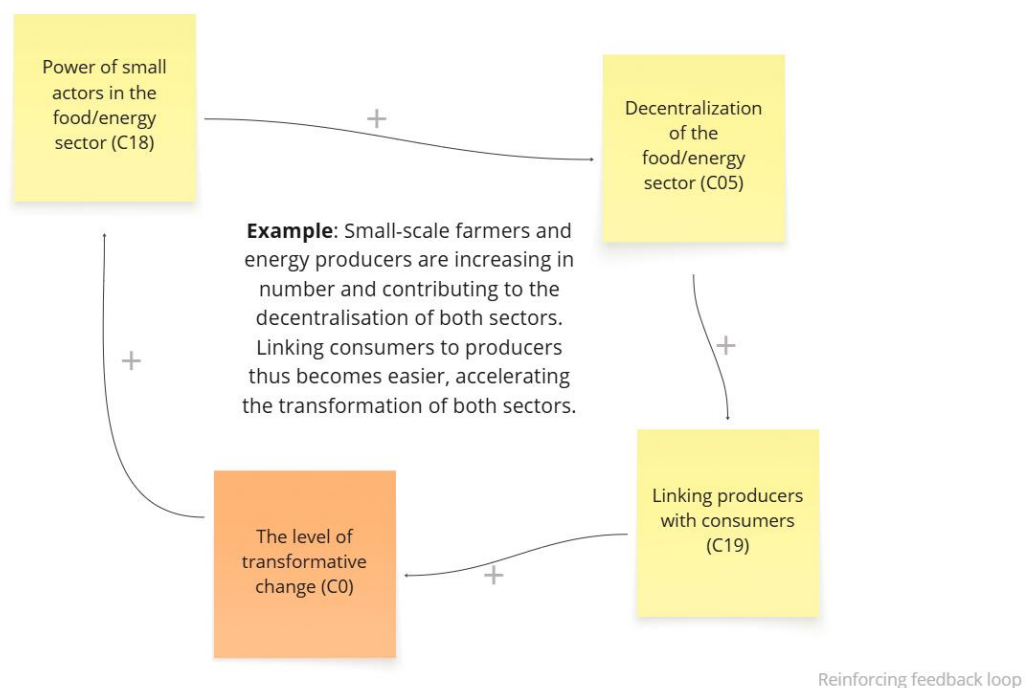


Figure 24. Key feedback loop 3: Bottom-up change in the production-consumption chain.

**Broad public support for bottom-up change**

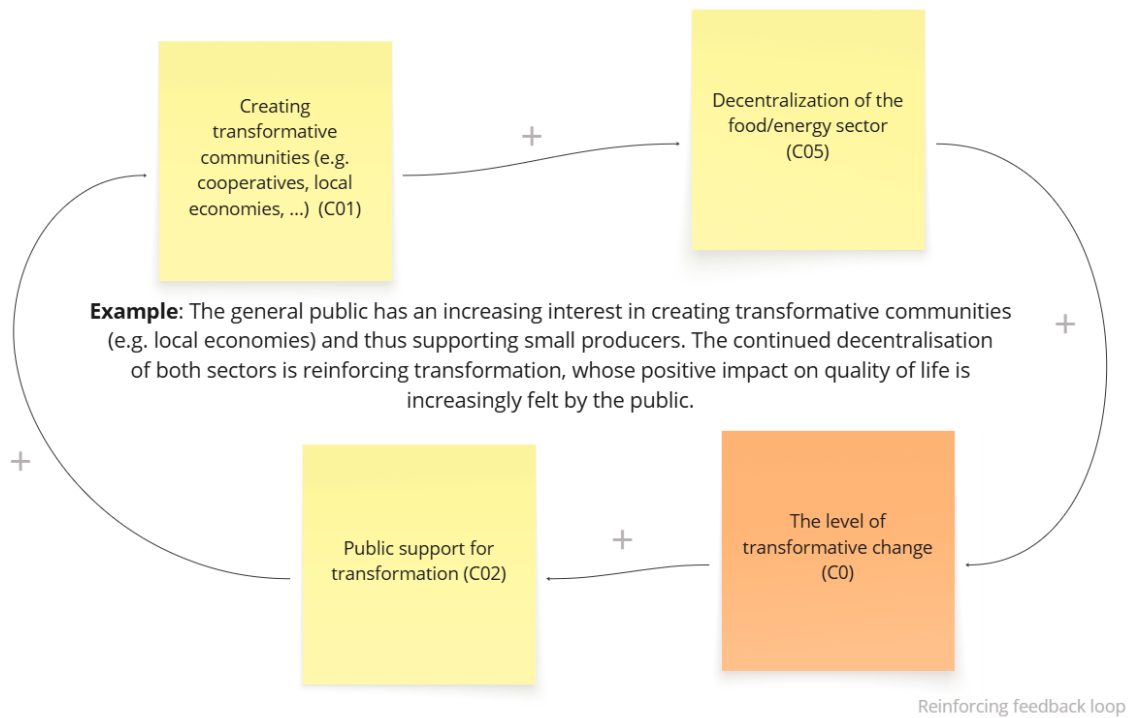


Figure 25. Key feedback loop 4: Broad public support for bottom-up change.

**Not willing to be different from others as a barrier**

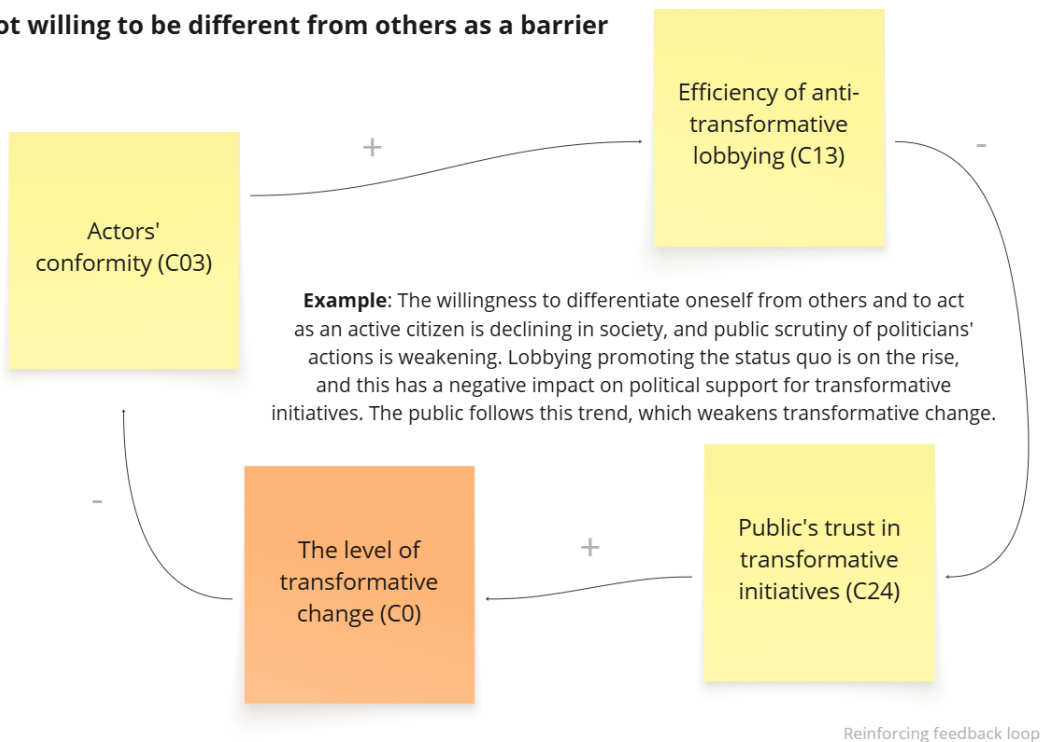


Figure 26. Key feedback loop 5: Not willing to be different from others as a barrier.

In the first activity of the workshop, these feedback loops were presented to the workshop participants and subsequently discussed. Afterwards, the participants had the opportunity to assign two stickers to the feedback loops that they found most interesting for further work. Based on this scoring, participants were divided into two groups. The first group focused on two feedback loops capturing "top-down" dynamics, whereas the second group worked with two feedback loops capturing "bottom-up" dynamics.

In order to identify interventions for transformative change in light of the selected feedback loops, each group was tasked with playing a modified game of Snakes and Ladders (Andrews et al., 2018). When participants stepped on a ladder, a card was drawn from the opportunity pile (Gould et al., 2023). Conversely, if participants stepped on a snake, a card was drawn from the barriers pile. The cards in both piles contained a brief description of a newly emerged situation that was expected to have either enabling or disabling effect on transformative change (Figure 27).<sup>4</sup> Whether the "opportunity" or "barrier" card was drawn, the participants were asked to discuss the significance of this newly created situation in relation to the chosen feedback loop. Then, based on the group discussion, the participants identified actions that directly responded to the card drawn.

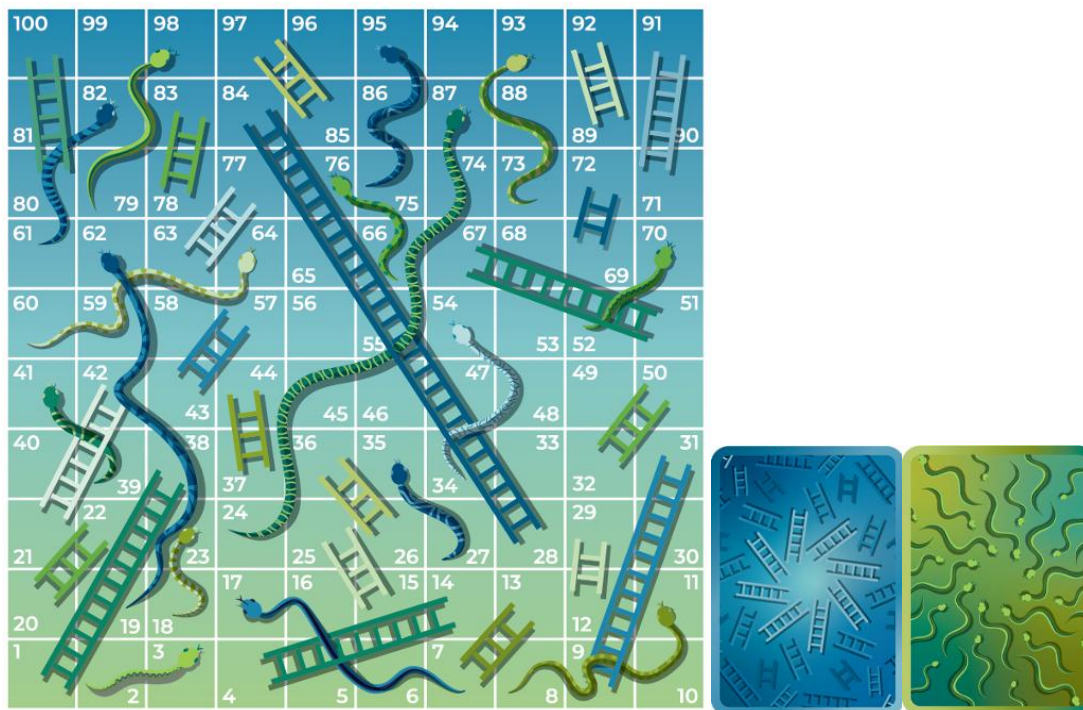


Figure 27. Snakes and Ladders game plan and opportunity and barrier cards to identify interventions.

In order to categorise and reflect on the interventions identified to trigger transformative change, participants were asked to sort the identified interventions into three levels using the metaphor of an iceberg (adapted from Goodman, 2002; see Figure 28). These were: the level of everyday functioning, the level of system settings and the level of mindset. During this activity, the participants first thought individually about which layer the intervention belonged to and then, in a group discussion, the interventions were sorted into different layers. Identified interventions could also be assigned to more than one layer at once.

<sup>4</sup>The description of the situation derived from the concept list used to construct the FCMs in the first workshop.



Figure 28. Game plan for sorting and reflecting on identified interventions.

The last activity aimed to co-create transformative pathways, by linking together the previously identified interventions (Fazey, 2016). The workshop participants were asked to do so either based on causality or temporal sequencing (Figure 29). At the beginning of the activity, participants chose any identified intervention and assigned it to a place on the game plan that was appropriate from their perspective. Subsequently, other interventions were selected and placed. Interventions placed on the game plan could (but did not necessarily) build on each other. The different layers on the game plan expressed the approximate relative position of the identified interventions.

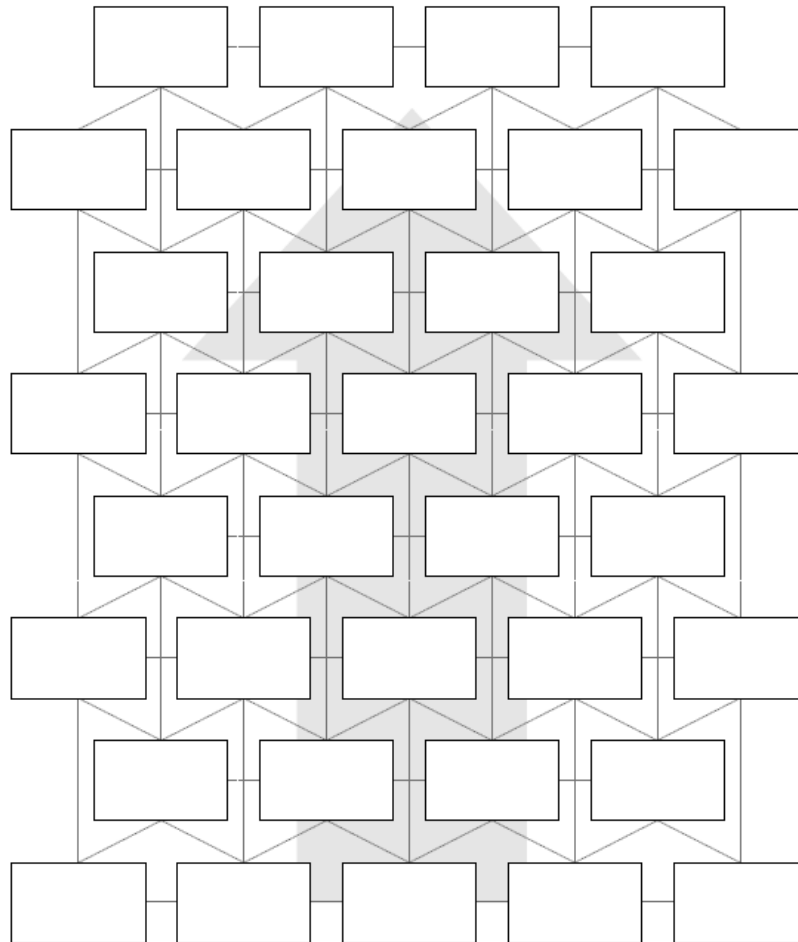


Figure 29. Game plan for creating transformative pathways.

### 5.1.3 Outcomes of the Czech pathway workshop

The Pathway workshop led to the co-creation of two transformative pathways for the energy sector and food systems, specifically both a top-down and a bottom-up transformative pathway, which can be seen as complementary. The top-down transformative pathway responds to a situation where there is declining societal interest in food systems and energy sector transformation. Therefore, this top-down transformative pathway focuses on consecutive actions to enable a stronger transformative direction in the face of societal counter-pressure. The bottom-up transformative pathway, on the other hand, responds to a situation where society is supportive of transformation and therefore focuses on more proactive steps. Similarly, both pathways define the emergence of a strong transformative movement as a prerequisite for a successful social-ecological transformation. While the bottom-up transformative pathway describes the possible systemic impacts of a transformative movement, the top-down transformative pathway expresses the need for the emergence of a shared vision and communication strategies for this movement.

When interpreting the co-created transformative pathways, it is important to take into account that these were developed based on the perspectives and experiences of the workshop participants. They should therefore be seen as two of many possible pathways that could be further developed, branched, and elaborated.

### Top-down pathway

The top-down transformative pathway related to the energy sector and food systems react to feedback loops that portray a situation of weakening transformative change through declining public support and reduced willingness of citizens to engage. This top-down transformative pathway can therefore be seen as a reaction to increased societal apathy and mistrust in government institutions, that are the basis for populist politics and support, as well as successful anti-transformative lobbying, such as from large energy companies.

In reaction, there is the emergence of a broader 'pro-transformative' movement at its core that actively positions itself in opposition to these forces. Therefore, the basis of the top-down transformative pathway depicted is the commitment of a sufficient amount of a variety of resources to the formation of a pro-transformative movement, including the identification of the underlying problem to which the movement is responding. The next step is to analyse the situation and the strategies that are used by populist movements and large corporations to undermine transformative change, which is necessary for further action and, above all, to shape the pro-transformative movement's communication strategy. These steps lead to effective self-organization, which is essential for taking a stand against populist movements and large energy companies. In this sense, such self-organization is not perceived as reactive, but rather as the result of anticipation and proactive approaches by a wide range of included transformative actors, all of which can be enabled by the previous step, i.e., situation/problem analysis.

The results are constructive interconnections, the emergence of new alliances (which would have been unlikely before, such as environmental movements and progressive businesses), capacity building, and the acquisition of innovative competences in self-management. All these actions are the basis for active distancing from populist movements and communication campaigns. Thanks to a well-thought-out strategy, well-managed communication (e.g. counter-campaigns in relation to large energy companies and populist movements), and, above all, a proactive approach, the pro-transformative movement becomes attractive to new types of actors, such as large and progressive companies, who strive to join a network of like-minded companies with seeds of transformative approaches already in implementation. All this creates an enabling environment for strengthening the pro-transformative movement's functioning and ensuring its continuation through continued investment of time, capacity and other resources within the already established movement structures.

“In fact, it's like setting up the back-end of the whole thing. Yeah, actually the future movement is just in training actually and gaining new competencies and getting ready for the moment when it comes out, there will be opportunities for us to take advantage of (...) like public support in those communications, for our intentions.”

### Bottom-up pathway

The co-created bottom-up transformative pathway related to the energy sector and food systems and reacted to feedback loops depicting the support for change from wider society and the subsequent changes that follow, e.g., reshaping the chain between production and consumption of agricultural products and energy from a highly centralized to a decentralized way of operating, or a closer connection of producers and consumers.

An interesting aspect of this bottom-up transformative pathway is its initial steps, which focus on concrete and practical activities to connect and mobilize different actors, such as reaching out to consumers, mapping existing initiatives and their activities, involving children and youth,

initiating face-to-face meetings, or working with vulnerable groups. These steps lead to the establishment of a range of different movements, from consumer movements to small farmers' platforms to civil resistance movements or spiritual movements. These movements are gradually gaining ground and becoming an active force in the functioning of society, with a negotiation power (through e.g. lobbying) and the potential to create pressure for systemic change (e.g. reforms in financial mechanisms, changes in funding for small farmers and energy associations, changes in reporting for different financial schemes, initiating new legislative proposals, changes in the training of state officers).

Movements also enable collective reflection on the types of values that predetermine the functioning of the energy and food sectors and their gradual transformation. The path to bottom-up transformation can either end in a phase of established individual movements that help improve the lives of consumers, small producers and other actors in the energy or food sectors, or it can lead to deeper systemic changes (e.g., state investment in securing new energy sources, the creation of a new state establishment that promotes the equitable and sustainable functioning of both sectors).

“For me, the ideal combination of both is that there is stability for those communities and movements without the need for further legislative action - still they can happen, but not necessarily.”

## Transformative pathway conclusions

Transformation, defined as a profound change in the functioning of certain sectors or society as a whole, is often perceived through the need to significantly transform system structures, ways of day-to-day operating and actors' mindsets. However, the transformative pathways developed above show that deep system or value changes can start from very concrete, practical initial steps that are oriented more towards everyday functioning of the system. Rather than an immediate and dramatic shift that would target the deepest levels of the system, our case study demonstrates that efforts to enable transformative change are better understood as a culmination of these small, seemingly limited or even currently systems aligned steps.

## 5.2 English pathways

### 5.2.1 Background

The aim of the pathways workshop in East Anglia was to build on the findings of the fuzzy cognitive mapping (FCM) exercise and to co-create transformative pathways for farm cluster groups and networks. The baseline dynamic model of the FCM revealed a negative stabilization of cluster longevity (C0), suggesting that, under current conditions, farmer clusters are unlikely to sustain long-term momentum. This can largely be attributed to the uncertain rural policy environment in post-Brexit England, as well as cluster-specific concepts such as group leadership. Encouragingly, the dynamic output revealed that strengthening the driver C4 ('leads' responsiveness to farmer perspectives'), had the potential to significantly improve the trajectory of C0.

Our analysis of the FCM interviews also highlighted that a key challenge to farm clusters is the lack of time for strategic thinking. This lack prevents groups from knowing about, engaging with and responding to emerging financial or political opportunities, as well as shifting farmer capacities, which are all key activities for cluster longevity.

Building from these two main insights, the pathways workshop sought to explore farmer perspectives in depth and open up a space to question the purpose of a farmer cluster, while fostering collective learning and reflection.

The workshop took place on the 18th of June 2025 in Norfolk and was attended by ten representatives of one farm cluster. Only the cluster's facilitator was interviewed and contributed to the narrative-based FCM. The objective of the workshop was to co-create a shared vision for what the stakeholders could achieve as a collective, and identify a set of concrete, practical pathways to realise long-term cluster sustainability in the context of rural change and farming challenges in England.

### 5.2.2 Methodological approach to pathway creation

The workshop began with a presentation of key learnings from the FCM and a discussion around the three most prevalent categories of focus for conservation-oriented farm clusters in East Anglia (Figure 30). These were: knowledge exchange (which are local, internally focused networks focused on the immediate needs and interests of their members), business sustainability (networks which prioritise the economy of farms as a talking point in their communications, push for structural economic change for the sector and often experiment with new forms of biodiversity finance to deliver landscape scale conservation) and advocacy and relations-building (which are proactive, externally focused groups which prioritise the creation of new partnerships for transforming the rural economy and not necessarily 'only' farming).

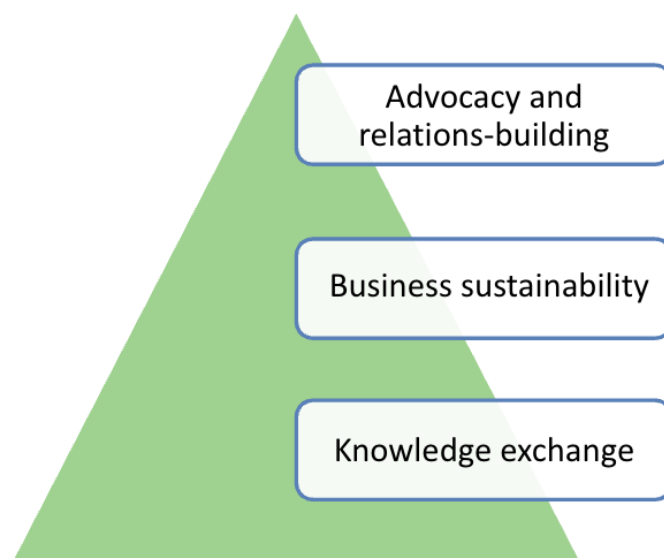


Figure 30. Typology of farm clusters in East Anglia presented at the pathways workshop.

Attendees were asked to choose which of the three focuses they would like to orient their network towards going forwards. Here, the intention was that participants make their views around the desired (i.e., sustainable) cluster future explicit.

To create a long-term, systemic transformative pathway in line with this new mission, participants were asked to complete an adapted version of the BioAgora Transformative Networks Assessment, a sister project of TRANSPATH, also within the Transformative

Change cluster (Westerink et al., 2023). The reason for this was twofold. First, a core objective of TRANSPATH is to foster collaboration with other research consortia funded under the EU Horizon Europe Transformative Change for Biodiversity call, in order to achieve better results collectively and to build on complementary insights and work. The BioAgora workshop-based questionnaire offered a practical format that matched the stakeholder time requirements: it could be delivered within three hours, in contrast to most participatory futures methods, which typically require at least six.

Second, the tool's conceptual focus on the transformative potential of networks, defined as 'the capacity of networks to spark, nurture and accelerate transformative changes through their influence in wider networks and on other actors, while working themselves in transformative ways' aligned closely with the objectives of the English T-Lab (Westerink et al., 2023: 17). The research sought to support farmer clusters to strengthen their collective capacities to rethink the delivery of landscape-level conservation and help advance a more locally oriented model of environmental governance, or in other words, consider how their group could better realise their potential to shape sustainability transformations within the land sector.

The purpose of the assessment is to support networks in realising their full potential and to foster collective learning. As opposed to an accountability or reporting tool, the assessment emphasises reflexivity through a series of probing questions that need to be collectively discussed and answered on a qualitative Likert scale of 1 to 4, with group consensus.

The assessment framework questions were created from a review of the wider literature on networks and theory of change in sustainability transition studies. For each level, questions quiz the network according to its: capabilities, practices, performances, and conditions. Capabilities refer to the (individual and collective) skills, knowledge and understanding needed to work in a transformative way and to positive change. Practices refer to the PEPE principles for working in transformative ways: pluralising (drawing in and navigating diverse perspectives), empowering (mobilising and inspiring collective action), politicising (engaging with power in ways that accelerate transformative change) and embedding (incorporating and sustaining iterative learning and collective action in institutions) (Chambers and Nel., 2020). Performances refer to what the network achieves. Conditions refer to what is conditional to a network's success, for example a supportive policy environment.

Participants were divided into two break-out groups to focus on different elements of the farm cluster: i) one focused on the networks' activities i.e. what the network does (Figure 31) and ii) the second focused on the governance of the network i.e. how the network is run (Figure 32). Each group was tasked with answering nine questions based on the BioAgora toolkit, modified to fit the context of farm clusters.

| Question  | Very insufficient | Insufficient | Sufficient | Good |
|---|-------------------|--------------|------------|------|
| 1. To what extent are current activities aligned with desired aims and objectives of the group?   |                   |              |            |      |
| 2. To what extent does the group have capabilities for prioritizing and strategizing?   |                   |              |            |      |
| 3. To what extent does the group have access to the latest knowledge on funding opportunities?  |                   |              |            |      |
| 4. To what extent does the group have capabilities to organize learning (eg. peer to peer learning, farm walks etc.)?   |                   |              |            |      |
| 5. To what extent does the group have capabilities to collaborate?  |                   |              |            |      |
| 6. To what extent does the group have the capability to respond and adapt to developments?  |                   |              |            |      |
| 7. Are the relevant external landholders, <u>businesses</u> and organisations aware of and engaged with the group?  |                   |              |            |      |
| 8. To what extent does the group have the capability to represent its interests? (for eg. if there's an ongoing consultation or planning proposal that affects the group) |                   |              |            |      |
| 9. To what extent has the group managed to engage the <u>general public</u> in its activities and ambition?   |                   |              |            |      |

Figure 31. Activities questions for assessing the clusters' transformative potential.

| Question  | Very insufficient | Insufficient | Sufficient | Good |
|---|-------------------|--------------|------------|------|
| 1. Does the group have a strategy that makes explicit how it expects to reach its goals and objectives in contributing to this change?                                  |                   |              |            |      |
| 2. Does the group's leadership (steering group) respond to and support new and emerging ideas and practices proposed by members?  |                   |              |            |      |
| 3. To what extent is the group able to deal with disagreement?  |                   |              |            |      |
| 4. Are the relevant businesses, conservation groups, supply chain actors and government agencies sufficiently covered in the composition of the groups' steering board? |                   |              |            |      |
| 5. Is the group embedded in and connected with other cluster groups or rural networks?  |                   |              |            |      |
| 6. To what extent is the group responsive to changing circumstances and opportunities?  |                   |              |            |      |
| 7. To what extent does the group have the right skills and connections?   |                   |              |            |      |
| 8. Does the group see a role for itself in terms of addressing the challenges facing the rural economy?   |                   |              |            |      |
| 9. To what extent does the group engage in political discussions?   |                   |              |            |      |

Figure 32. Governance questions for assessing the clusters' transformative potential.

To create grounded local pathways for improving farm clusters' transformative potential, each group was asked to start by choosing a priority question to address, that groups had by consensus agreed that they were currently insufficient on. The next step was to brainstorm potential actions that the group could take to begin changing their governance and activities to better fit the cluster mission. Participants were asked to focus on actions within the cluster's direct control to generate strategic pathways that they could take following the workshop. In a closing plenary the two groups summarised their pathway of actions back to each other and discussed how they could best develop their potential in ways that could be transformational for the group in the near- and long- term.

### 5.2.3 Outcomes of the English pathway workshop

In a near unanimous choice, workshop participants decided that they would be best placed to shift their cluster focus to one that placed the overall business sustainability of farms at the centre of their remit.

“What this group could sort of look at doing is actually creating a way of recognising what a rare species Norfolk farmers are. That they are under pressure [...] it should be a protected species - the Norfolk farmer - because it's dying, or retiring without anyone coming forward”

This development for the cluster would build on their current focus that the group evaluated to be aligned with knowledge exchange. Currently, the group meets and organises learning opportunities and sessions on one another's' farms. Thus, working out how to reconfigure the cluster to secure the economic viability and sustainability of farms in their membership became the collectively agreed 'mission' to work towards. The participants created two pathways to develop their network going forwards: a governance pathway and an activities pathway.

The governance group chose to work on creating a pathway for how their group's leadership could better respond to the emerging practices and ideas proposed by the membership - that is, to tackle what being a 'farmer-led' group could mean in practice. The pathway thus responds to the need to bolster the group's adaptive capacity and agility within their decision-making structures. Brainstormed interventions included organising a group-wide conversation as to how the cluster would be steered going forwards, especially how decisions would be made. Coming to an understanding around the decision-making structure – be it consensus, majority rule or a vote tied to land-ownership-share – was identified as a key priority, particularly necessary for dealing with any potential disagreements. Another intervention framed as key to realising the cluster's potential was organising a survey of the membership to gauge their preferences around cluster governance, and how regularly/on what decisions the steering board consults the wider membership. This needs to include the hire of a full-time facilitator to represent, market and communicate opportunities and projects between the cluster and the broader public and potential private investors, and the formation of a legal entity to receive and distribute funding in ways agreed as fair by the collective.

“I think the group, as we said, has been very good at bringing neighbours together and [doing] knowledge exchange and I think now it needs to go into the next stage [...] whether we've nailed that as a steering group committee is debatable.”

The activities group chose to work on developing a pathway for improving their capabilities for strategising and prioritising as a cluster. Their pathway responds to the need to formulate clear aims and objectives in light of their cluster mission as a starting point for promoting the cluster to potential investors and the wider public. This group found it harder to identify concrete interventions beyond the need for a meeting to set the group aims and objectives. This was seen as an essential first step, and the absence of clear objectives a clear current block to further group strategising. Nevertheless, once the aims and objectives were decided, the group identified a need to better promote themselves and explain their importance regionally to a wide array of different stakeholders. To address this, they decided to work on a branding plan to better communicate their unique cluster identity and their potential to deliver joined-up nature conservation at scale across the cluster landholdings. This included outreach, to encourage farmers not currently in the membership but with ecologically valuable and contiguous land to join the cluster. The importance and need of a key communicator or facilitator became central to this pathway as well in the immediate term.

## Farm cluster pathway conclusions

For neighbouring farmers aiming to direct and deliver conservation at a landscape scale, improving the adaptive capacity of the collective is a crucial step for realising the potential of locally-attuned environmental decision-making. However, arriving at these locally defined and led transformative sustainability pathways also requires that researchers adopt a similarly responsive approach to stakeholder needs and capacities. Simplifying or reframing established methods like futures thinking and backcasting is essential for recruiting stakeholders who hold valuable knowledge and influence, but who are either unable or unwilling to engage in participatory sustainability research. We overcame some of these challenges by putting significant time into discovering relevant stakeholders and undertaking a large number of interviews (n=40), to ensure that a holistic understanding of context and views were held by the research team. This was an essential step for broadening the range of perspectives that could be included in our research on sustainability transformations, and for ensuring that 'co-created pathways' to achieve change are grounded in local realities and so useful to participants.

### 5.3 Western European pathways

Contrary to the two regional case studies, no pathway construction work was undertaken with stakeholders based on the aggregate Western European FCM. Additional analysis and stakeholder consultation is underway and will be reported on in subsequent Deliverables.

Rather, we contacted the first authors of the publications reporting on the six individual cases and asked them to reflect and elaborate on our main findings from the Western European FCM, in light of their own case study. Specifically, we asked them about the two relationships that were identified as crucial to ensure an increase in landscape quality, and that were both based on strong assumptions that were interpreted as partially desirable system characteristics:

- Global markets to Environmental policies
- Science and Education to Nature acceptance

Possible pathways were identified based on the authors' responses to these questions about the existence, establishment, or strengthening of key relationships in their FCM, as well as their assessments of landscape quality across Western Europe. Four out of six authors replied to our email inquiry.<sup>5</sup> Based on their responses, we introduced two new concepts in the FCM related to the relationship between science, knowledge, and environmental education that influence nature acceptance: economic stability and policies that support environmental education (Figure 33). Economic stability influences people's willingness (and capacity) to make 'sacrifices' for environmental protection. Additionally, policies that promote environmental education can enhance people's environmental awareness.

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<sup>5</sup> For a full description of the results, see Pamungkas (2025).

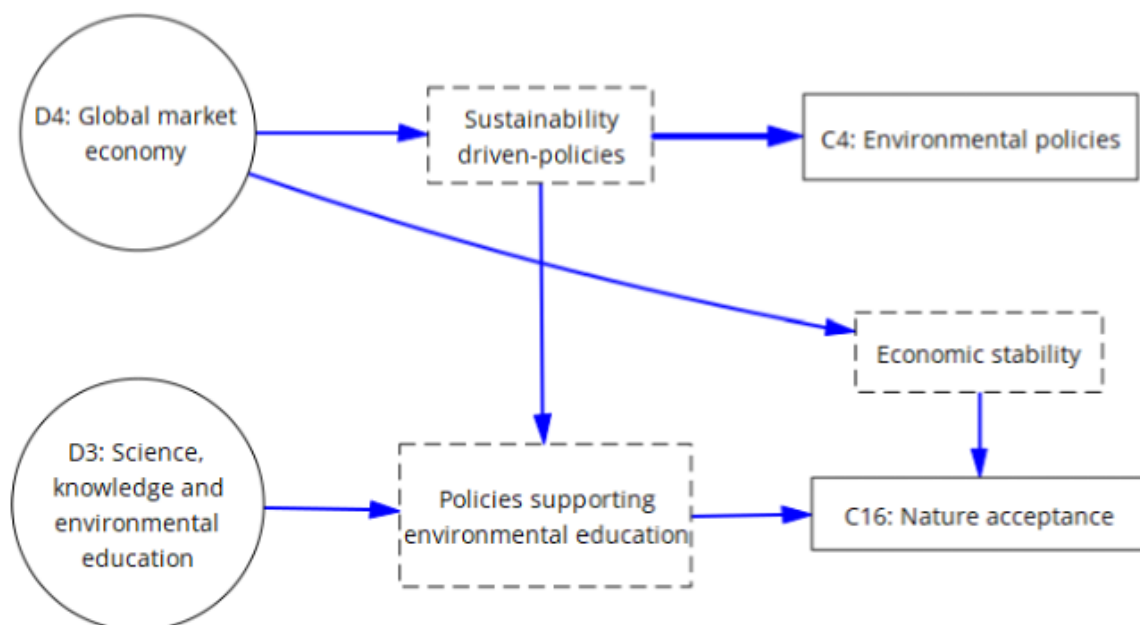


Figure 33. Modification of key relationships for policy interventions scenario. Blue indicates a positive relationship. The circle is the driver, the rectangle with a solid line is the existing concept and the rectangle with the dashed line is an additional concept.

Figure 33 provides the backbone for a more detailed pathway analysis. A total of eight potential pathways were identified. The three most important are:

- Global markets to Sustainability driven policies to Environmental policies.
- Global markets to Economic stability in the region to Nature acceptance.
- Science and education to Policies supporting environmental education to Nature acceptance.

Together these “proto-pathways” sketch a picture of top-down forces that, when translated to regional factors, will influence two key factors that are present across Western Europe: stimulation of Nature acceptance and targeted Environmental policies. More work is needed to flesh out the detailed pathways that can lead to these factors being stimulated to ensure an increase in Landscape Quality.

The aggregating process of six individual cases showed how a number of common elements emerge that are crucial across Western Europe. Because of the aggregated perspective, these factors are rather generic and the resulting proto-pathways need grounding in actual cases.

## 6 Conclusions

Our deliverable has allowed us to showcase a range of conceptual, methodological and practical conclusions around stakeholder engagement and transformative change.

Conceptually, transformation, defined as a profound change in the functioning of certain sectors or society as a whole, is often perceived through the need to significantly transform system structures, ways of day-to-day operating and actors' mindsets. However, the transformative pathways co-developed across the TRANSPATH project show that deep system or value changes can emerge from very concrete, practical initial steps. Transformative change is a culmination of these small, seemingly innocuous or even current-systems-aligned transitions, and is unlikely to be immediate if change is to be progressive and meaningful. Indeed, Termeer et al. (2017) question whether change can simultaneously be in-depth, large scale and fast. Rather than a rapid and dramatic overhaul, they propose that, in practice, transformative change is made up of continuous 'small wins.'

Methodologically, we have explored a range of approaches to building an understanding of diverse stakeholders' mental maps through Fuzzy Cognitive Mapping. These were through group-based workshop settings, narrative and semi-structured interviews, and aggregate reviews of published literature. In Table 12, we present a summary of key considerations to researchers considering these approaches, where understanding people's values, perspectives and theories of change are key for sustainability transformations. Ultimately, the choice of FCM construction must be guided by a careful consideration of stakeholders' capacities, constraints and modes of participation.

There is also an under-explored element to how methods enable or constrain creative thinking and brainstorming: when collective brainstorming in the form of workshops is possible and useful; and when more isolated, or smaller, group discussions lead to more nuanced or diverse insights into change mechanisms and realities. This raises important questions around how methodological choices shape who participates, as well as what kinds of ideas and imaginaries are possible through these.

Table 12. Overall summary evaluation of three different approaches to constructing an FCM as explored by our case studies across Czechia, England and in aggregate.

| Dimension                     | Group-based FCMs   | Narrative Interview FCMs  | Meta-analysis FCMs   |
|-------------------------------|--|---|--|
| <b>Purpose &amp; Use</b>      | Knowledge co-development, collective understanding, dialogue, consensus, system learning, legitimacy | Depth of understanding, inclusivity, capturing nuance                                   | Cross-case synthesis, pattern recognition for policy relevance, or shared factors in studies |
| <b>Stakeholder Engagement</b> | High (in-person, interactive)  | Medium (one-on-one, private)  | Indirect (based on past data)  |
| <b>Power Dynamics</b>         | Transparent visibility of power relations, risk of dominance by vocal actors                         | More equitable space for quiet/marginalised voices; researcher holds interpretive power | Researcher and individual case study leaders hold interpretive power                         |

|                                    |   |  |   |
|------------------------------------|---|--|---|
| <b>Facilitation Needs</b>          | High – requires detailed workshop programme preparation and skilled facilitation                            | Moderate – requires skilled interviewing   | N/A - Indirect (based on past data)   |
| <b>Concept Selection</b>           | Collective agreement, group framing   | Individual framing interpreted by researcher   | Researcher aggregates diverse vocabularies  |
| <b>Conflict Handling</b>           | Handled through discussion & consensus; conflict preserved in transcripts                                   | Preserved in transcripts, smoothed in aggregation  | Not relevant for synthesis and FCM construction; 'smoothed' or deleted if not relevant to systems understanding |
| <b>Representation of Nuance</b>    | Limited (needs consensus); nuance preserved in transcripts  | High in interviews, reduced in final model   | Limited – generalised and abstracted  |
| <b>Social Learning Potential</b>   | Potentially high as participants learn from each other  | Potentially high between interview/(ee), potentially low in output as nuances are aggregated | Some potential, depends if stakeholders are engaged post-FCM construction                                       |
| <b>Data Ownership &amp; Ethics</b> | Shared, transparent mapping   | Needs strong validation protocols  | Needs strong validation protocols   |
| <b>Resource Requirements</b>       | High (6+ hour workshops; financially demanding; large preparatory work e.g interviews, transcripts, coding) | High (interviews, transcription, coding)   | Medium (secondary data, extensive researcher time needed to aggregate models)                                   |
| <b>Feedback Possibility</b>        | Immediate (live in workshop)  | Optional (depends on project design)   | Optional (depends if structured back into engagement)   |
| <b>Best Used When</b>              | Stakeholders are available and willing to deliberate  | Access is fragmented, inclusion and nuance are key   | Synthesis or strategic overview is the priority   |

In terms of a range of practical conclusions, we offer reflections around the best practices and challenges of stakeholder engagement. Engaging a broader and more diverse group of stakeholders in co-creative sustainability research requires flexibility in workshop design as

well as in language, framing, and facilitation. One of the key lessons from our pathway co-creation work is that harder-to-reach or time-constrained stakeholders require a more adaptive approach. In particular, when stakeholders are not compensated for their time, researchers must be prepared to shorten, simplify, and reframe established methods like futures thinking and backcasting. Doing so is essential to ensure the involvement of actors who hold valuable knowledge and influence, but who might not typically participate in participatory sustainability research due to time pressures or misalignment with normative framings. Without such adaptation, there is a risk that workshops only include those already aligned with progressive agendas or those with the flexibility and familiarity to engage with research language and formats.

In the English workshop, modifying the systems change language used in invitations and facilitation proved crucial for recruiting stakeholders who were motivated by sustainability outcomes on their landholdings but were not aligned with the more transformative framing of “safe and just” sustainability transitions. This adaptation helped to get key stakeholders “in the room”, and to keep them there. However, there were clear trade-offs. Once in the workshop, conversations tended to remain within the bounds of current systems logic: for example, participants did not challenge ideas around commodification of nature, land ownership, or access rights. Indeed, non-confrontational framings were a deliberate research and outreach choice when advertising the English workshop, as we decided to prioritise the functionality and scope of the cluster group over any systems critique or very aspirational topics within the workshop. This stood in contrast to the Czech workshops, where stakeholders were more progressive-leaning and comfortable with the interlinkages between social justice and environmental sustainability, and so produced a very different discursive environment.

This highlights a crucial methodological and political tension: the language used to frame research directly shapes who is recruited, whose values and priorities are represented, and what types of transformations are imagined and deemed possible. If the resulting pathways are intended to inform future policy or public discourse, it is essential to be transparent about whose visions they reflect - and whose they do not. At the same time, excluding more radical or justice-oriented framings in order to expand participation can have a significant limiting effect on the workshop discussions themselves, potentially reinforcing mainstream views rather than challenging them. These tensions around recruiting beyond the ‘usual suspects’ in transformative change research will be explored further in Deliverable D2.3.

## 7 Next steps

The next stage of our research investigates if, and how, the findings from our FCM and pathway work across Europe might be meaningfully scaled. As a first step, we aim to link up local and domestic initiatives with a regional focus, in order to better understand networking forms and their associated needs. Our findings highlight a need to question what ‘scaling’ means in the context of European sustainability transformations.

In the English context, this will mean going beyond East Anglia, to explore the regional interconnections of farm cluster collectives throughout England, and possibly throughout the UK. These domestic insights will be expanded by interviewing farm cluster equivalents elsewhere in Europe, mirroring the East-West complementary approach that TRANSPATH was designed with. This will enable us to understand in concrete ways how local-level collective action - which has been so integral to realisations of transformative change across all our case studies - best supports and fosters local groups across a wide range of socio-economic and cultural contexts.

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The insights from the Czech case study will be further expanded for the broader Eastern Europe perspective. To this end, interviews will be carried out with the representatives of networks related to the stakeholders participating in the Czech workshops and that are operational in other Eastern European countries.

Follow-up work related to the Western European aggregate FCM is currently being carried out that focuses on the verification or development of pathways with researchers responsible for each individual case study. Initially proposed pathways above were based on the aggregate-FCM and entirely desk-based; the next phase will include a hybrid workshop with first author researchers from the original six studies used to build the aggregate FCM.

Developing our understanding of regional scaling and how local-level groups link together is also necessary for informing our communications and advice to relevant European institutions and funders, and for feeding into D2.4.

## **8 Acknowledgements**

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## **Appendix 1: The UK Case Study**

### **Introduction to the West Europe case study**

The Western European case study focuses on landscape-scale nature recovery in England. This focus responds to the current national attention to the long-term needs and challenges facing farming and rural areas, particularly in the context of post-Brexit subsidy and wider policy changes. The rollback of state agricultural support has increased the insecurities of farming households, and placed the conversation around desirable (and possible) rural futures at the forefront of national debate.

The case study approaches these questions by focusing on farm clusters, which are farmer-centric initiatives organised around building community and delivering conservation measures as a collective. Our work examines the needs, challenges and potential of these farmer cluster networks locally and potentially at different scales. These clusters range in size, structure and ambition: from informal groupings of 7 neighbours, for example, to legally recognised entities of 30+ farmers partnering to deliver nature-based solutions at scale.

Focusing on a particular region, East Anglia, the research marks a timely opportunity to explore strategies and preferences for rural transformation from the starting point of farmer-groups with direct experiences of the sector's most pressing challenges, and livelihood stakes in ongoing changes.

Alongside the stakeholders actively involved in farm cluster networks, the case study also engaged with pre-existing networks and stakeholders actively involved in changemaking activities particularly relevant to TRANSPATH.

Early on in our stakeholder engagement outreach, we encountered the very real issue of research- stakeholder fatigue, as farmer-groups in East Anglia are involved in many ongoing research projects into their land management practices, largely owing to their established connections with the Universities of Cambridge and East Anglia. However, the content and scope of this research differs significantly from existing studies, and the relative novelty of cluster groups, accompanied by the policy upheaval in the sector has refocused interest and attention to working through new, and potentially transformative strategies for farmers to maintain their livelihoods in the region.

To mitigate the risk of stakeholder fatigue, it was important that the transformation labs and their particular focus be tailored to the needs and interests of the participants as much as possible, by a) involving them from the outset and b) tailoring the workshop design and content to meet their interests and preferences. For example, this entailed integrating the transformation labs into the events organised by stakeholders themselves. Another factor that we had to engage with and strategise around included the political contentions and issues surrounding farm businesses, as demonstrated by the recent farmer protests in Westminster. Careful sensitivity to this issue was needed when designing the Western European case study.

### **Overview of stakeholder identification and recruitment**

To identify the most relevant stakeholders to engage in our study we created a stakeholder database on Excel. Initially, we chose to focus exclusively on people heading up a land- based network. Entries were classified in terms of their organisation, specialism, and location.

This was achieved through in-depth internet research, and recommendations from conservation and agriculture experts as well as key stakeholders in the field.

To map out the transformation baseline in the English context, that is, the extent to which farmer collaboration for conservation is currently possible, we conducted 40 scoping interviews with land-based rural networks, social enterprises, policy makers and business leaders. Questions explored the key enabling and constraining factors faced by collaborative enterprises and networks; the pressing challenges for farmers in the sector; and desired solutions. During the scoping interviews, snowball sampling was used, which consequently provided us with expert opinions for other relevant stakeholders within the field. This approach allowed us to map the context and identify other relevant stakeholders efficiently, and reliably, while also applying bottom-up methods to avoid researcher bias.

Out of the range of identified stakeholders in the stakeholder database, the following organisations were selected for scoping interviews:

- *The Norfolk and Suffolk Association*: a regional network of landscape-oriented partnerships in East Anglia focusing on delivering on-farm conservation at scale and improving farmer well-being.
- *The Countryside Regeneration Trust*: network of tenant farms promoting nature-friendly farming to help reverse the biodiversity decline and combat climate change.
- *Centre for Landscape Restoration Cambridge*: academic research network working to provide the knowledge and tools necessary to regenerate the British countryside using cost-effective nature-based solutions.
- *Nature Friendly Farming Network*: a farmer-led membership organisation that supports farmers who want to restore the balance between farming and nature.
- *National Farmers Union*: largest representation body for agriculture and horticulture in England and Wales.
- *Landworkers Alliance*: a union representing small-scale growers, foresters and land-based workers.
- *Food, Farming and Countryside Commission*: research charity set-up to shape government policy on food and farming, land use and the countryside.

## Appendix 2: Czech FCM Workshop Report

### Glossary

**Transformative change** is such change that is fundamental and systemic, takes place across scales (from the personal and local to the national or global), and at the same time has positive impacts on society and the environment.

**Transformative initiatives** are organisations/networks of different societal actors in the energy/food and agricultural sectors. They can be formalised or informal, smaller or larger scale.

**A transformative community** is a broader set of societal actors associated with transformative activities (e.g. energy cooperatives, broader communities contributing to community supported agriculture).

**A social-ecological system** is a conception of the world in which we live in as an inseparable combination of social and natural processes. In this conception, society is an integral part of nature, and therefore any human action must be understood as something that is both influenced by ecosystems and at the same time influences events within ecosystems.

**Systems thinking and modelling** is an analytical approach suitable for examining in detail the connections in a social-ecological system. By uncovering hidden connections, it allows for a deeper understanding of the processes that take place in a social-ecological system.

**System dynamics** is the set of all social and natural processes and events in a social-ecological system.

**Fuzzy Cognitive Mapping (FCM)** is one of the mental modeling methods working with system dynamics. Its use is appropriate wherever we want to get perspectives of different types of actors on events and dynamics within a social-ecological system.

**Factors** are the building blocks of FCM. They represent the variables of the social-ecological system which is being studied. Within the FCM, they are symbolized as elements in the system map.

**A central factor** is a factor that responds directly to the central question we are trying to answer with FCM.

**Drivers** are those factors in FCM that drive the entire social-ecological system. Within the resulting FCM, these are those factors that are at the source of all mapped linkages, and in turn are not themselves influenced by anything (or in the sense of system mapping, are influenced only by themselves).

**Linkages** are the relationships between individual factors of a social-ecological system, symbolized by arrows in the FCM. Within the FCM we determine both their direction and whether they are a strengthening (+) or balancing (-) relationship.

**A strengthening relationship (+)**, or a positive relationship, is a relationship between two factors in which there is a direct proportionality. If factor A is strengthened, factor B will be strengthened.

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If Factor A is weakened, Factor B will also be weakened. Thus, the relationship 'the more A, the more B' (or conversely 'the less A, the less B') applies.

**A balancing relationship (-)**, or a negative relationship, means that there is an inverse relationship between two factors. If factor A is strengthened, factor B will be weakened (and vice versa). Thus, the relationship 'the more A, the less B' (or, conversely, 'the less A, the more B') applies.

**The dynamic output of** the FCM map of the social-ecological system captures the development of individual factors (variables) resulting from system dynamics.

**Feedback loops** represent cyclical relationships between individual factors (e.g. A affects B and at the same time B affects A). Their presence in the FCM map is a prerequisite for creating a dynamic FCM output. Feedback loops cause even seemingly simple systems to exhibit strong nonlinear behavior.

## 1 Introduction

### 1.1 About the TRANSPATH project

There are many actors in the Czech Republic who are helping to change society and the natural environment for the better. The TRANSPATH project maps their transformative work. It focuses on actors who support change at the intersection of the energy sector and food systems (the so-called land-energy-food nexus).

TRANSPATH aims to map the actions and mechanisms that can lead to transformative change, at different levels - from producers to consumers to the societal level. Using a variety of approaches and methods, scenarios of transformation towards a more sustainable future will emerge for the Czech context. The four-year project, funded by Horizon Europe, involves researchers and experts from nine countries and 11 institutions around the world. In the Czech Republic, it is implemented by the Global Change Research Institute CAS - CzechGlobe.

In the first phase of the TRANSPATH project, we conducted a series of interviews with representatives of initiatives and networks within the energy sector and food systems that support transformative change in the Czech Republic. The interviews helped to identify the key motivations and visions of transformative actors and map out proven concrete steps, activities, and actions that support the achievement of transformative change. In addition, the data collected during the interviews was further used during the participatory workshop "How to achieve transformative change in energy, food, and land use sectors in the Czech Republic?" (see below).

### 1.2 About the workshop

The workshop "How to achieve transformative change in energy, food, and land use sectors in the Czech Republic?" organised by the CzechGlobe project team took place on 23 May 2024 in Prague. The aim of the workshop was to share experiences with transformative processes in the three sectors mentioned above in the Czech context and at the same time to gain deeper insights into the issue from different perspectives. In addition to the CzechGlobe project team, Kasper Kok, a project partner from Wageningen University and Research (WUR) and a leading expert in the Fuzzy Cognitive Mapping (FCM) method used in the workshop, also participated in the preparation and implementation of the workshop. The workshop was attended by ten representatives from transformative initiatives, networks, and social enterprises advocating for transformative change towards a more sustainable energy sector and food systems<sup>6</sup>.

In the beginning, the project team introduced the objectives of the workshop and the FCM method, central to the workshop. The next session introduced the factors that the participants subsequently worked with. After a detailed explanation of the process and steps involved in creating mind maps of transformative change mechanisms, the participants were divided into three working groups, "Food System 1", "Food System 2" and "Energy". For the purposes of the workshop, transformative change was defined as change that is fundamental and systemic, taking place across scales (from personal and local to national or global), while having positive impacts on society and the environment.

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<sup>6</sup> In order to preserve the anonymity of the participants, we do not mention the specific organisations.

The afternoon session was followed by a lecture by Matěj Malecha from the design and innovation studio Pábení on the *Doughnut model: a safe and fair space for humanity*, which was thematically linked to the TRANSPATH project. The last item on the agenda was a presentation of the dynamic outputs of the FCM (specifically the maps from the "Food System 2" and "Energy" groups), followed by a rich discussion. At the end of the workshop, the next steps in the processing of the results and the TRANSPATH project itself were mentioned.

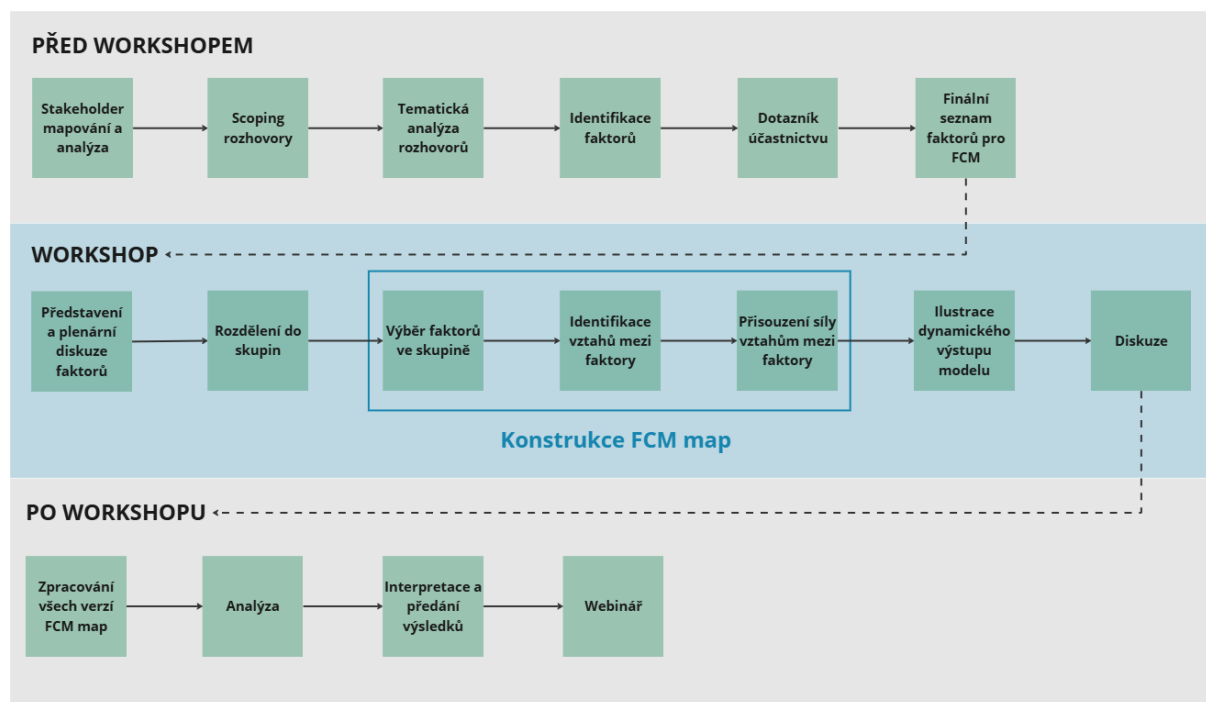


Figure 1. The sequence of workshop steps, including pre-workshop and post-workshop activities



Figure 2: Illustrative photo from the workshop



Figure 3: Illustrative photo from the workshop

## 2 Factors of transformative change

### 2.1 Identification of factors influencing transformative change

The selection of the factors used in the workshop was based on qualitative interviews with actors working in transformative initiatives, networks, and social enterprises at the intersection of the energy and food systems sectors in the Czech Republic which took place in late summer/early autumn 2023. The main themes of the interviews were the transformative goals of the initiatives and their responses to broader systemic issues, as well as proven actions supporting transformative change. Other themes then included factors that influence transformative change, both positively (called enablers) and negatively (called disablers) from the actors' experience.

Based on the thematic analysis of the interviews, the factors that actors believe influence transformative change in their sectors of activity were identified. The final list of factors was generated through a multi-step process of filtering the extracted factors (including clustering similar factors) and testing their applicability to FCM within the project team. A questionnaire was also sent out to the participants prior to the workshop to select factors common to all working groups. Table 1 lists the factors and their definitions. In total, there were 33 factors, coded accordingly (*F0-F31*, *FA*, *FB* - see below). The factors covered a range of social, political, cultural, and psychological phenomena related to transformative processes in society. Factor *F0*, common to all three groups, represents the central factor that directly responds to the central question we seek to answer with the FCM and to which all other factors are related. Factors *F1-F5* represent pre-selected factors that were common to all three groups. These pre-selected factors allowed us to subsequently compare their impact on transformative change between the energy and food systems sectors. The latter factors, *FA* and *FB*, emerged during a plenary discussion of the factors with participants prior to creating the FCM maps ('*FA Ability to meet needs in a non-monetary/non-market way*' and '*FB Level of understanding of the sector by society*'). The factors were further worked with as part of the group work to develop the FCM maps. In each group, an additional 10 factors were selected according to participant preference.

Table 1: List of factors for creating FCM system maps

|           | Factor  | Definition of   |
|-----------|---|---|
| <b>F0</b> | <b>The level of transformative change in the energy/food/land sectors</b> | Degree of major changes towards greater sustainability and equity in the energy/food/agriculture sector. Transformative change is characterised by being systemic, taking place across scales (national, regional, local) and having positive impacts on society and the environment. |
| <b>F1</b> | <b>Creating transformative communities</b>                                | Creating transformative communities within the energy/food and agriculture sectors (strengthening cohesion, cooperation, interconnectivity).  |
| <b>F2</b> | <b>Public support for transformation</b>                                  | The degree of debate in society that supports issues of social, economic and environmental transformation towards sustainability.   |
| <b>F3</b> | <b>Actors' conformity</b>   | The degree of inclination of society to maintain the status quo. It is linked to the ability of actors to respond to new situations (e.g. adaptation/flexibility to adopt new ways of thinking vs.  |

|            | Factor   | Definition of   |
|------------|--|---|
|            |  | persistence in outdated ways of thinking; including generational change that allows for new perspectives on different topics).  |
| <b>F4</b>  | <b>Level of personal enthusiasm/determination</b>              | Having the passion and other personal qualities (e.g. enthusiasm, determination, fearlessness and willingness to take risks) that enable actors to engage in long-term transformative action.                                 |
| <b>F5</b>  | <b>Decentralisation of the energy/food sector</b>              | Decentralisation, localisation and building self-sufficiency within the energy/food and agricultural sectors.   |
| <b>F6</b>  | <b>Actors' cooperation</b>                                     | The degree of cooperation between different actors in society, including networking.  |
| <b>F7</b>  | <b>Inspiring others</b>  | Inspiring others through examples of good practice.   |
| <b>F8</b>  | <b>Fair remuneration</b>                                       | Ensuring pay equity in transformative initiatives.  |
| <b>F9</b>  | <b>Legislation supportive of transformation</b>                | The presence of legislation at the national level actually supporting the transformation in the energy/food and agricultural sectors.   |
| <b>F10</b> | <b>Political support</b>                                       | The degree of support by political representation or specific politicians.  |
| <b>F11</b> | <b>Implementation of EU policies</b>                           | Transposition and implementation of European legislation into the Czech legislative environment.  |
| <b>F12</b> | <b>Efficiency of pro-transformative lobbying</b>               | Effectiveness of lobbying by social actors supporting the transformation.   |
| <b>F13</b> | <b>Efficiency of anti-transformative lobbying</b>              | The effectiveness of lobbying by social actors benefiting from the status quo.  |
| <b>F14</b> | <b>Professionalization of transformative initiatives</b>       | The process of professionalization of initially informal transformative initiatives.  |
| <b>F15</b> | <b>Bureaucracy</b>   | The amount and intensity of administrative processes and procedures.  |
| <b>F16</b> | <b>Resortism</b>   | The tendency of the state to address issues within only one sector.   |
| <b>F17</b> | <b>Openness of governance processes</b>                        | The level to which social governance processes are open/accessible for actors to participate/shape them (e.g. actors' input in the development of new policies/legislation).  |
| <b>F18</b> | <b>Power of small actors</b>                                   | The influence of smaller social actors and their ability to defend their interests against those of large companies/organisations (e.g. small farmers/energy cooperatives vs. large agricultural companies/energy companies). |
| <b>F19</b> | <b>Linking producers with consumers</b>                        | Connecting consumers/consumers with producers.  |
| <b>F20</b> | <b>People's ability to afford sustainably-sourced products</b> | The ability and willingness of people to pay for goods and services produced in a sustainable and equitable way.  |
| <b>F21</b> | <b>Accessibility of finance for transformative initiatives</b> | The extent to which funding (e.g. grants) is available for transformative initiatives.  |
| <b>F22</b> | <b>Fair price levels</b>                                       | Value recognition as a prerequisite for ensuring fair prices along production chains for producers and consumers.   |
| <b>F23</b> | <b>Society's relationship to nature</b>                        | Perception of the inseparability of man and nature (man and nature as one).   |
| <b>F24</b> | <b>Public's trust in transformative initiatives</b>            | Public confidence in the transformative initiative as a means to achieve transformative goals and within the organization itself.   |

|     | Factor   | Definition of  |
|-----|--|--|
| F25 | <b>Evidence base on transformation</b>                         | Availability of empirical evidence and data on the mechanisms of transformative processes (evidence from practice that the transformation mechanisms work).  |
| F26 | <b>Communication of transformative change</b>                  | Intensity of communication of transformative change.   |
| F27 | <b>Public education</b>  | The level of education of different parts of society on different topics related to the transformation towards a more just and sustainable future.   |
| F28 | <b>Cooptation of transformative topics</b>                     | Level of co-optation/Cooptation of transformative topics by "non-transformative" actors.   |
| F29 | <b>Sensitivity to certain topics and terms</b>                 | High sensitivity of society to certain topics and concepts, e.g. the topic of land and agriculture, community, solidarity, or topics perceived as politicized.   |
| F30 | <b>Individualism</b>   | Prioritising individual solutions over collective ones.  |
| F31 | <b>Global crises</b>   | The impact of emerging/emerging global crises on the practicalities of everyday life and on social paradigms. For example, the Covid pandemic has created a specific environment that has accelerated some transformative processes (e.g. enabling people to set up new ways of communicating at work, to pause and reflect on their lives, to strengthen their relationship with nature, etc.). Similarly, the energy crisis caused by the war in Ukraine has made visible/opened up some neglected issues, e.g. energy self-sufficiency and the need for renewable and community energy sources. |
| FA  | <b>Ability to meet needs on a nonmonetary/non-market basis</b> | Meeting the needs of society in ways other than money-dependent ways.  |
| FB  | <b>Society's level of understanding the sector</b>             | A deeper understanding of how the sector functions in society (e.g. pricing in agriculture, energy distribution).  |

Of the more than 30 factors defined before the workshop and added during the initial discussion (Table 1), each working group selected 15 factors for further work (Table 2). The "Food System 2" group added an additional factor "*FX Active Mainstream Pressure*" during the mapping.

Table 2 . Factors used in the system maps of each working group.

| Factor  | Group "Food system 1" | Group "Food system 2" | Group "Energy" |
|---|-----------------------|-----------------------|----------------|
| <b>F0 The level of transformative change in the energy/food/land sectors</b> (mandatory factor) | ✓                     | ✓                     | ✓              |
| <b>F1 Creating transformative communities</b> (mandatory factor)                                | ✓                     | ✓                     | ✓              |
| <b>F2 Public support for transformation</b> (mandatory factor)                                  | ✓                     | ✓                     | ✓              |
| <b>F3 Actors' conformity</b> (mandatory factor)   | ✓                     | ✓                     | ✓              |

| Factor  | Group "Food system 1" | Group "Food system 2" | Group "Energy" |
|---|-----------------------|-----------------------|----------------|
| <b>F4 Level of personal enthusiasm/determination</b> (mandatory factor) | ✓                     | ✓                     | ✓              |
| <b>F5 Decentralisation of the energy/food sector</b> (mandatory factor) | ✓                     | ✓                     | ✓              |
| <b>F6 Actors' cooperation</b>   |                       | ✓                     |                |
| <b>F7 Inspiring others</b>  |                       |                       |                |
| <b>F8 Fair remuneration</b>   |                       |                       |                |
| <b>F9 Legislation supportive of transformation</b>                      |                       | ✓                     | ✓              |
| <b>F10 Political support</b>  |                       | ✓                     | ✓              |
| <b>F11 Implementation of EU policies</b>                                |                       |                       | ✓              |
| <b>F12 Efficiency of pro-transformative lobbying</b>                    |                       | ✓                     | ✓              |
| <b>F13 Efficiency of anti-transformative lobbying</b>                   | ✓                     | ✓                     | ✓              |
| <b>F14 Professionalization of transformative initiatives</b>            |                       |                       |                |
| <b>F15 Bureaucracy</b>  | ✓                     |                       |                |
| <b>F16 Resortism</b>  |                       |                       |                |
| <b>F17 Openness of governance processes</b>                             |                       | ✓                     |                |
| <b>F18 Influence of small actors</b>                                    |                       | ✓                     | ✓              |
| <b>F19 Linking producers with consumers</b>                             |                       |                       | ✓              |
| <b>F20 People's ability to afford sustainably-sourced products</b>      | ✓                     | ✓                     | ✓              |
| <b>F21 Accessibility of finance for transformative initiatives</b>      |                       | ✓                     | ✓              |
| <b>F22 Fair price levels</b>  | ✓                     |                       |                |
| <b>F23 Society's relationship to nature</b>                             | ✓                     | ✓                     |                |
| <b>F24 Public's trust in transformative initiatives</b>                 | ✓                     |                       | ✓              |
| <b>F25 Evidence base on transformation</b>                              |                       |                       |                |
| <b>F26 Communication of transformative change</b>                       |                       |                       | ✓              |
| <b>F27 Public education</b>   | ✓                     |                       |                |
| <b>F28 Cooptation of transformative topics</b>                          | ✓                     | ✓                     |                |
| <b>F29 Sensitivity to certain topics and terms</b>                      |                       |                       | ✓              |
| <b>F30 Individualism</b>  |                       |                       |                |
| <b>F31 Global crises</b>  |                       |                       | ✓              |
| <b>FA Ability to meet needs on a non-monetary/non-market basis</b>      | ✓                     | ✓                     |                |

| Factor   | Group "Food system 1" | Group "Food system 2" | Group "Energy" |
|--|-----------------------|-----------------------|----------------|
| FB Degree of company understanding of the sector |                       |                       |                |
| FX Active mainstream pressure                    |                       | ✓                     |                |

### 3 Fuzzy Cognitive Mapping: mapping transformative change processes

#### 3.1 About Fuzzy Cognitive Mapping (FCM)

Fuzzy Cognitive Mapping (hereafter FCM) is one of the tools of participatory social-ecological systems mapping that allows us to understand these dynamics. FCM is a technique that works with semi-quantitative models based on knowledge and understanding of the interrelated variables (factors) in a given system. The strength of FCM is the ability to model the dynamic outputs of mental models. Thus, the basic building blocks of FCM are feedback loops between factors that influence the behavior of the whole system. This allows us to describe how even seemingly simple systems can exhibit strong nonlinear behavior. Further, this allows us to analyze and understand the broader relationships across factors within the system.

Therefore, FCM is appropriate to use when we want to include the perspectives of different types of actors who live or work in a given system in system mapping. Through participatory workshops, we can thus create maps of the dynamic links between key factors as understood and perceived by the actors involved. In addition, FCM allows us to engage with both qualitative and quantifiable factors affecting the complex system we are investigating. FCM thus provides a relatively simple approach for combining and taking into account the different types of knowledge that are represented by these particular actors.

FCM allows:

- To look at the schemes and frameworks within which we think
- Understand in detail the theory of change of other actors
- Recognize the mental schemes and frameworks of other actors
- Illustrate what these mental models can lead to.

#### 3.2 FCM design

The construction of the system maps took place in several steps during the workshop (Figure 1). It was based on a central factor representing transformative change processes (*F0 The level of transformative change in the energy/food/land sectors*). Subsequently, system maps of the related factors, including their linkages through feedback loops, were developed by each working group. Relationships between factors were captured in two steps: first, the presence/absence of a relationship and its type (positive or negative) was defined, followed by assigning a value to the relationship representing its strength (on a scale of ---, --, -, +, ++, +++).

After the workshop, the system maps created by each working group were photo-documented and digitally redrawn in Miro and Vensim software, including notes.

A part of the construction of FCMs is also their subsequent checking to detect possible problems that could lead to errors in the resulting analysis, for example, due to the duplication of relationships between factors, etc. The Transpath project team checked the redrawn maps after the workshop and identified several types of problems that were subsequently corrected:

1. Group "Food System 1":

- Missing feedback loops. Feedback loops have been completed by adding the following links:
  - i. weak positive links (+) between the factors "F0 The level of transformative change in the energy/food/land sectors" → "F2 Public support for transformation" - the motivation for adding this link was its presence in the map of the "Food System 2" group.
  - ii. a weak negative relationship (-) between the factors "F4 Level of personal enthusiasm/ determination " → "F13 Efficiency of anti-transformative lobbying" based on the transcript of the recording of the discussion during which this relationship was mentioned. To prevent the emergence of a feedback loop with the same strength of both links, the original link "F13 Efficiency of anti-transformative lobbying" → "F4 Level of personal enthusiasm/ determination " was strengthened from weak (-) to moderately strong (--).

2. Group "Food System 2":

- Presence of a short reinforcing feedback loop between the factors "F1 Creating transformative communities" ↔ "F6 Actors' cooperation". The problem was solved by creating two alternative maps, one in which the loop is maintained and one in which it is broken by deleting the F6 → F1 feedback loop that was plotted as less certain during the workshop. The version with the removed feedback loop was used for the analysis.
- The overlapping variables "F12 Efficiency of pro-transformative lobbying" and the factor "FXX Positive political pressure" were temporarily included during group work. As both factors behaved identically in the final version of the map, they were merged into one factor.

3. "Energy" group:

- The presence of linkages, the existence of which was identified by the participants as not certain (in the process of creating the FCM charts, plotted by the dashed line), between the factors "F5 Decentralization of the energy/land/food sectors" → "F1 Creating transformative communities", and "F19 Linking producers with consumers" → "F5 Decentralization of the sector". These linkages were included as valid in the final map.
- The presence of duplicate links that described duplicate causal relationships in the map, thereby disproportionately increasing the complexity of the map and the number of feedback loops. A modified version of the final map was produced in which the following duplicate links were removed as they were reached vicariously through the retained causal pathways:

- i. F5 Decentralisation of the energy/food sector → F0 The level of transformative change in the energy/food/land sectors
- ii. F13 Efficiency of anti-transformative lobbying → F3 Actors' conformity
- iii. F19 Linking producers with consumers → F5 Decentralisation of the energy/food sector
- iv. F24 Public's trust in transformative initiatives → F2 Public support for transformation
- v. F26 Communication of transformative change → F24 Public trust in transformative initiatives

No apparent logical inconsistencies were found in the characterization of individual links as reinforcing (+) or balancing (-).

### 3.3 Creating dynamic output

The individual system maps were converted into numerical form.

We illustrate the principle of the computation using the example of a system map with three factors,  $C_1$ ,  $C_2$  and  $C_3$ .

The initial state of all factors is written using the state vector  $A$ , where the factors that act as driving forces in the system map have the value 1:

$$A = (1, 0, 1)$$

We describe the strength and direction of the individual relationships in the system map using a matrix - as an example we use the matrix  $E$ .

$$E = (1 \ 1 \ 0 \ -0.1 \ 0 \ 0 \ 0 \ 0.5 \ 1)$$

The resulting state of all factors (the new state vector  $B$ ) is calculated by matrix multiplication of the original state vector  $A$  with the relationship matrix  $E$ :

$$\begin{aligned} B &= A \times E = (1, 0, 1) \times (1 \ 1 \ 0 \ -0.1 \ 0 \ 0 \ 0 \ 0.5 \ 1) = 1 \times (1, 1, 0) + 0 \times (-0.1, 0, 0) + 1 \times (0, 0.5, 1) \\ &= 1 \times (1, 1, 0) + 0 \times (-0.1, 0, 0) + 1 \times (0, 0.5, 1) = (1, 1, 0) + (0, 0, 0) + (0, 0.5, 1) \\ &= (1, 1.5, 1) = (1, 1, 0) + (0, 0, 0) + (0, 0.5, 1) = (1, 1.5, 1) \end{aligned}$$

The calculation of the new state vectors can be repeated in individual steps indefinitely. During this process, four situations can occur: (A) the system "implodes" - all concepts converge to zero; (B) the system "explodes" - all concepts continuously increase/decrease; (C) the system stabilizes in a cyclic state (resembling a sinusoid); (D) all concepts stabilize at a constant value. Ideally, the stepwise calculation should be repeated until the resulting system behavior can be identified (usually about 20-30 steps, but the system may stabilize earlier). The resulting graphs of the system model's behaviour are called the "dynamic model".

The strength of each bond was converted according to a predefined key (Table 3).

Table 3. Relationship between symbolic and numerical representation of the strength of the links between factors in the system map.

| The strength of the relationship expressed on a symbolic scale | The strength of the relationship expressed numerically |
|--|--|
| +++  | -0,8   |
| ++   | -0,5   |
| +  | -0,2   |
| -  | 0,2  |
| --   | 0,5  |
| ---  | 0,8  |

### 3.4 Resulting FCM system maps

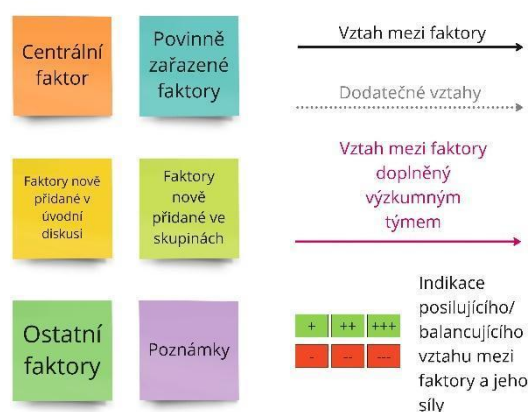


Figure 4. Legend to system maps created in Miro.

#### 3.4.1 Group "Food system 1"

##### 3.4.1.1 Basic features of the system map

The "Food System 1" group worked with 15 factors (Table 2), among which they plotted 26 linkages (see final system map, Figure 7). The plotted linkages represent 12% of the total number of all theoretically possible linkages between factors (the so-called density of the system map). This overall model density is indicative of the level of complexity of the system map. This is a standard density measure (FCM system maps usually have a density between 5-15%), indicating that an optimal amount of links have been included in the system map.

The group focused on developing FCMs for transformative change in the food system. The discussion gave great importance to factors such as society's relationship with nature, society's conformity, and anti-transformative lobbying. Issues of fair pricing for smallholder farmers and food producers were also an important part of the discussion. From the perspective of the participants, while changes in remuneration would lead to a fairer environment between small farmers and food producers, on the other hand, it could result in higher prices for final products and thus more exclusivity of such goods. On the other hand, the issue of fair pricing was seen as an important aspect of changing society's relationship with nature. Throughout the process, the group worked with the premise that from their point of view, there were no changes in the food system that could be described as transformative.



Figure 6. Digitally redrawn version of the system map of the group "Food system 1" (software: Miro). The spatial layout and colours have been kept as close as possible to the original created during the workshop.

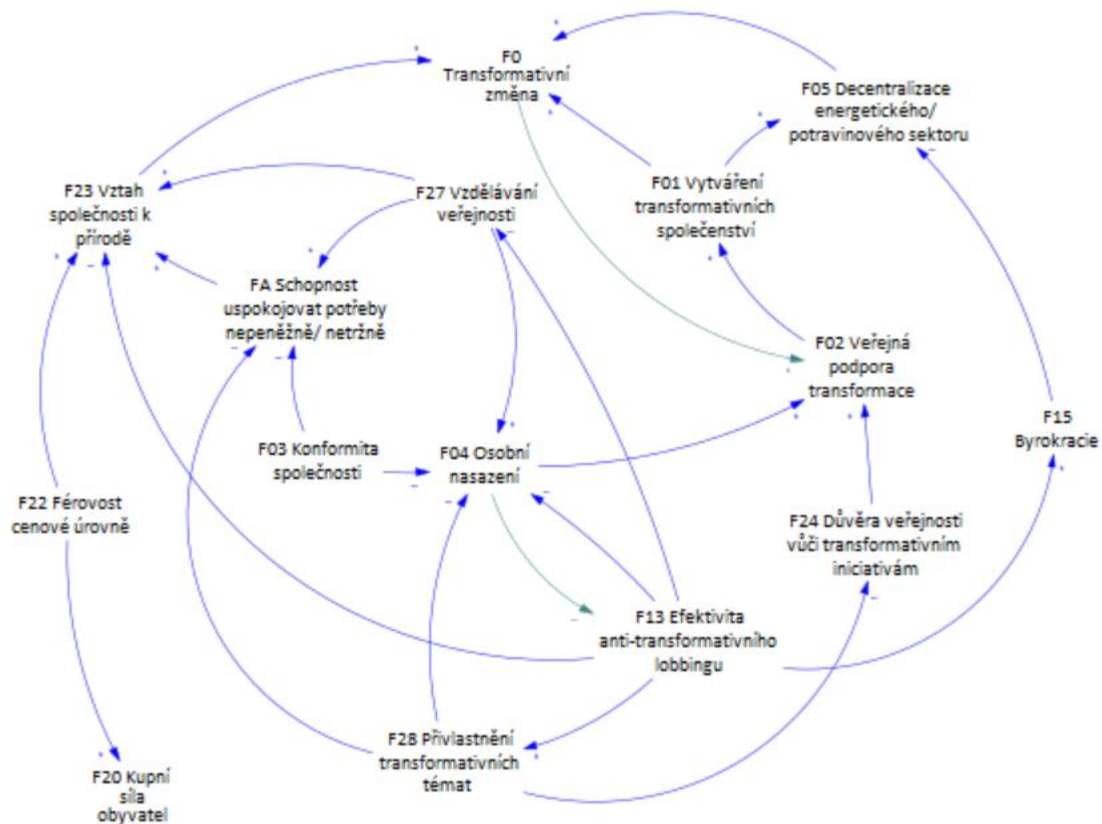


Figure 7. The final adaptation of the system map of the "Food System 1" group, which was further analysed. Links complementing feedback loops (see section FCM design) are marked in green (software: Vensim).

### 3.4.1.2 Importance of individual factors: centrality

Table 4 summarises the number and absolute values for each factor appearing in the system map of the 'Food system 1' group. The table also shows the centrality of each factor in the map, i.e. how many incoming and outgoing relationships a given concept has in the map. Centrality is expressed as the total number of relationships or as the aggregate absolute value of the strength of all these relationships.

The most important factors in terms of centrality were:

- *F4 Level of personal enthusiasm/ determination* (6 ties with a total value of 2.1): this factor, together with *F13 Efficiency of anti-transformative lobbying*, had the highest number of ties, with incoming ties outweighing outgoing ties
- *F13 Efficiency of anti-transformative lobbying* (6 ties with a total value of 3.3): the factor with the most outgoing ties out of the whole map and no incoming ties, thus acting as a significant driving force in the model.

- *F3 Actors' conformity* (4 ties with a total value of 2.7): a factor with no incoming ties, which, due to the high number of outgoing ties, represents one of the driving forces of the model

Table 4 . Number and aggregate absolute value of individual linkages in the system map of the "Food System 1" group; centrality of individual factors in the map.

| Factor   | Number of incoming links | Number of outgoing links | Centrality (total number of links) | Aggregate absolute value of incoming links | Aggregate absolute value of outgoing links | Centrality (total absolute value of links) |
|--|--------------------------|--------------------------|------------------------------------|--|--|--|
| <b>F0 The level of transformative change in the energy/food/land sectors</b> | 3                        | 1                        | 4                                  | 0.6  | 0.2  | 0.8  |
| <b>F1 Creating transformative communities</b>                                | 1                        | 2                        | 3                                  | 0.5  | 0.4  | 0.9  |
| <b>F2 Public support for transformation</b>                                  | 3                        | 1                        | 4                                  | 1.2  | 0.5  | 1.7  |
| <b>F3 Actors' conformity</b>   | 1                        | 3                        | 4                                  | 1.0  | 1.7  | 2.7  |
| <b>F4 Level of personal enthusiasm/determination</b>                         | 4                        | 2                        | 6                                  | 1.4  | 0.7  | 2.1  |
| <b>F5 Decentralisation of the energy/food sector</b>                         | 2                        | 1                        | 3                                  | 0.4  | 0.2  | 0.6  |
| <b>F13 Efficiency of anti-transformative lobbying</b>                        | 1                        | 5                        | 6                                  | 0.2  | 3.1  | 3.3  |
| <b>F15 Bureaucracy</b>   | 1                        | 1                        | 2                                  | 0.2  | 0.2  | 0.4  |
| <b>F20 People's ability to afford sustainably-sourced products</b>           | 1                        | 0                        | 1                                  | 0.2  | 0.0  | 0.2  |
| <b>F22 Fair price levels</b>   | 1                        | 3                        | 4                                  | 1.0  | 1.4  | 2.4  |
| <b>F23 Society's relationship to nature</b>                                  | 4                        | 1                        | 5                                  | 1.4  | 0.2  | 1.6  |
| <b>F24 Public's trust in transformative initiatives</b>                      | 1                        | 1                        | 2                                  | 0.5  | 0.5  | 1.0  |
| <b>F27 Public education</b>  | 1                        | 3                        | 4                                  | 0.8  | 0.6  | 1.4  |
| <b>F28 Cooptation of transformative topics</b>                               | 1                        | 3                        | 4                                  | 0.8  | 1.5  | 2.3  |
| <b>FA Ability to meet needs on a non-monetary/non-market basis</b>           | 3                        | 1                        | 4                                  | 1.2  | 0.2  | 1.4  |

### 3.4.1.3 Importance of individual factors: feedback loops

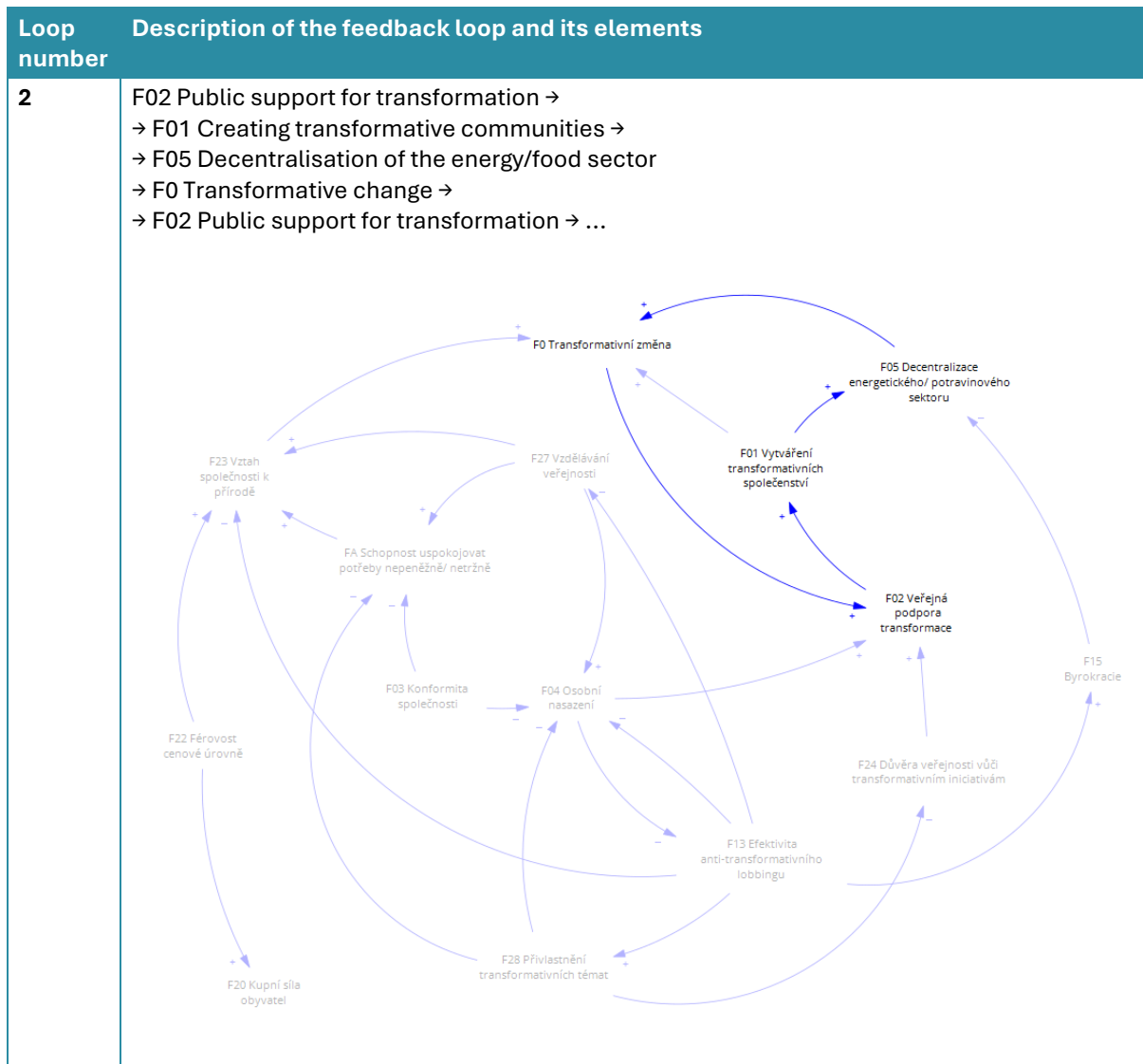
The FCM system map of the "Food System 1" group contained five feedback loops (Table 5). The inclusion of factors in the feedback loops indicates their increased importance in the system map.

The strongest reinforcing feedback loop was loop 3: *F4 Level of personal enthusiasm/ determination* → *F13 Efficiency of anti-transformative lobbying*. Conversely, the strongest balancing feedback loop was loop 4: *F4 Level of personal enthusiasm/ determination* → *F13 Efficiency of anti-transformative lobbying* → *F28 Cooptation of transformative topics*. The common factors for both loops were *F4 Level of personal enthusiasm/ determination* and *F13 Efficiency of anti-transformative lobbying*. While Loop 3 can be interpreted as a situation in which *F13 Efficiency of anti-transformative lobbying* continuously weakens *F4 Level of personal enthusiasm/ determination*, in Loop 4 the factor *F4 Level of personal enthusiasm/ determination* represents a balancing force that balances the effects of *F13 Efficiency of anti-transformative lobbying* and *F28 Cooptation of transformative topics*.

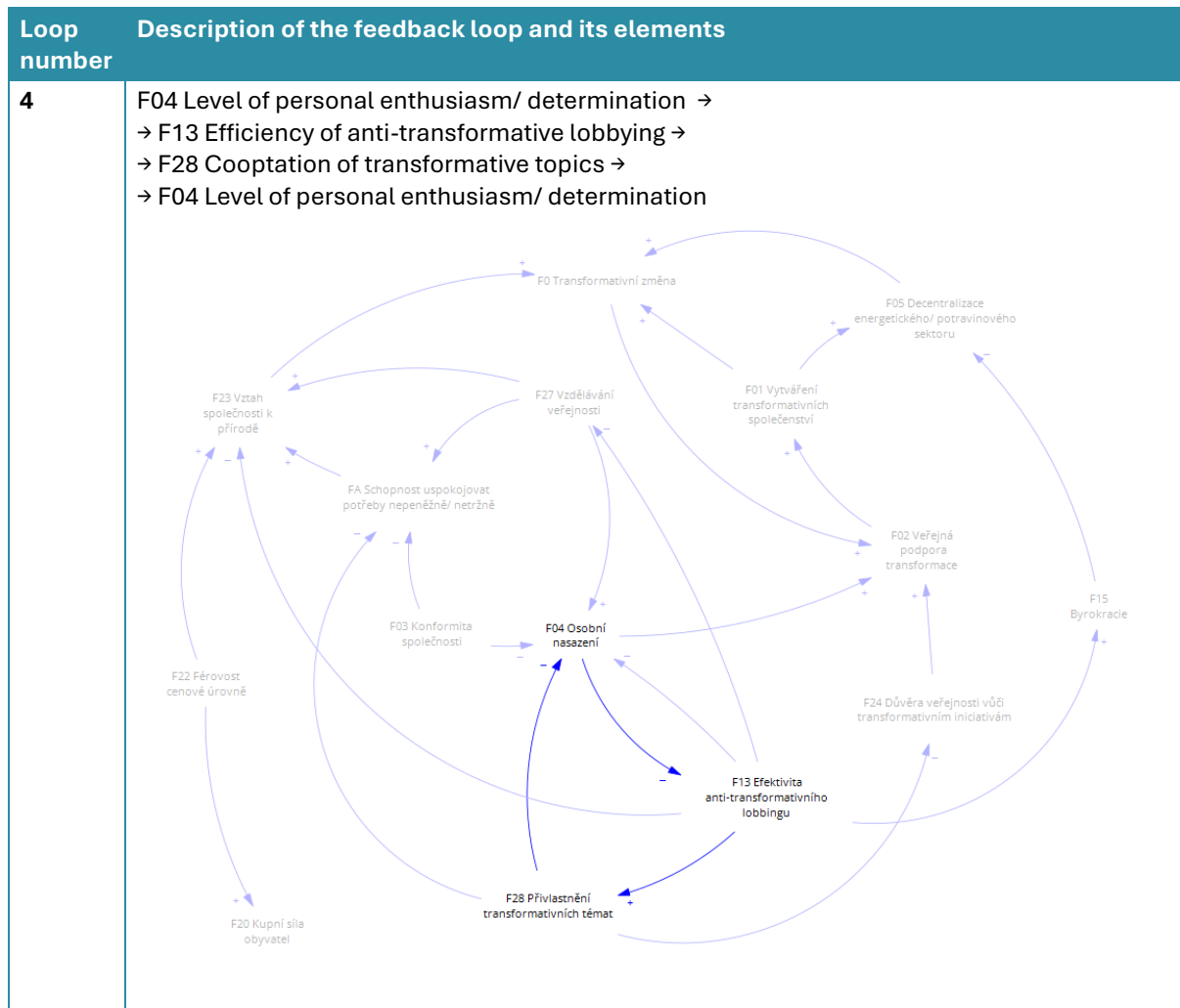
Loop 1 and Loop 2 had a similar basis in the form of factors *F02 Public support for transformation*, *F01 Creating transformative communities*, *F0 Transformative change*. Loop 2 then added factor *F05 Decentralisation of the energy/food sector*. Both loop 1 and loop 2 are reinforcing feedback loops. Loop 5 then had the same basis as the strongest loops 3 and 4, and thus included factors *F4 Level of personal enthusiasm/ determination* and *F13 Efficiency of anti-transformative lobbying*, but its difference was the inclusion of factor *F27 Public education*. At the same time, the feedback in this loop was similar to that of Loop 4, with *F27 Public Education* and *F4 Level of personal enthusiasm/ determination* balancing factor *F13 Efficiency of anti-transformative lobbying*.

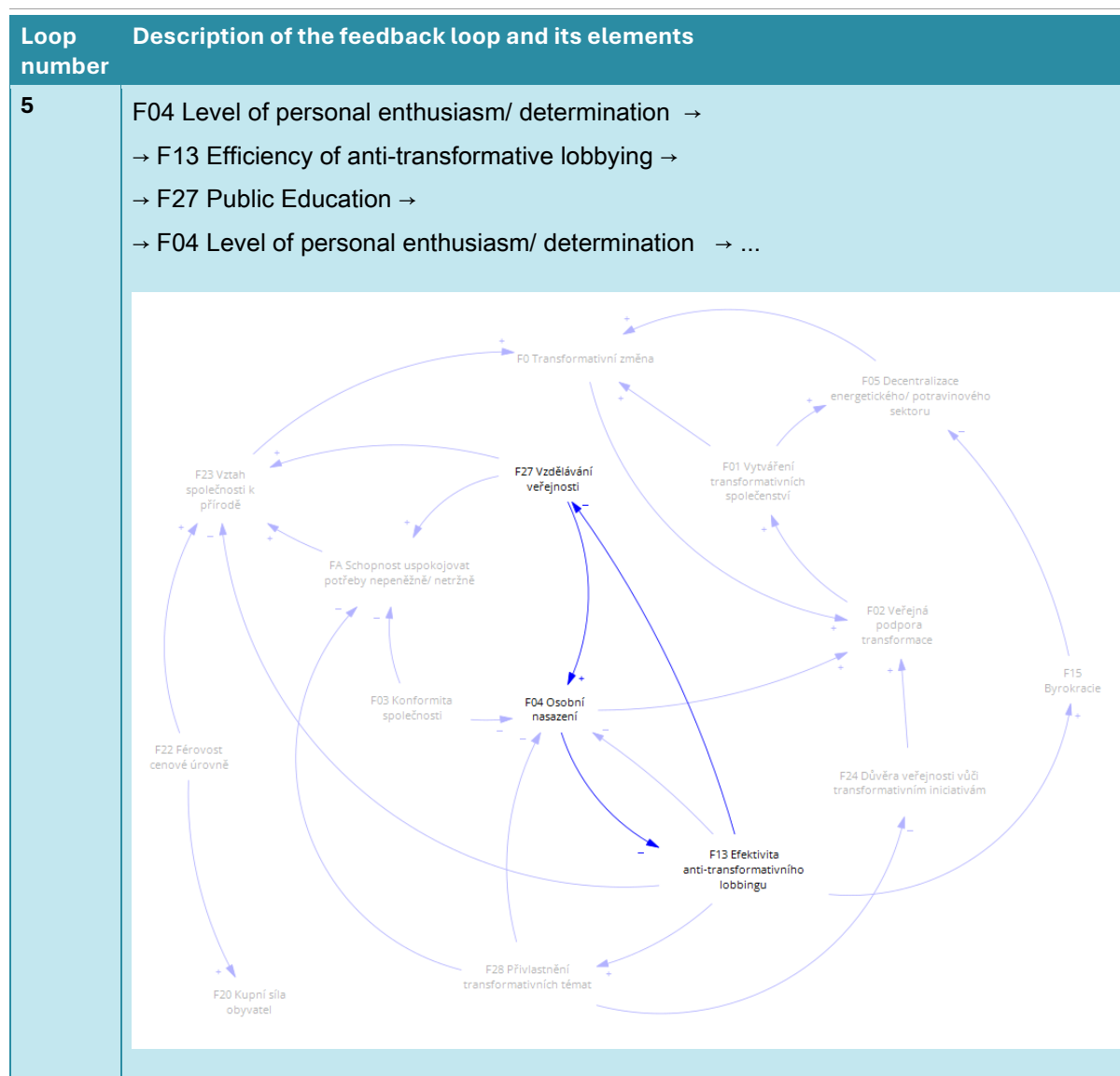
Table 5 . Feedback loops in the system map "Food system 1".

| Loop number | Description of the feedback loop and its elements  |
|-------------|--|
| 1           | <p>F02 Public support for transformation →<br/>                     → F01 Creating transformative communities →<br/>                     → F0 Transformative change →<br/>                     → F02 Public support for transformation → ...</p> |



| Loop number | Description of the feedback loop and its elements   |
|-------------|---|
| 3           | <p>F04 Level of personal enthusiasm/ determination →<br/>                     → F13 Efficiency of anti-transformative lobbying<br/>                     → F04 Level of personal enthusiasm/ determination → ...</p> |





### 3.4.1.4 The importance of individual factors: dynamic output and analysis

Figure 8 shows the dynamic output of the basic FCM version of the system map of the group "Food system 1". This dynamic output describes a situation where all "**driving forces**", i.e. factors that influence the rest of the system but are themselves not influenced by any other factor, are taken into account ("switched on") in the system map. The driving forces for the group "Food system 2" were the **factors F3 Actors' conformity and F22 Fair price levels**. If we look at the outputs in which we disregard ("switch off") one of the driving forces, we see that the factor *F3 Actors' conformity* affects transformative change negatively. In contrast, factor *F22 Fair price levels* has a positive effect on transformative change.

The graph further shows that the F0 Transformative Change initially increases slightly to positive values, but soon stabilizes at zero (i.e., the same value as at the beginning of the simulation). This phenomenon indicates that the level of transformative change does not decrease in the long run, but neither does it increase, i.e. transformative change is difficult to achieve in the system. This reversal in the dynamics of F0 is due to the influence of feedback loops. Factors that have stabilized at a negative level (i.e., at a value lower than at the beginning) include FA Ability to meet needs in a non-monetary/non-market way, F4 Level of

personal enthusiasm/ determination , F2 Public support for transformation, and F1 Creation of transformative communities. Just around neutral (i.e., 0), but still at a negative level, factors F24 Public Trust in Transformative Initiatives, F27 Public Education have stabilized. The rest of the factors stabilize at a positive value.

The most influential factors according to the dynamic output of the model are those that have the highest absolute value at which they stabilize. In the case of the basic dynamic output, these are FA Ability to meet needs in a non-monetary/non-market way (-0.52), F4 Level of personal enthusiasm/ determination (-0.25) and F20 People's ability to afford sustainably-sourced products (+0.2). The system is most sensitive to the behaviour of these factors from a dynamic output perspective, and if the final stabilisation level of F0 Transformative Change is to be changed, efforts should be directed towards influencing these factors.

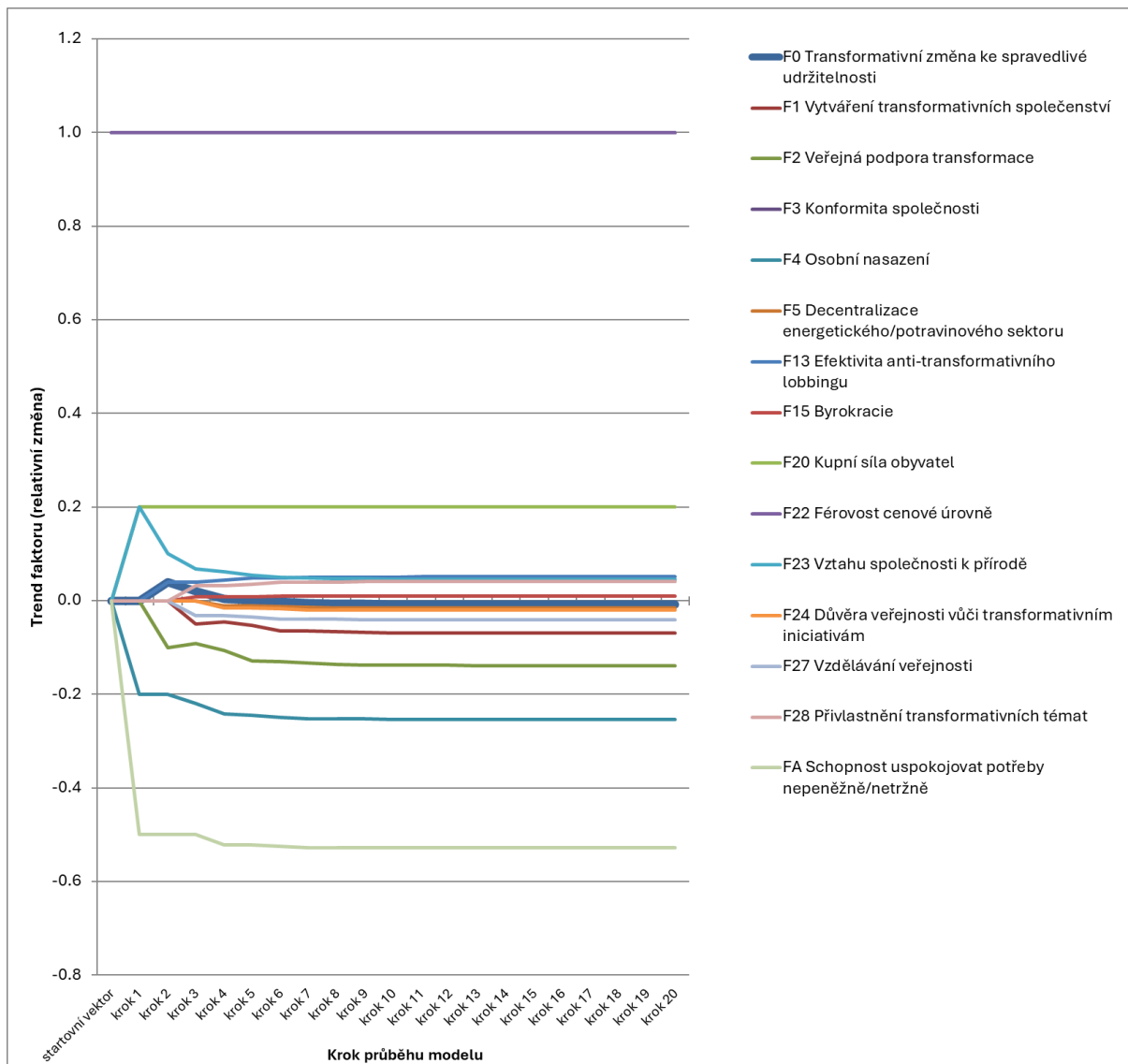


Figure 8. The dynamic output of the basic version of the FCM system map "Food System 1".

If we "turn off" the driving force F3 Actors' conformity (Figure 9), which had a negative effect on the dynamic output, we see that F0 Transformative Change reaches a positive level compared to the baseline graph and settles at +0.04. The factor F20 People's ability to afford sustainably-sourced products remained at the same value (+0.2) and the factor F23 Society's relationship to nature and F0 Transformative change increased from the original value of +0.046 to +0.2. The rest of the factors remain at zero, so there is no change from the initial value.

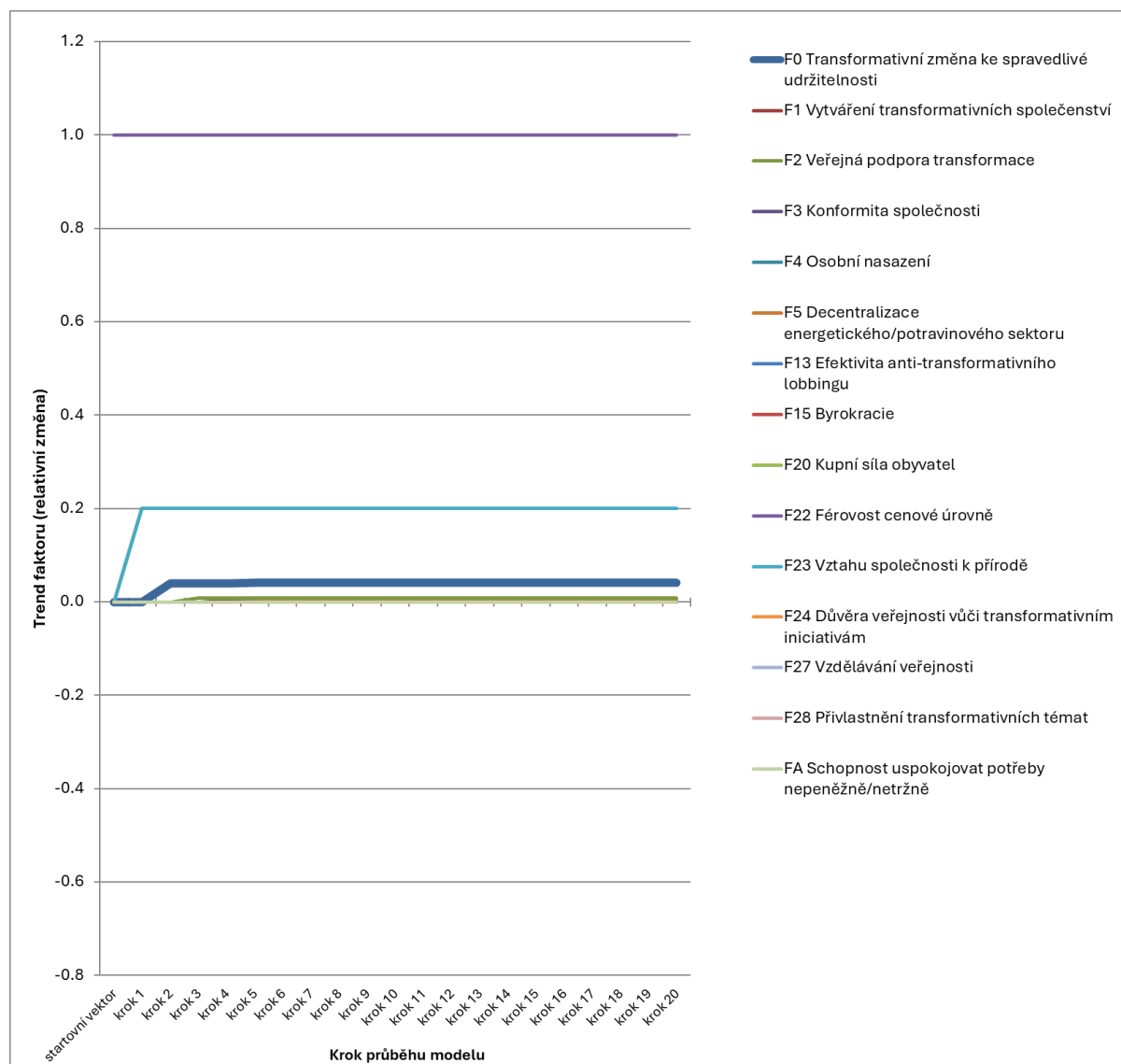


Figure 9. The dynamic output of the FCM version of the system map "Food System 1" with the absence of the driving force F3 Actors' conformity.

Absence of the driving force F22 Fair price levels (Figure 10) shifted the central factor F0 Transformative change from the baseline version of dynamic output (Figure 8) and the version with the driving force turned off F3 Actors' conformity (Figure 9) to a negative level (stabilizing at -0.05), through the following mechanism. While the absence of this driving force caused most of the factors to move to the negative level, the factors F13 Efficiency of anti-transformative lobbying and F28 Cooptation of transformative topics were the only ones that remained at the positive level and which at the same time did not change compared to the baseline version of the dynamic output with both driving forces. This suggests that the absence of F22 Fair price levels prevented the engagement of most of the drivers that could have

reinforced transformative change, while not limiting the drivers that had a negative impact on transformative change. As a result, F0 Transformative Change settled at a negative level, lower compared to the baseline.

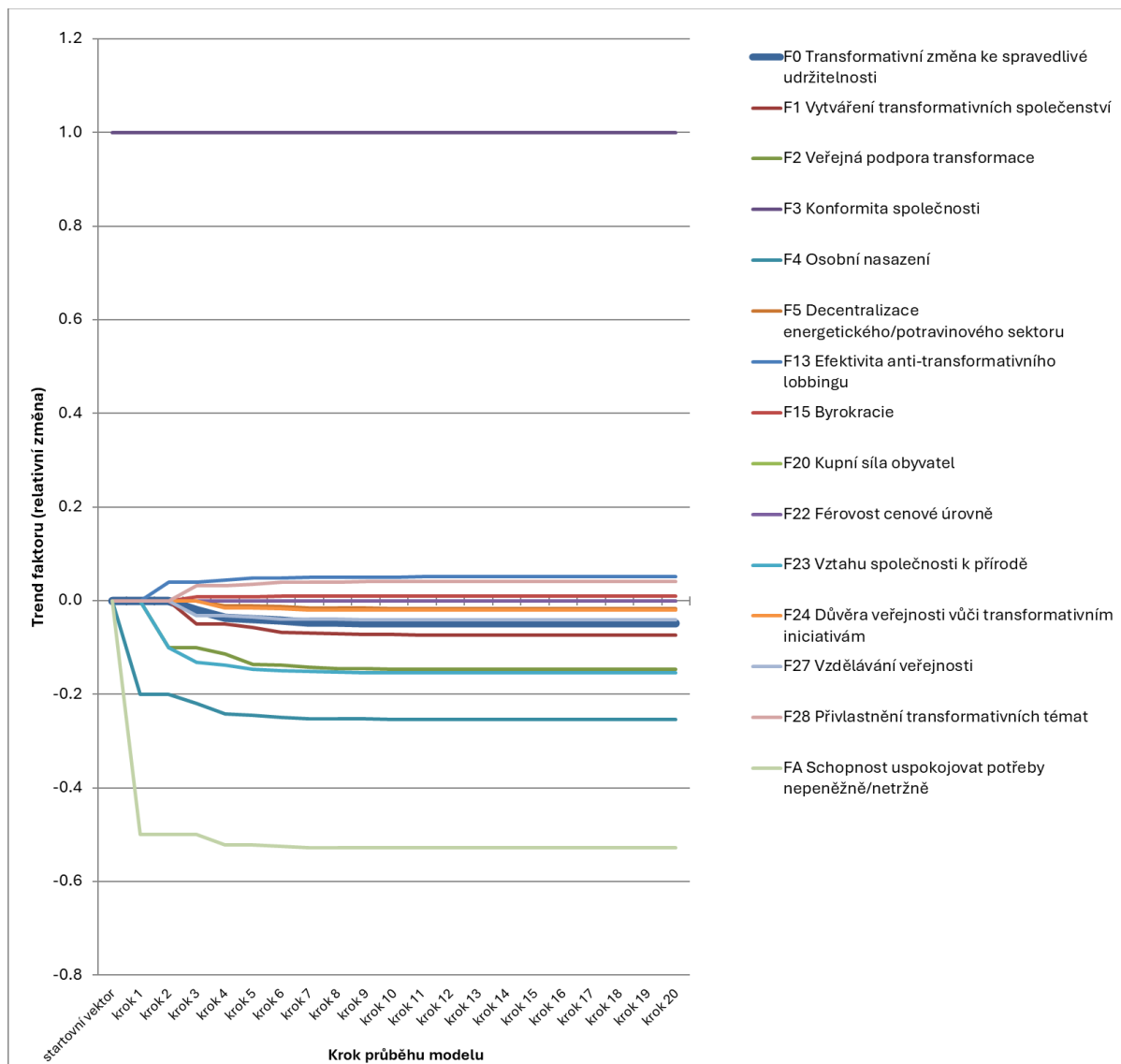


Figure 10. The dynamic output of the FCM version of the system map "Food System 1" with the absence of the driver F22 Fair price levels.

### 3.4.1.5 Summary of the importance of each factor

Table 6 shows the importance of each factor in terms of the different methods of FCM analysis of the system map "Food System 1". Factor *F4 Level of personal enthusiasm/ determination* was significant in terms of all three analytical approaches. Factor *F13 Efficiency of anti-transformative lobbying* was significant in terms of two analytical approaches (centrality and feedback loops).

Other significant factors from the perspective of at least one type of analysis were mainly factors touching on society-wide issues, such as *F3 Actors' conformity*, *F20 People's ability to*

*afford sustainably-sourced products* , *F28 Cooptation of transformative topics*, and *FA Ability to meet needs in a non-money/non-market way*.

This conclusion suggests that transformative change in food systems is strengthened by Level of personal enthusiasm/ determination from the perspective of the Food System 1 group, but is also undermined by the Efficiency of anti-transformative lobbying .

*Table 6 . Most important factors in the "Food system 1" group*

| <b>Factor</b>  | <b>Centrality</b> | <b>Feedback loops</b> | <b>Dynamics</b> |
|--|-------------------|-----------------------|-----------------|
| <b>F3 Actors' conformity</b>                                       | ✓                 |                       |                 |
| <b>F4 Level of personal enthusiasm/ determination</b>              | ✓                 | ✓                     | ✓               |
| <b>F13 Efficiency of anti-transformative lobbying</b>              | ✓                 | ✓                     |                 |
| <b>F20 People's ability to afford sustainably-sourced products</b> |                   |                       | ✓               |
| <b>F28 Cooptation of transformative topics</b>                     |                   | ✓                     |                 |
| <b>FA Ability to meet needs on a non-monetary/non-market basis</b> |                   |                       | ✓               |

### 3.4.2 Group "Food system 2"

#### 3.4.2.1 Basic features of the system map

The "Food System 2" group worked with 19 factors (Table 2), among which it plotted 32 linkages (see version 1 of the final system map, Figure 13). The plotted linkages represent 9% of the total number of all theoretically possible linkages between factors (the so-called density of the system map). This overall model density is indicative of the level of complexity of the system map. This is a standard measure of density (FCM system maps usually have a density between 5-15%), indicating that an optimal amount of links have been included in the system map.

The group focused on mapping the key mechanisms of processes related to transformative change in the food sector. The group viewed these mechanisms as both (a) higher-level pressure from the current mainstream, related to the Efficiency of anti-transformative lobbying (i.e., a higher-level process inhibiting transformative change), and (b) building collaborative and transformative communities, empowering small actors, and decentralizing the food sector (i.e., a lower- or local-level process enhancing transformative change). The overall message suggested that a bottom-up mechanism seeking transformative change in the sector faces a difficult situation, set by a top-down mechanism (Figure 11, Figure 12, Figure 13).

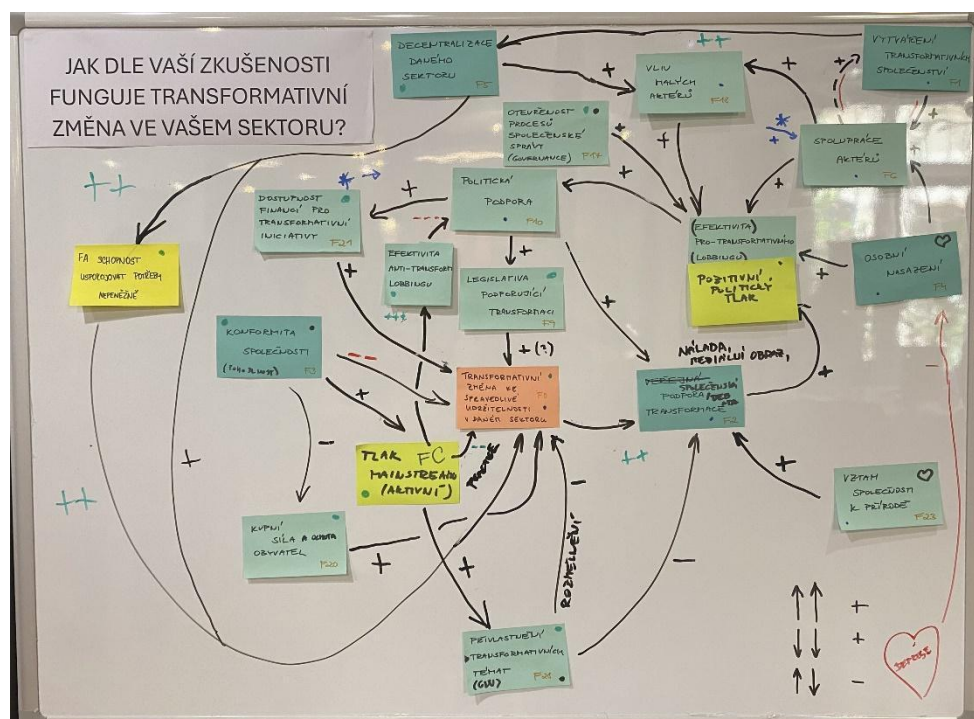


Figure 11. Photo documentation of the system map of the "Food System 2" group, created during the workshop.

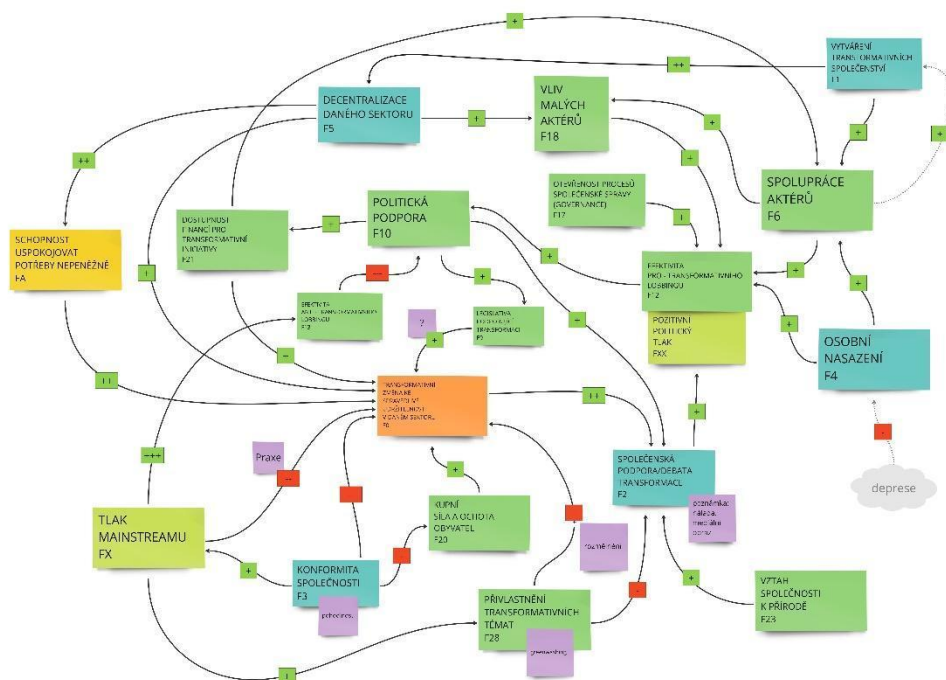


Figure 12. Digitally redrawn version of the system map of the "Food System 2" group (software: Miro). The spatial layout and colours have been kept as close as possible to the original created during the workshop.

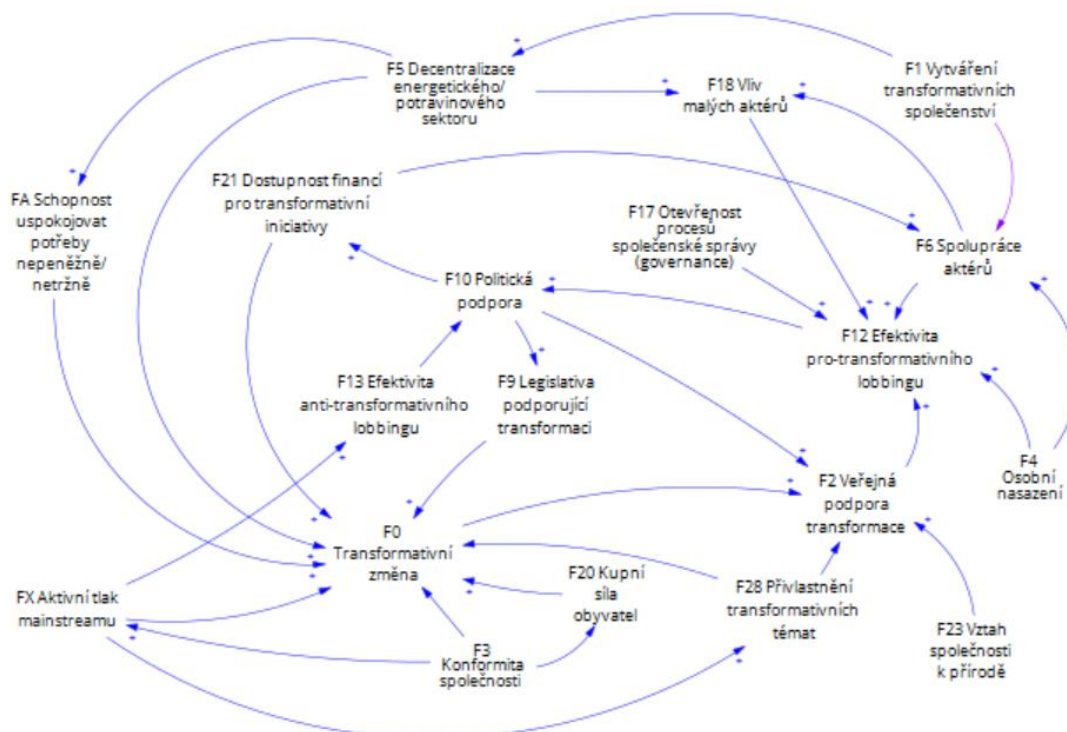


Figure 13. Final adaptation of the system map of the "Food System 2" group, which was further analysed. In purple is the omitted link from the feedback loop F1 Creating transformative communities ↔ F6 Actors' cooperation, see section FCM design (software: Vensim).

### 3.4.2.2 Importance of individual factors: centrality

Table 7 shows the number and aggregate absolute value of each link in the system map of the "Food System 2" group, together with the centrality of each factor in the map. (Centrality quantifies how many incoming and outgoing relationships a given concept in the map has, either expressed as the total number of relationships or as the aggregate absolute value of the strength of all these relationships.)

The most important factors in terms of centrality were:

- *F0 The level of transformative change in the energy/food/land sectors* (9 links with a total value of 3.0): as a central factor and the focus of the discussion, high centrality is to be expected. The factor has significantly more incoming than outgoing links, i.e. it is more influenced by the functioning of the system than it influences it.
- *F3 Actors' conformity* (5 ties with a total value of 2.9): this factor had the most outgoing ties of the whole map and no incoming ties, thus significantly influencing the rest of the model.
- *F1 Creating transformative communities* (4 links with a total value of 2.7): similar case to *F3*.
- *F12 Efficiency of pro-transformative lobbying* (6 ties with a total value of 1.2): this factor had a large number of incoming ties and a minimum of outgoing ties, so it is strongly influenced by the rest of the model and also affects *F0 Transformative change* as a result.

Table 7. Number and aggregate absolute value of individual linkages in the system map of the "Food System 2" group; centrality of individual factors in the map.

| Factor   | Number of incoming links | Number of outgoing links | Centrality (total number of links) | Aggregate absolute value of incoming links | Aggregate absolute value of outgoing links | Centrality (total absolute value of links) |
|--|--------------------------|--------------------------|------------------------------------|--|--|--|
| <b>F0 The level of transformative change in the energy/food/land sectors</b> | 8                        | 1                        | 9                                  | 2,5  | 0,5  | 3,0  |
| <b>F1 Creating transformative communities</b>                                | 1                        | 3                        | 4                                  | 1,0  | 1,7  | 2,7  |
| <b>F2 Public support for transformation</b>                                  | 4                        | 1                        | 5                                  | 1,1  | 0,2  | 1,3  |
| <b>F3 Actors' conformity</b>   | 1                        | 4                        | 5                                  | 1,0  | 1,9  | 2,9  |
| <b>F4 Level of personal enthusiasm/determination</b>                         | 1                        | 3                        | 4                                  | 1,0  | 1,4  | 2,4  |

| Factor   | Number of incoming links | Number of outgoing links | Centrality (total number of links) | Aggregate absolute value of incoming links | Aggregate absolute value of outgoing links | Centrality (total absolute value of links) |
|--|--------------------------|--------------------------|------------------------------------|--|--|--|
| <b>F5 Decentralisation of the energy/food sector</b>               | 1                        | 3                        | 4                                  | 0,5  | 0,9  | 1,4  |
| <b>F6 Actors' cooperation</b>                                      | 3                        | 2                        | 5                                  | 0,6  | 0,4  | 1,0  |
| <b>F9 Legislation supportive of transformation</b>                 | 1                        | 1                        | 2                                  | 0,2  | 0,2  | 0,4  |
| <b>F10 Political support</b>                                       | 2                        | 3                        | 5                                  | 1,0  | 0,6  | 1,6  |
| <b>F12 Efficiency of pro-transformative lobbying</b>               | 5                        | 1                        | 6                                  | 1,0  | 0,2  | 1,2  |
| <b>F13 Efficiency of anti-transformative lobbying</b>              | 1                        | 1                        | 2                                  | 0,8  | 0,8  | 1,6  |
| <b>F17 Openness of governance processes</b>                        | 1                        | 2                        | 3                                  | 1,0  | 1,2  | 2,2  |
| <b>F18 Influence of small actors</b>                               | 2                        | 1                        | 3                                  | 0,4  | 0,2  | 0,6  |
| <b>F20 People's ability to afford sustainably-sourced products</b> | 1                        | 1                        | 2                                  | 0,2  | 0,2  | 0,4  |
| <b>F21 Accessibility of finance for transformative initiatives</b> | 1                        | 2                        | 3                                  | 0,2  | 0,4  | 0,6  |
| <b>F23 Society's relationship to nature</b>                        | 1                        | 2                        | 3                                  | 1,0  | 1,2  | 2,2  |
| <b>F28 Cooptation of transformative topics</b>                     | 1                        | 2                        | 3                                  | 0,2  | 0,4  | 0,6  |
| <b>FA Ability to meet needs on a non-monetary/non-market basis</b> | 1                        | 1                        | 2                                  | 0,5  | 0,5  | 1,0  |
| <b>FX Active mainstream pressure</b>                               | 1                        | 3                        | 4                                  | 0,2  | 1,5  | 1,7  |

### 3.4.2.3 Importance of individual factors: feedback loops

The FCM system map of the "Food System 2" group contained five feedback loops (Table 8). The inclusion of factors in the feedback loops indicates their increased importance in the system map. In all cases, these were reinforcing loops, and in two cases they included the factor *F0 Transformative change*.

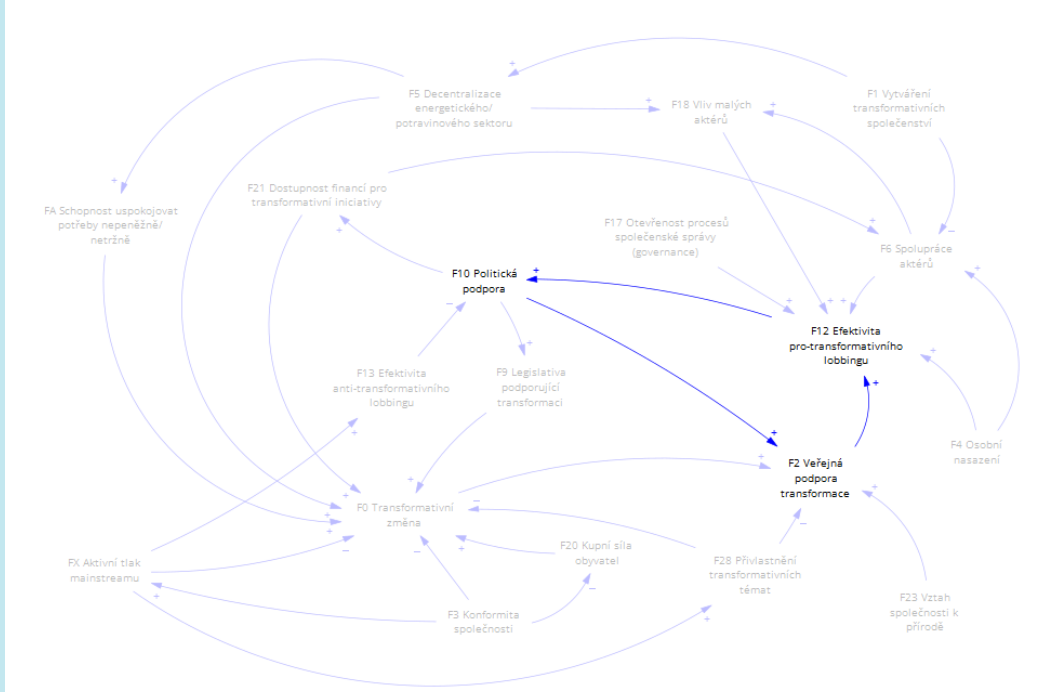
The strongest feedback loop (in terms of multiplying the strengths of the individual links present in the loop) was loop 1: *F2 Public support for transformation* → *F12 Effectiveness of pro-transformation lobbying* → *F10 Political support*.

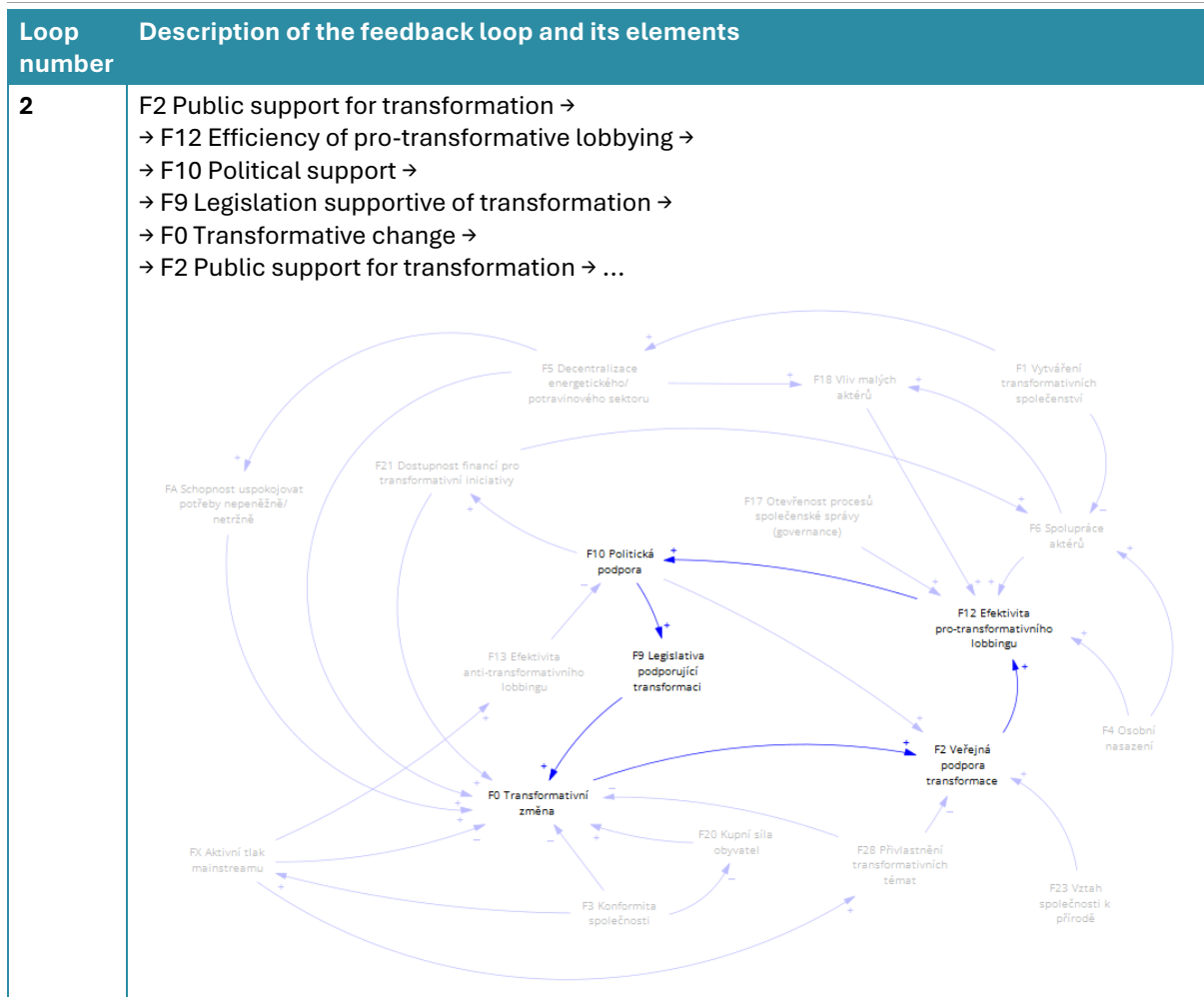
Loop 1, 2 and 3 had the same basis in the form of the elements *F2 Public support for transformation*, *F10 Political support* and *F12 Efficiency of pro-transformative lobbying*, which were complemented in loop 2 by the factors *F9 Legislation supportive of transformation* and *F0 Transformative change*, and in loop 3 by the factors *F21 Accessibility of finance for transformative initiatives* and *F0 Transformative change*. Loops 4 and 5 also included the phenomena of the efficiency of pro-transformative lobbying and political support, but instead

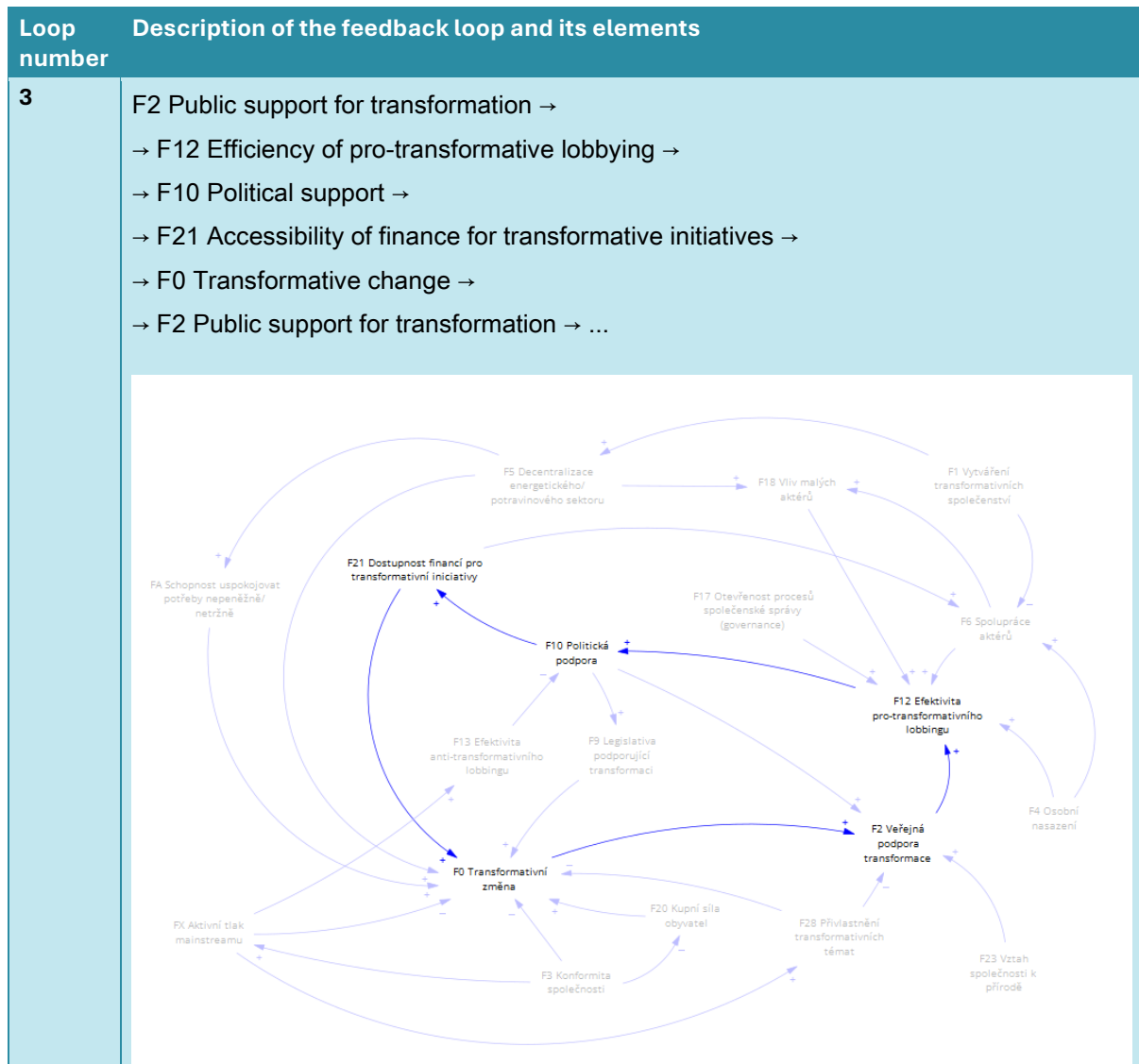
of public support for transformation, they were based on factors *F6 Actors' cooperation* and *F18 Influence of small actors*.

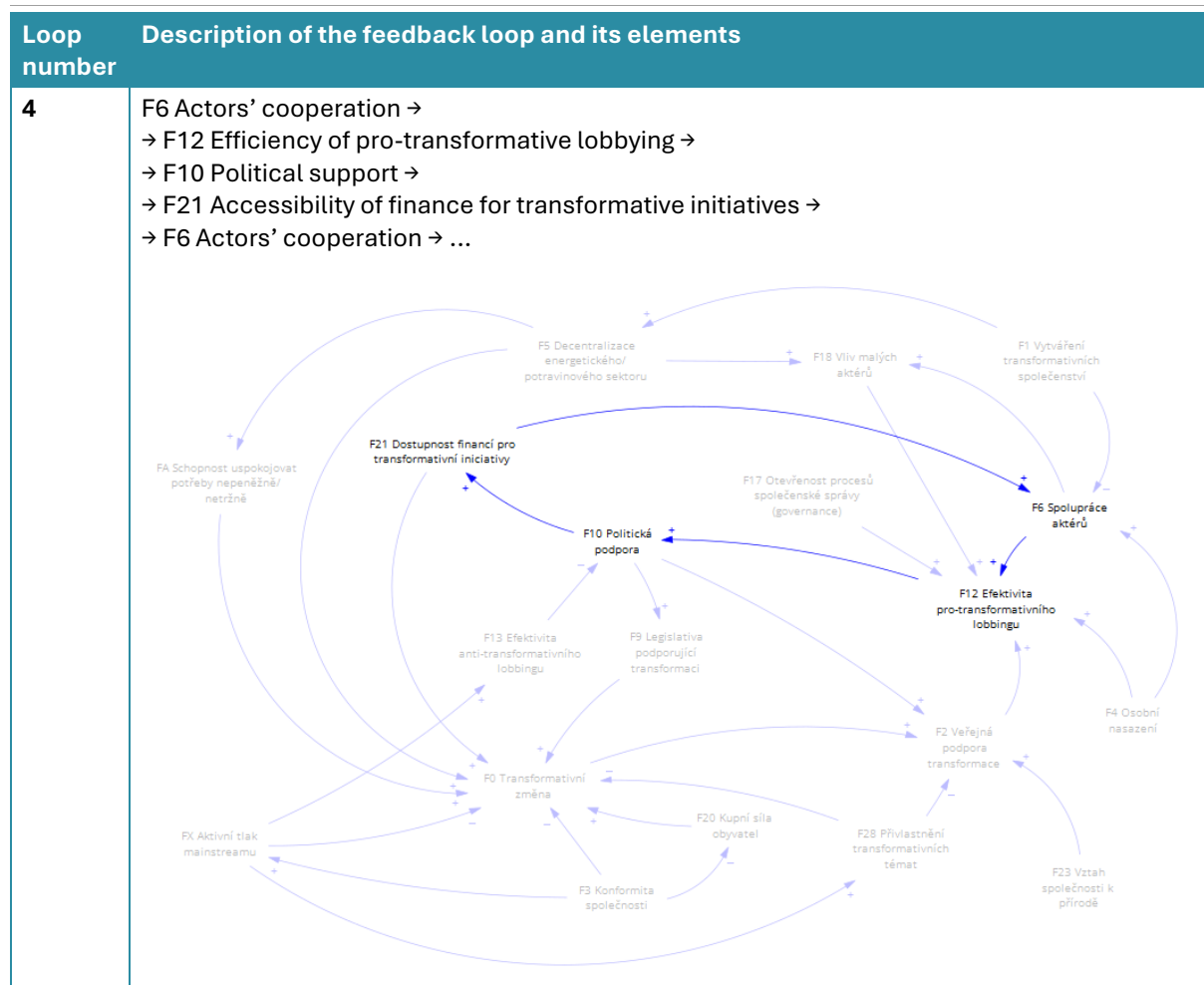
Inclusion of the discussed short feedback loop *F1 Creating transformative communities* ↔ *F6 Actors' cooperation* (Figure 13) did not have a significant effect on the model's behavior and its dynamic output (see below), given that even without the presence of the feedback loop, these were significant factors influencing the model's behavior.

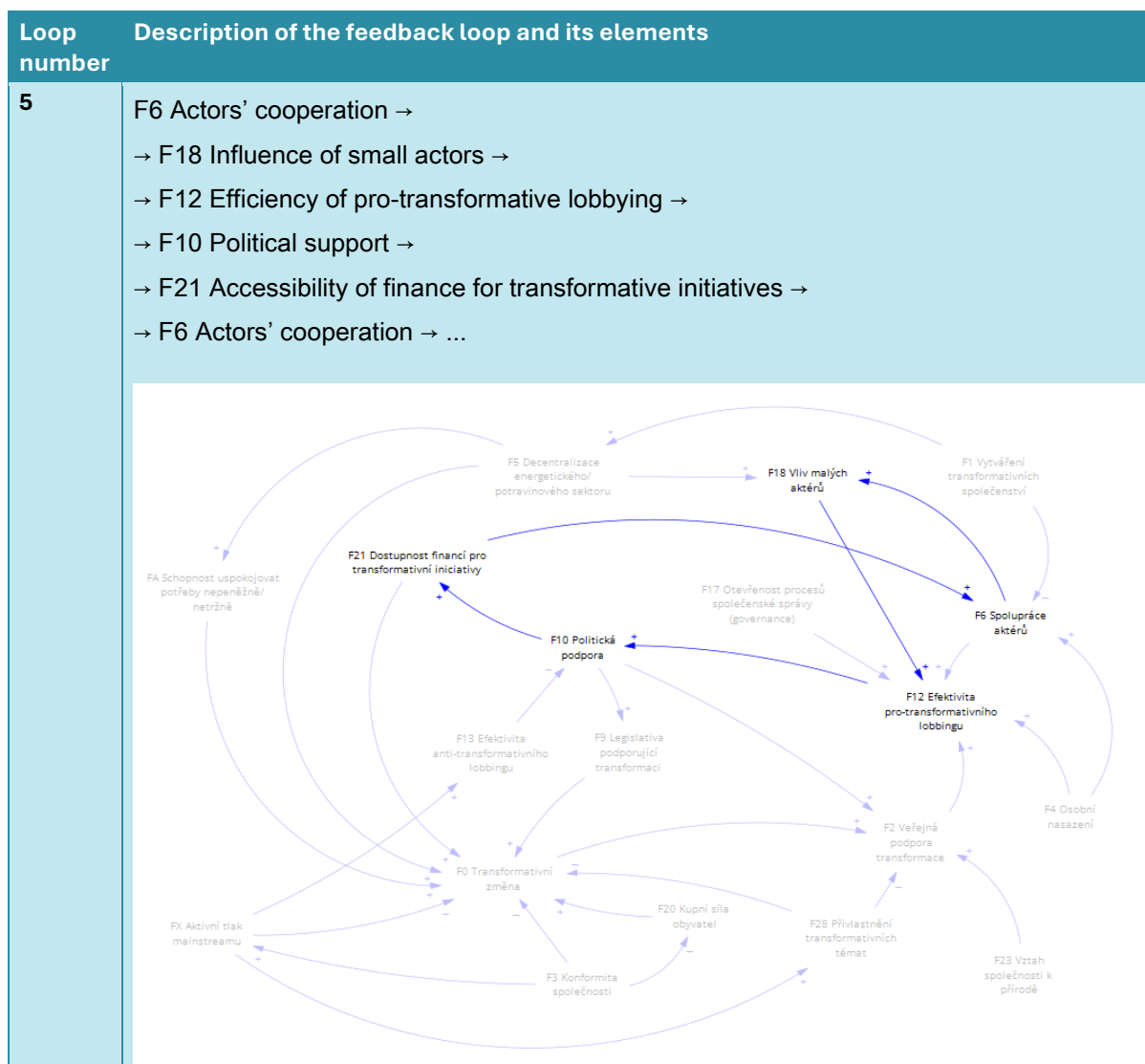
Table 8 . Feedback loops in the system map "Food System 2".

| Loop number | Description of the feedback loop and its elements   |
|-------------|---|
| 1           | <p>F2 Public support for transformation →<br/>                     → F12 Efficiency of pro-transformative lobbying →<br/>                     → F10 Political support →<br/>                     → F2 Public support for transformation → ...</p>  |









### 3.4.2.4 The importance of individual factors: dynamic output and analysis

Figure 14 shows the output of the basic version of the FCM system map of the "Food System 2" group. The basic flow describes a situation in which all the proposed "drivers", i.e. factors that influence the rest of the system in the map but are not themselves influenced by any other factor (here *F1 Creating transformative communities*, *F3 Actors' conformity*, *F4 Level of personal enthusiasm/ determination*, *F17 Openness of social governance processes* and *F23 Society's relationship with nature*) are taken into account ("switched on") in the system map. While most of these drivers have a positive effect on transformative change, *F3 Actors' conformity* affects it negatively. At the same time, however, the strength of influence of each driver varies considerably.

The graph shows that *F0 Transformative change* stabilizes at a negative value (i.e., at a value lower than at the beginning of the simulation), as do *F20 People's ability to afford sustainably-sourced products*, *F2 Public support for transformation*, *F10 Political support*, and *F21 Accessibility of finance for transformative initiatives*. This phenomenon suggests that the level of transformative change does not decrease in the long run, but neither does it increase, i.e. transformative change is difficult to achieve in a given system. The rest of the factors stabilize at

a positive value. Thus, the simulation shows that the driving forces in this system initially cause a decrease in the  $F_0$  factor, but a series of feedback loops reinforcing transformative change balance this trend after some time.

The most influential factors according to the dynamic output of the model are those that have the highest absolute value at which they stabilize. In this case, these are  $F_{12}$  *Efficiency of pro-transformative lobbying* (+0.51),  $F_5$  *Decentralization of the sector* (+0.5) and  $F_6$  *Actors' cooperation* (+0.4) (and on the negative side,  $F_0$  *Transformative change* itself; -0.43). The system is most sensitive to the behaviour of these factors from a dynamic output perspective, and if the final level of stabilisation of  $F_0$  *Transformative change* is to be changed, efforts should be directed toward influencing these factors.

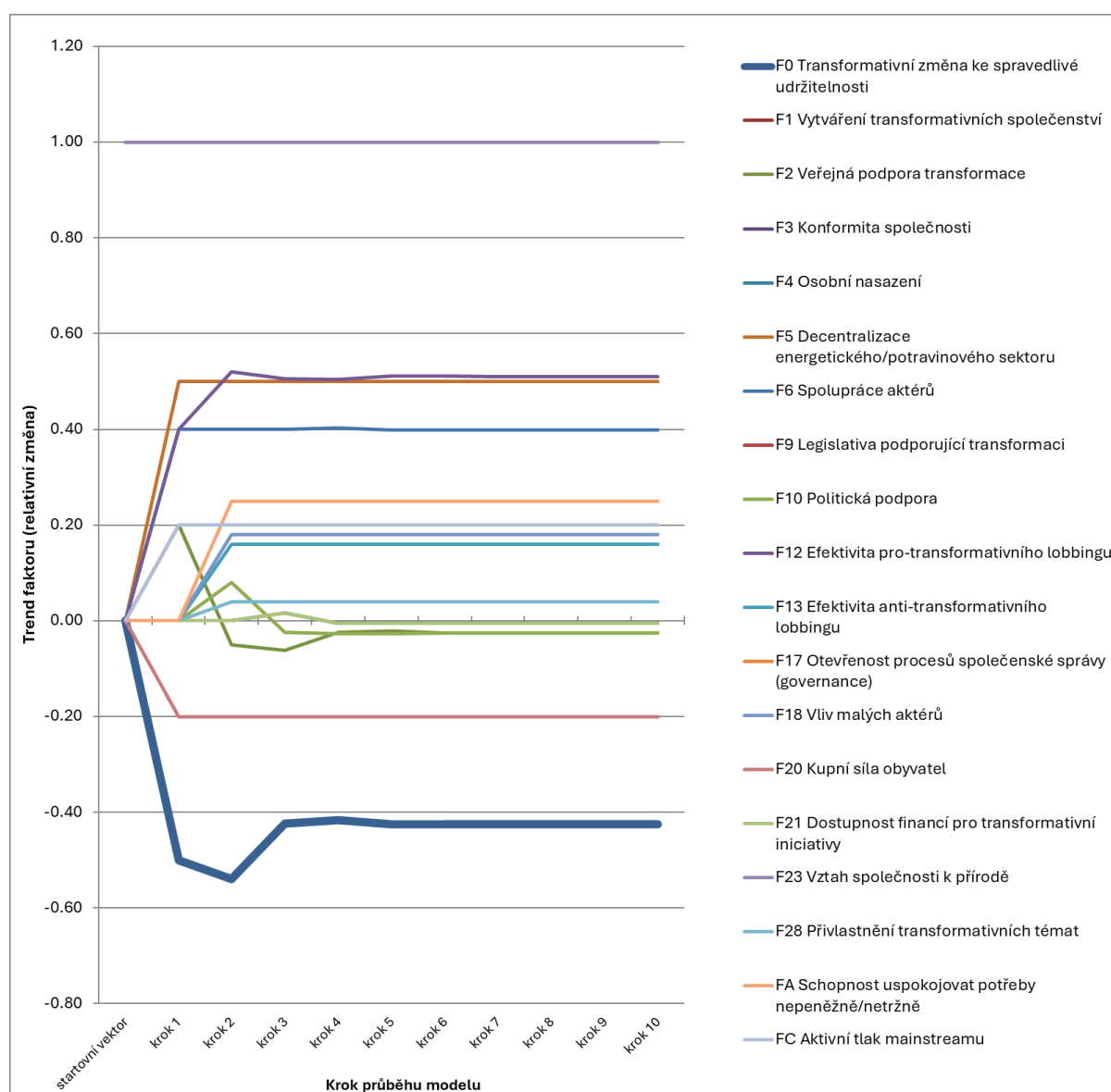


Figure 14. The dynamic output of the basic version of the FCM system map "Food System 2".

Absence of driving force  $F_1$  *Creation of transformative communities* leads to a further decline in the resulting stabilisation level of  $F_0$  *Transformative change* (Figure 15). This suggests that in a

given system, the level of transformative change would be further weakened without the role of transformative communities. The opposite effect is the "switching off" of the driving force *F3 Actors' conformity*, which results in the growth of *F5 Decentralization of the energy/food sector*, *F6 Actors' cooperation*, and *F12 Efficiency of pro-transformative lobbying*, and as a consequence the stabilization of *F0 Transformative change* at a positive level (i.e. at a value higher than at the beginning of the simulation) (Figure 14).

Experimental "switching off" of the role of drivers *F4 Level of personal enthusiasm/determination*, *F17 Openness of social governance processes* and *F23 Society's relationship with nature* from the course of the dynamic output shows that the absence of these factors does not change the negative level of the final stabilization of *F0 Transformative change* (we do not include the resulting graphs - the trend of *F0* in them is identical to the original graph; Figure 14). The reason for this is that none of these factors is significantly related to the rest of the system.

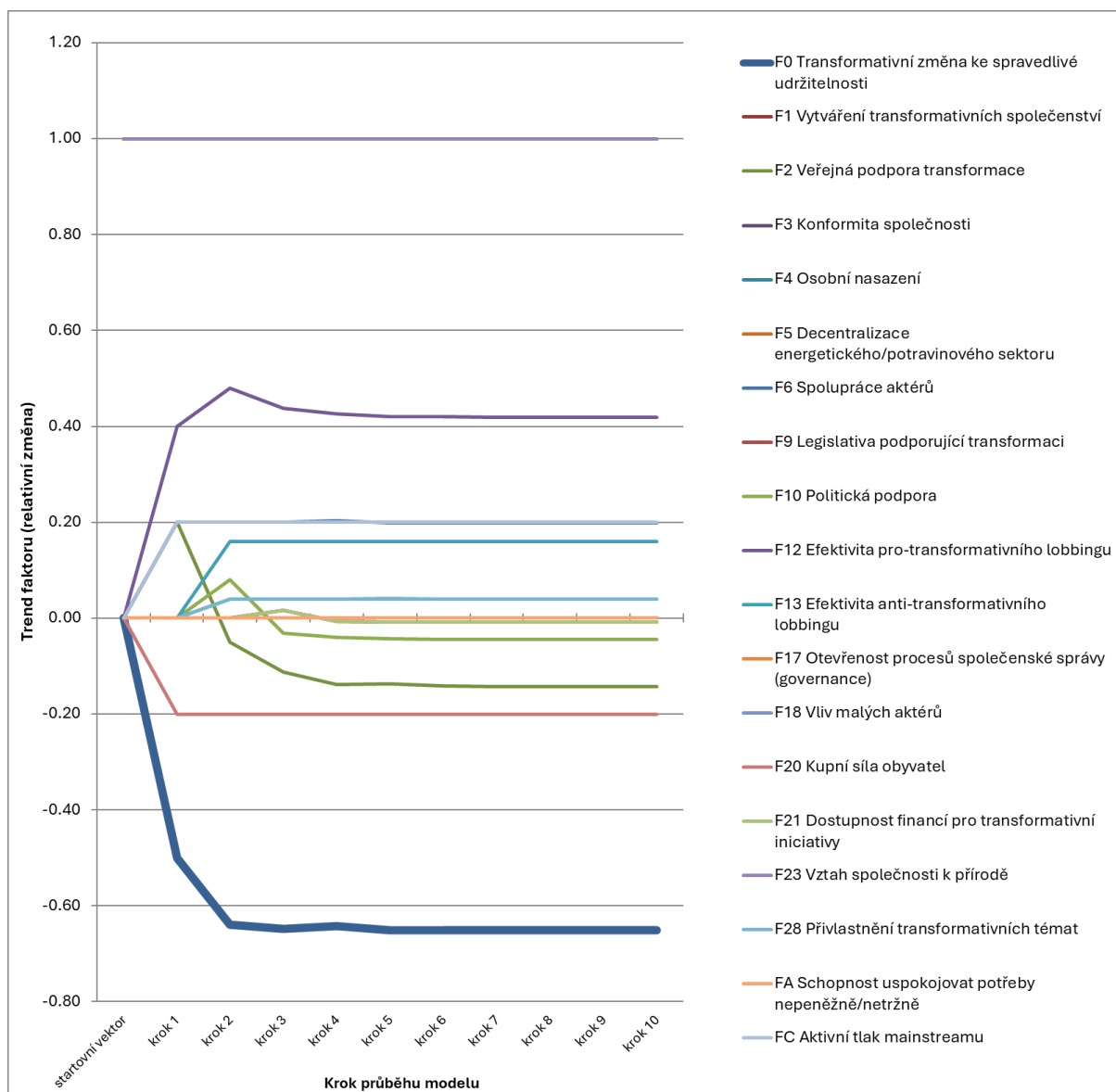


Figure 15. The dynamic output of the FCM version of the system map "Food System 2" with the absence of the F1 driver Creation of transformative communities.

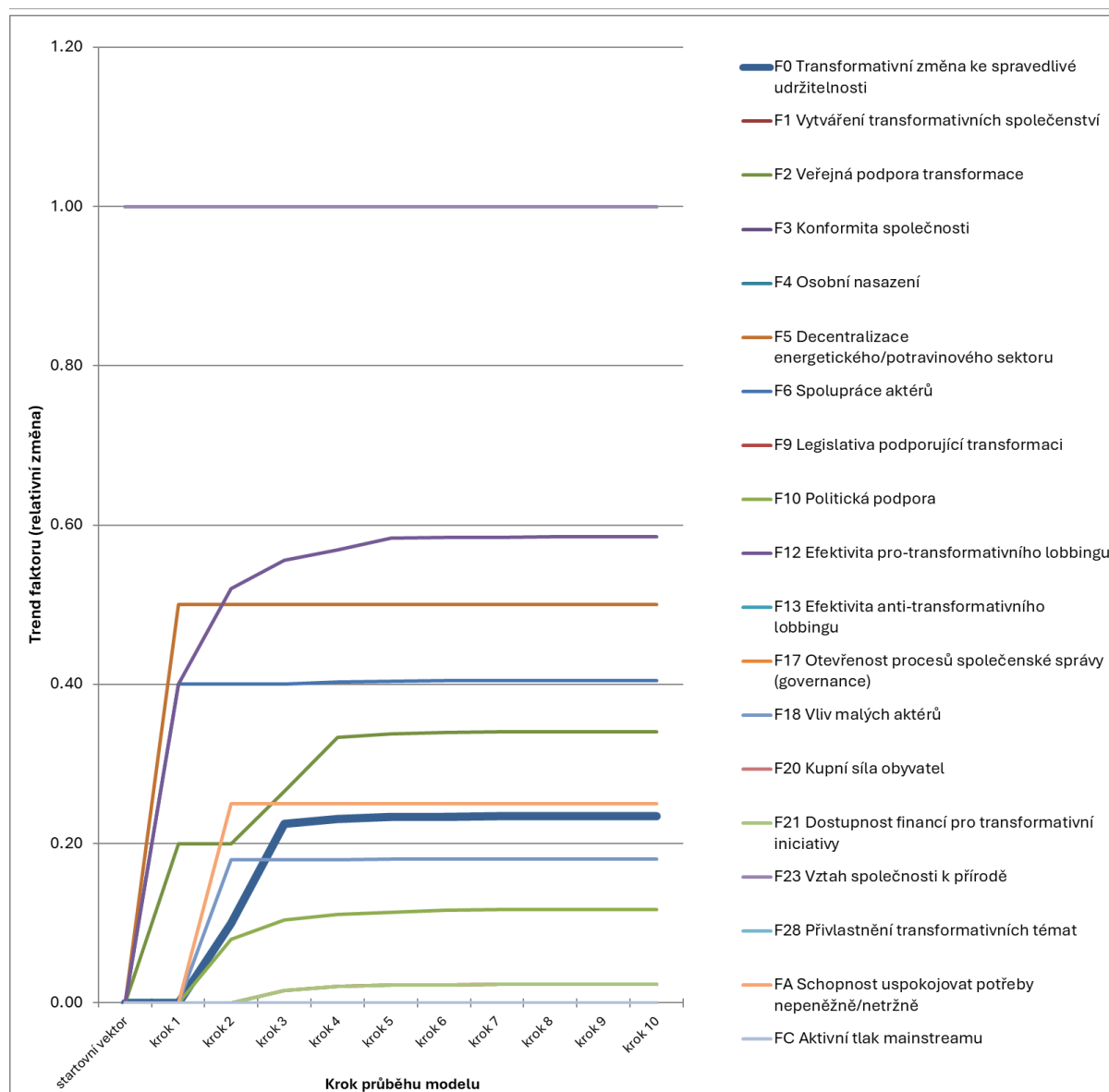


Figure 16. The dynamic output of the FCM version of the system map "Food System 2" with the absence of the driver F3 Actors' conformity.

### 3.4.2.5 Summary of the importance of each factor

Table 9 shows the importance of each factor in terms of the different methods of FCM analysis of the system map "Food System 2". In terms of all three types of analysis, a single factor, *F12 Efficiency of pro-transformative lobbying*, was the most significant.

Other significant factors from the perspective of at least one type of analysis included both phenomena emanating from the broader society, such as *F1 Creation of transformative communities*, *F2 Public support for transformation*, *F3 Actors' conformity* or *F6 Actors' cooperation*, and phenomena related to systemic or political functioning, such as *F5 Decentralization of the sector* and *F10 Political support*.

This conclusion suggests that transformative change in food systems, from the perspective of the Food System 2 group, is the result of opposing dynamics, where transformative change is

fostered by collaboration, the creation of transformative communities, and pro-transformative lobbying, and in contrast is slowed or blocked by societal conformity.

*Table 9. The most important factors in the "Food System 2" group*

| <b>Factor</b>  | <b>Centrality</b> | <b>Feedback loops</b> | <b>Dynamics</b> |
|--|-------------------|-----------------------|-----------------|
| <b>F1 Creation of transformative communities</b>     | ✓                 |                       |                 |
| <b>F2 Public support for transformation</b>          |                   | ✓                     |                 |
| <b>F3 Actors' conformity</b>                         | ✓                 |                       |                 |
| <b>F5 Decentralisation of the sector</b>             |                   |                       | ✓               |
| <b>F6 Actors' cooperation</b>                        |                   |                       | ✓               |
| <b>F10 Political support</b>                         |                   | ✓                     |                 |
| <b>F12 Efficiency of pro-transformative lobbying</b> | ✓                 | ✓                     | ✓               |

### 3.4.3 Group "Energy"

#### 3.4.3.1 Basic features of the system map

The "Energy" group worked with 19 factors (Table 2), among which it drew 40 links (see the first version of the final version of the system map, Figure 18). After removing duplicate links, the map contained 35 links (see the second version of the final edit of the system map, Figure 19). The plotted linkages represent 12% (or 10%) of the total number of all theoretically possible linkages between factors (the so-called density of the system map). This overall model density is indicative of the level of complexity of the system map. This is a standard density measure (FCM system maps usually have a density between 5-15%), indicating that an optimal number of links have been included in the system map.

The group mapped the mechanisms of the ongoing transformation in the energy sector towards sustainability (see Figure 17, Figure 18, Figure 19). Compared to the other two groups, there was a clear consensus that transformative change in this sector is already underway, thanks in particular to the long-standing pressure from the European Union to implement the community energy concept into Czech legislation as well as the energy crisis, which has subsequently accelerated this implementation significantly. The FCM map was dominated by the influence of top-down factors that enable decentralisation and transformation of the energy sector, while highlighting the crucial influence of Czech legislation. At the same time, the group stressed the presence of two opposing parallel systems created by lobbying - the influence of pro-transformative lobbying leading to political support for transformative change, and conversely the influence of anti-transformative lobbying blocking this support. Among the bottom-up factors, the group highlighted the power of small actors enabling decentralisation of the energy sector or the actors' conformity blocking transformative change in the sector.

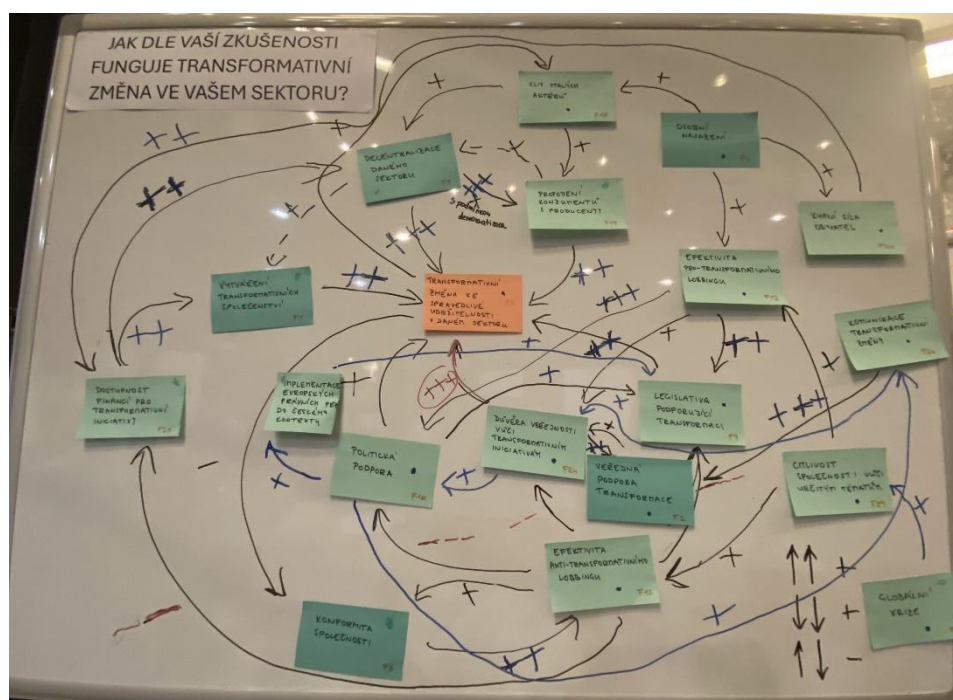


Figure 17. Photo documentation of the system map of the "Energy" group, created during the workshop.

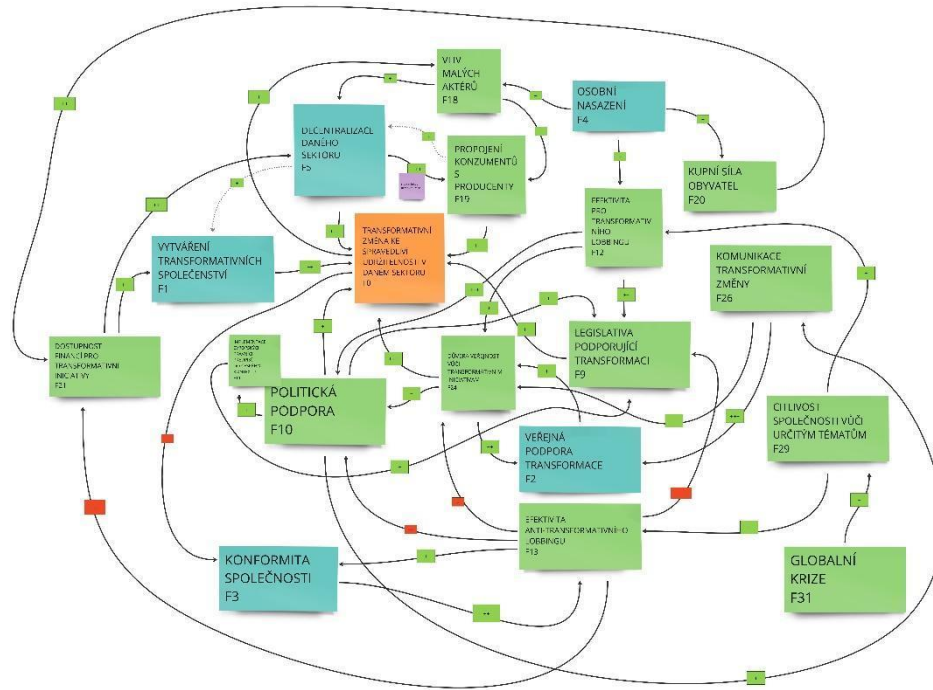


Figure 18. Digitally redrawn version of the system map of the "Energy" group (software: Miro). The spatial layout and colours have been kept as close as possible to the original created during the workshop.

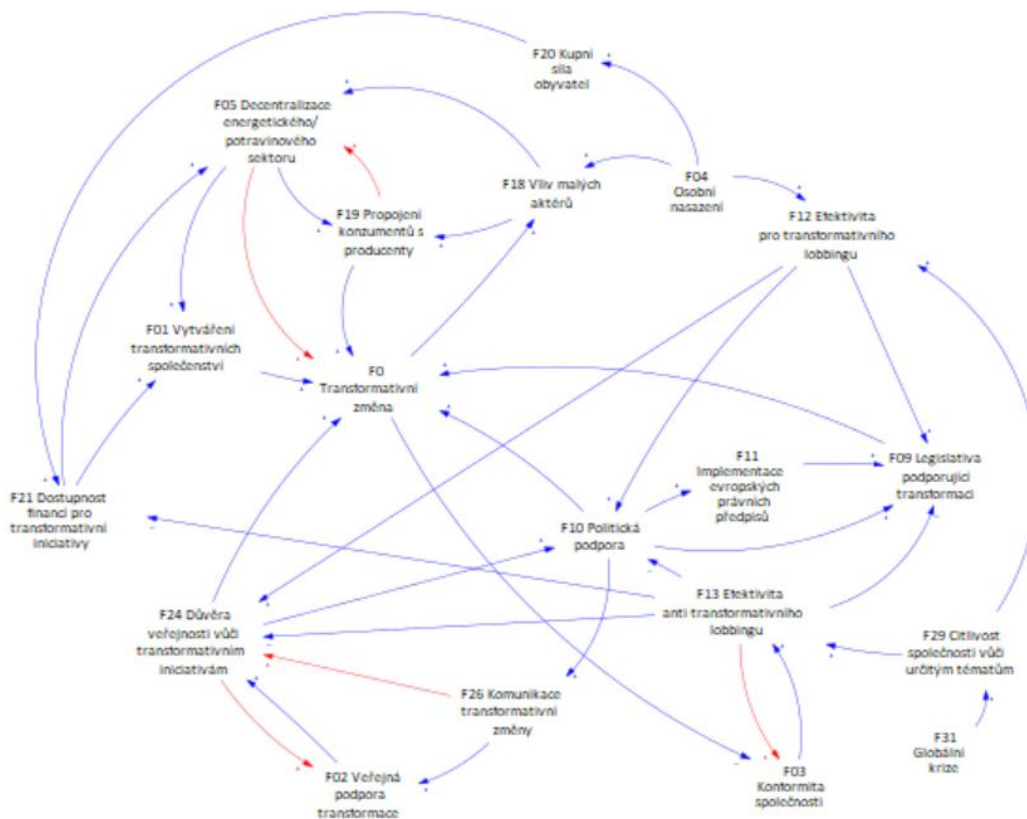


Figure 19. Final modification of the system map of the "Energy" group with removed duplicate links (marked in red; see section FCM design), which was further analysed (software: Vensim).

### 3.4.3.2 Importance of individual factors: centrality

Table 10 shows the number and aggregate absolute value of each link in the system map of the "Energy" group, together with the centrality of each factor in the map. (Centrality quantifies how many incoming and outgoing relationships a given concept in the map has, either expressed as the total number of relationships or as the aggregate absolute value of the strength of all these relationships.)

The most important factors in terms of centrality were:

- *F0 The level of transformative change in the energy/food/land sectors* (7 links with a total value of 2.9): as a central factor and the focus of the discussion, high centrality is to be expected. The factor has significantly more incoming than outgoing links, i.e. it is more influenced by the functioning of the system than it influences it.
- *F4 Level of personal enthusiasm/ determination* (5 links with a total value of 2.6): this factor had more outgoing than incoming links, thus influencing the rest of the model considerably.
- *F10 Political support* (7 links with a total value of 2.6): this factor again had more incoming than outgoing links.
- *F13 Efficiency of anti-transformative lobbying* (6 links with a total value of 3.3): this factor had the most outgoing links of the entire map and fewer incoming links, thus significantly influencing the rest of the model.

Table 10. Number and aggregate absolute value of individual links in the system map of the "Energy" group with duplicate links removed; centrality of individual factors in the map.

| Factor   | Number of incoming links | Number of outgoing links | Centrality (total number of links) | Aggregate absolute value of incoming links | Aggregate absolute value of outgoing links | Centrality (total absolute value of links) |
|--|--------------------------|--------------------------|------------------------------------|--|--|--|
| <b>F0 The level of transformative change in the energy/food/land sectors</b> | 5                        | 2                        | 7                                  | 2,5  | 0,4  | 2,9  |
| <b>F1 Creating transformative communities</b>                                | 2                        | 1                        | 3                                  | 0,7  | 0,5  | 1,2  |
| <b>F2 Public support for transformation</b>                                  | 1                        | 1                        | 2                                  | 0,8  | 0,2  | 1,0  |
| <b>F3 Actors' conformity</b>   | 1                        | 1                        | 2                                  | 0,2  | 0,5  | 0,7  |
| <b>F4 Level of personal enthusiasm/ determination</b>                        | 1                        | 4                        | 5                                  | 1,0  | 1,6  | 2,6  |
| <b>F5 Decentralisation of the energy/food sector</b>                         | 2                        | 2                        | 4                                  | 0,7  | 1,0  | 1,7  |
| <b>F9 Legislation supportive of transformation</b>                           | 4                        | 1                        | 5                                  | 1,7  | 0,5  | 2,2  |
| <b>F10 Political support</b>   | 3                        | 4                        | 7                                  | 1,8  | 0,8  | 2,6  |

| Factor   | Number of incoming links | Number of outgoing links | Centrality (total number of links) | Aggregate absolute value of incoming links | Aggregate absolute value of outgoing links | Centrality (total absolute value of links) |
|--|--------------------------|--------------------------|------------------------------------|--|--|--|
| <b>F11 Implementation of EU policies</b>                           | 1                        | 1                        | 2                                  | 0,2  | 0,2  | 0,4  |
| <b>F12 Efficiency of pro-transformative lobbying</b>               | 2                        | 3                        | 5                                  | 0,4  | 1,5  | 1,9  |
| <b>F13 Efficiency of anti-transformative lobbying</b>              | 2                        | 4                        | 6                                  | 0,7  | 2,6  | 3,3  |
| <b>F18 Influence of small actors</b>                               | 2                        | 2                        | 4                                  | 0,4  | 0,4  | 0,8  |
| <b>F19 Linking producers with consumers</b>                        | 2                        | 1                        | 3                                  | 1,0  | 0,5  | 1,5  |
| <b>F20 People's ability to afford sustainably-sourced products</b> | 1                        | 1                        | 2                                  | 0,2  | 0,5  | 0,7  |
| <b>F21 Accessibility of finance for transformative initiatives</b> | 2                        | 2                        | 4                                  | 1,0  | 1,0  | 2,0  |
| <b>F24 Public's trust in transformative initiatives</b>            | 3                        | 2                        | 5                                  | 0,9  | 1,0  | 1,9  |
| <b>F26 Communication of transformative change</b>                  | 1                        | 1                        | 2                                  | 0,2  | 0,8  | 1,0  |
| <b>F29 Sensitivity to certain topics and terms</b>                 | 1                        | 2                        | 3                                  | 0,2  | 0,4  | 0,6  |
| <b>F31 Global crises</b>   | 1                        | 2                        | 3                                  | 1,0  | 1,2  | 2,2  |

### 3.4.3.3 Importance of individual factors: feedback loops

The FCM system map of the "Energy" group contained 16 feedback loops (Table 11), two of which were of equivalent strength. The inclusion of factors in feedback loops indicates their increased importance in the system map. In most cases, these were reinforcing loops, and in all cases the F0 Transformative change factor was included.

The first strongest feedback loop (in terms of multiplying the strengths of the individual links present in the loop) was loop 5: F0 Transformative change → F03 Actors' conformity → F13 Efficiency of anti-transformative lobbying → F24 Public trust in transformative initiatives. The second strongest feedback loop was loop 7: F0 Transformative change → F03 Actors' conformity → F13 Efficiency of anti-transformative lobbying → F09 Legislation supportive of transformation.

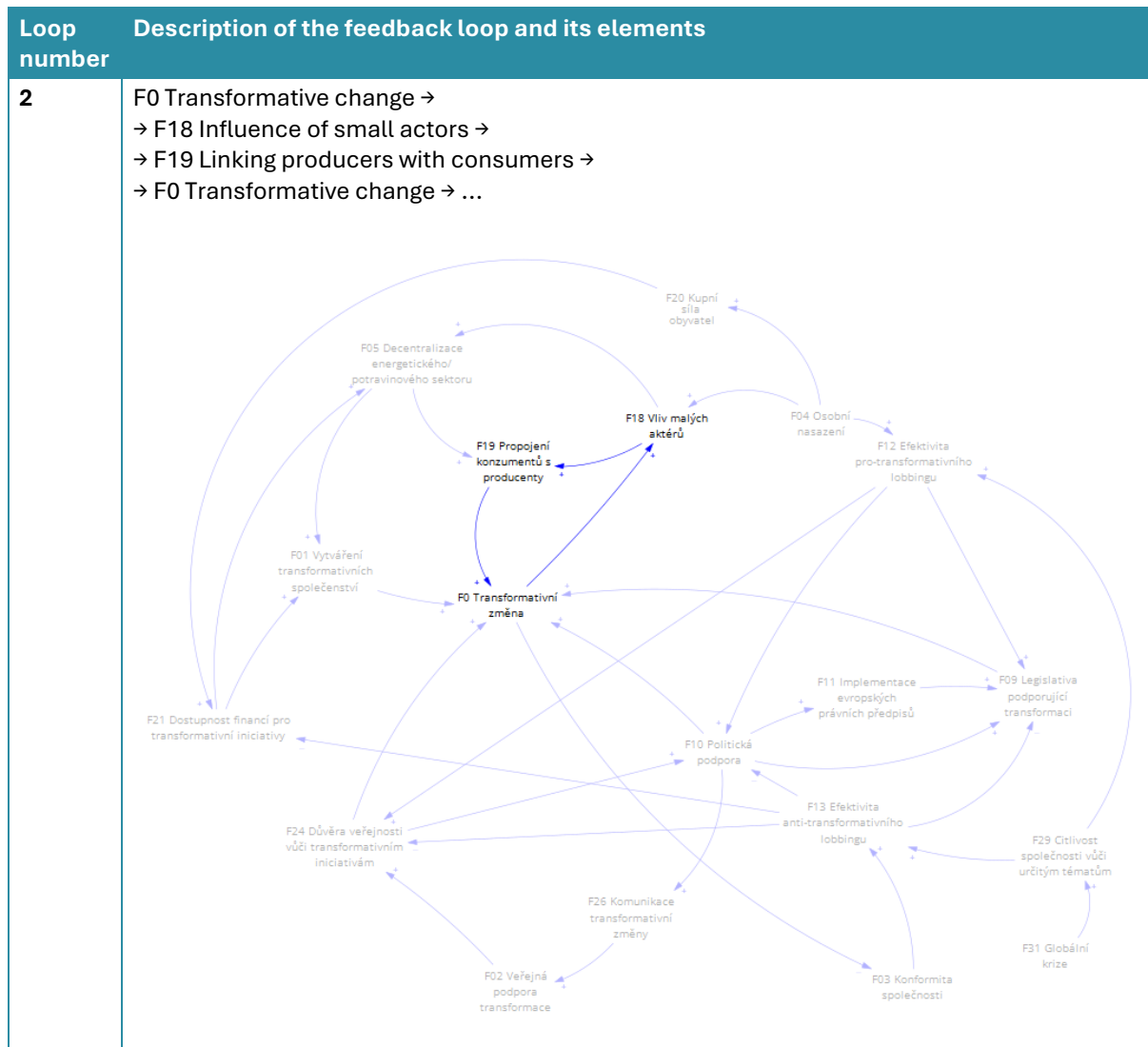
Loop 5 and 7 had the same basis in the form of elements *F0 Transformative change*, *F03 Actors' conformity*, and *F13 Efficiency of anti-transformative lobbying*. These factors were also common to all subsequent loops (8-16), including Loop 6. Other common factors in the feedback loops included *F9 Legislation supportive of transformation*, *F10 Political support*, *F18 Influence of small actors*, and *F24 Public trust towards transformative initiatives*.

Inclusion of discussed short feedback loop *F1 Creating transformative communities* ↔ *F6 Actors' cooperation* did not have a significant effect on the model's behavior and its dynamic

output (see below), given that even without the presence of the feedback loop these were significant factors influencing the model's behavior.

Table 11. Feedback loops in the system map "Energy" with duplicate links removed.

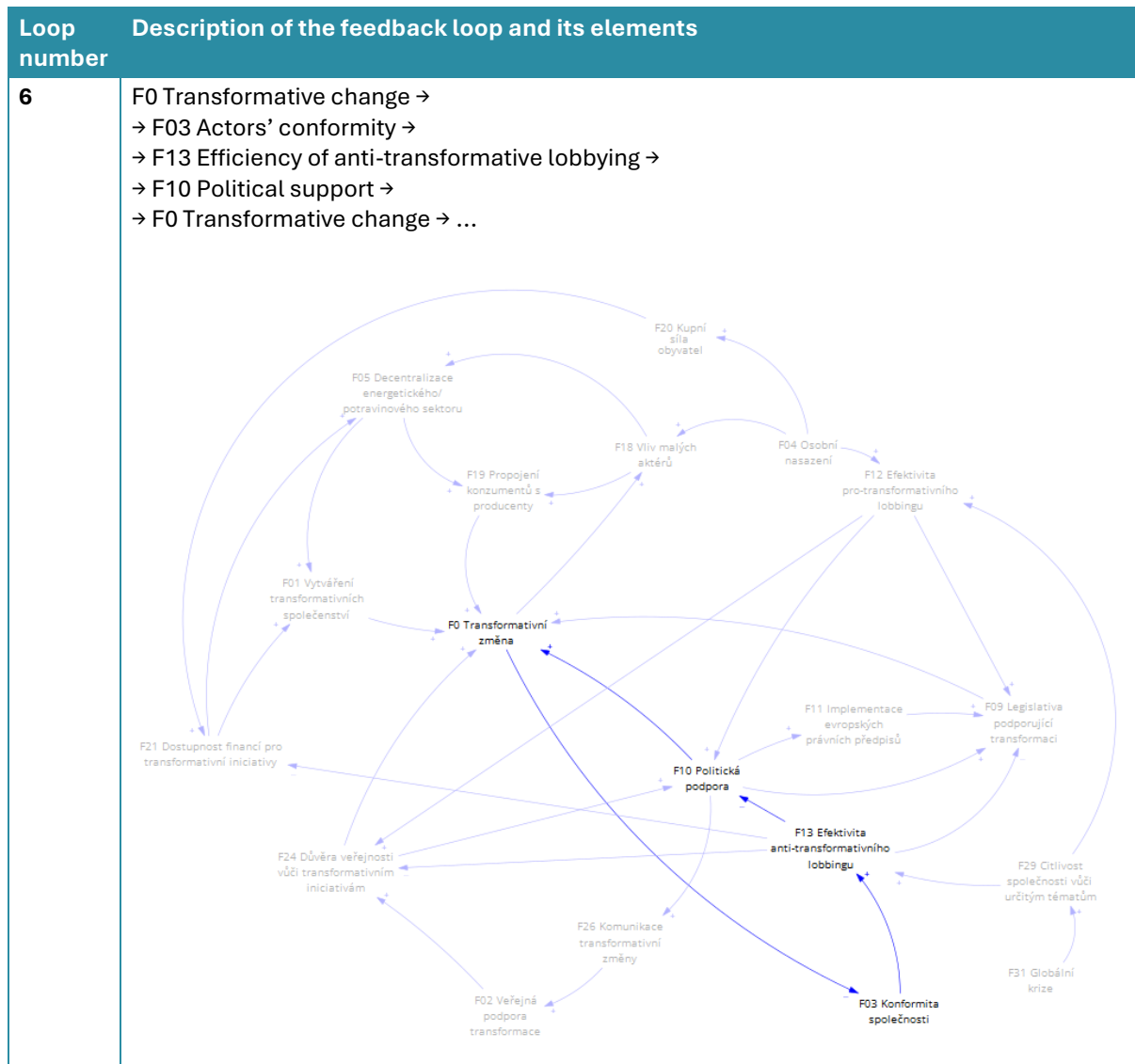
| Loop number | Description of the feedback loop and its elements  |
|-------------|--|
| 1           | <p>F02 Public support for transformation →<br/>                     → F24 Public trust in transformative initiatives →<br/>                     → F10 Political support →<br/>                     → F26 Communication of transformative change →<br/>                     → F02 Public support for transformation → ...</p> |
|             |  |



| Loop number | Description of the feedback loop and its elements   |
|-------------|---|
| 3           | <p>F0 Transformative change →<br/>                     → F18 Influence of small actors →<br/>                     → F05 Decentralisation of the energy/food sector →<br/>                     → F19 Linking producers with consumers →<br/>                     → F0 Transformative change →...</p> |

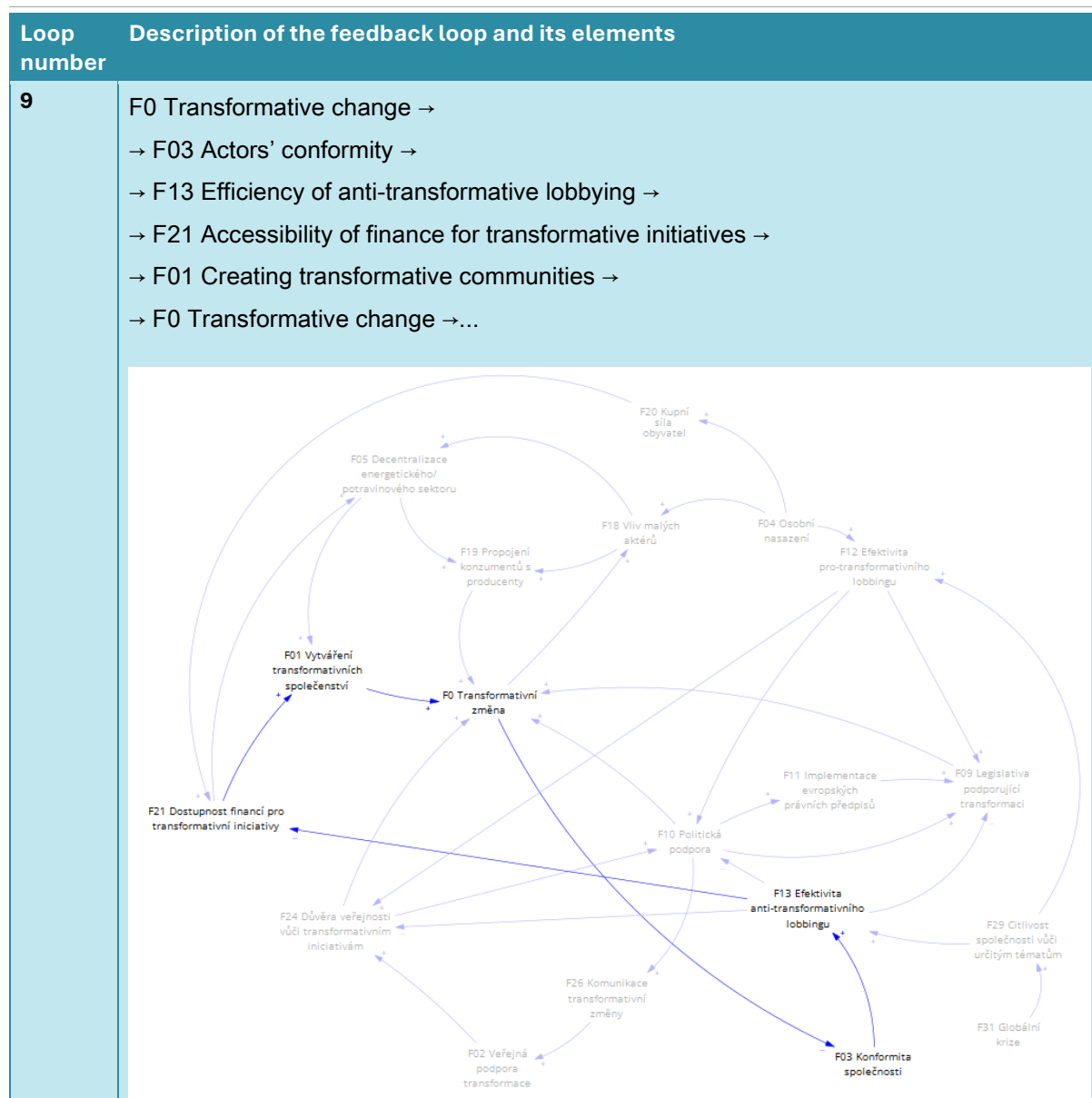


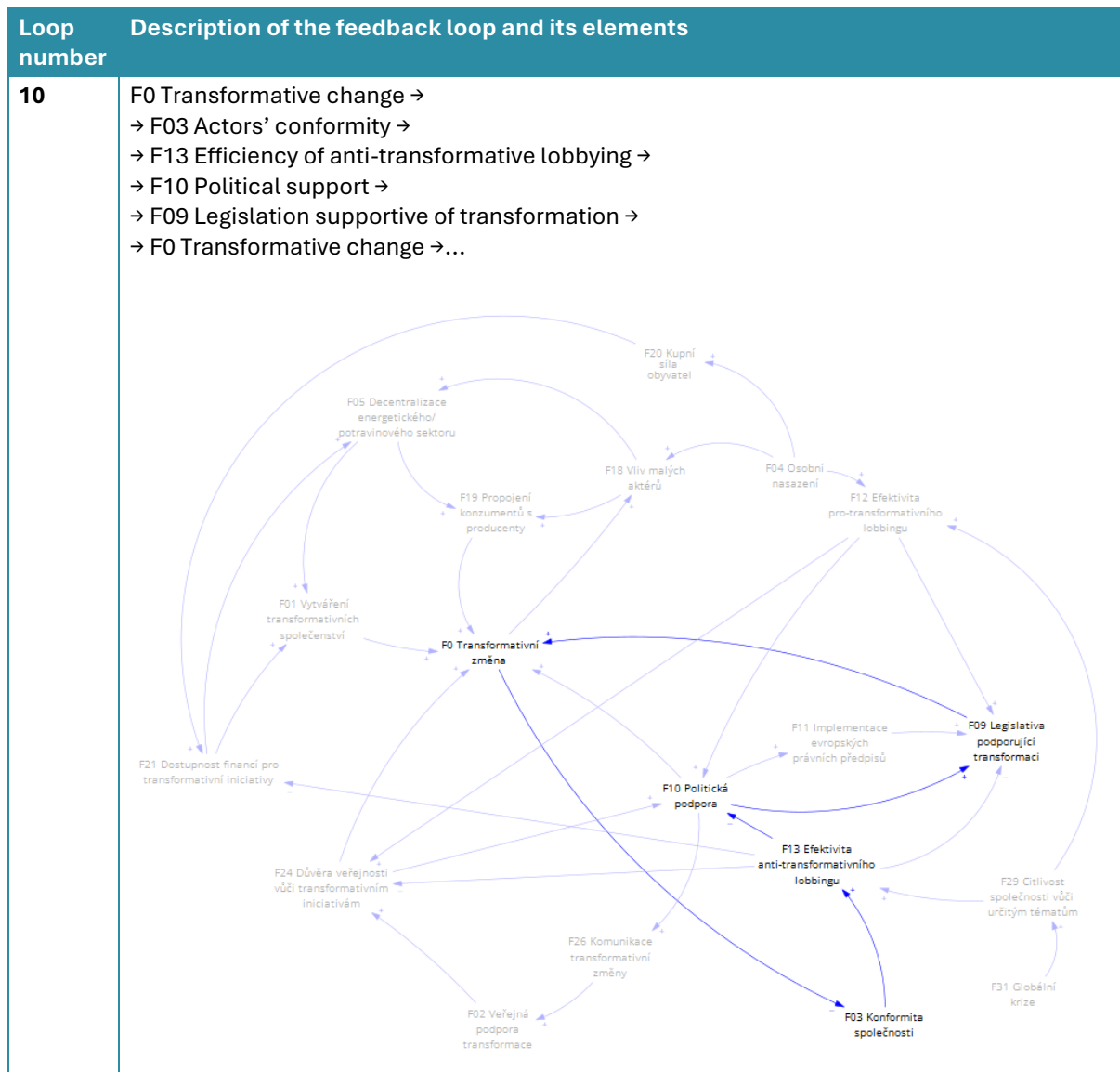
| Loop number | Description of the feedback loop and its elements   |
|-------------|---|
| 5           | <p>F0 Transformative change →<br/>                     → F03 Actors' conformity →<br/>                     → F13 Efficiency of anti-transformative lobbying →<br/>                     → F24 Public trust in transformative initiatives →<br/>                     → F0 Transformative change → ...</p> |



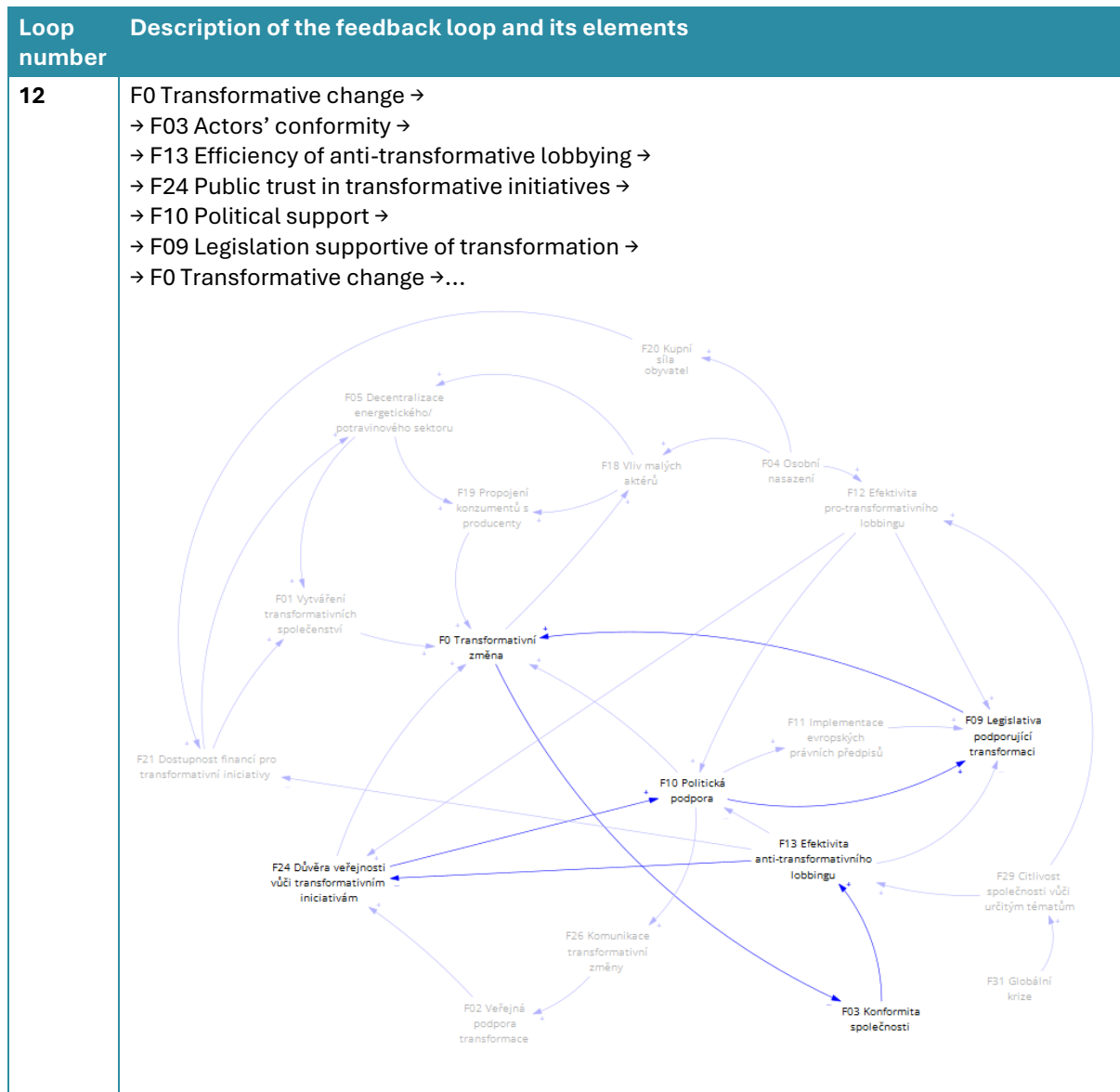
| Loop number | Description of the feedback loop and its elements  |
|-------------|--|
| 7           | <p>F0 Transformative change →<br/>                     → F03 Actors' conformity →<br/>                     → F13 Efficiency of anti-transformative lobbying →<br/>                     → F09 Legislation supportive of transformation →<br/>                     → F0 Transformative change →...</p> |



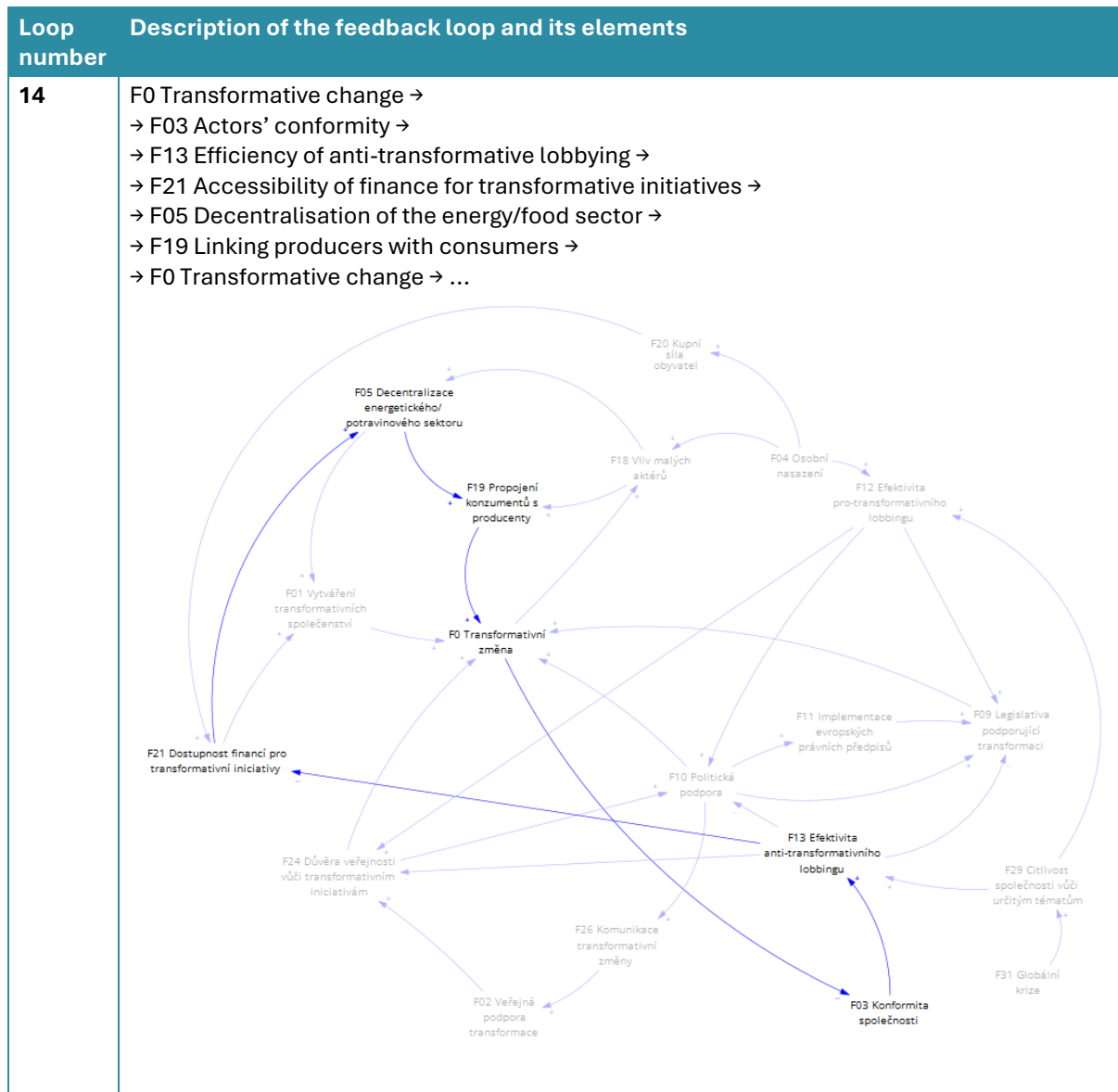




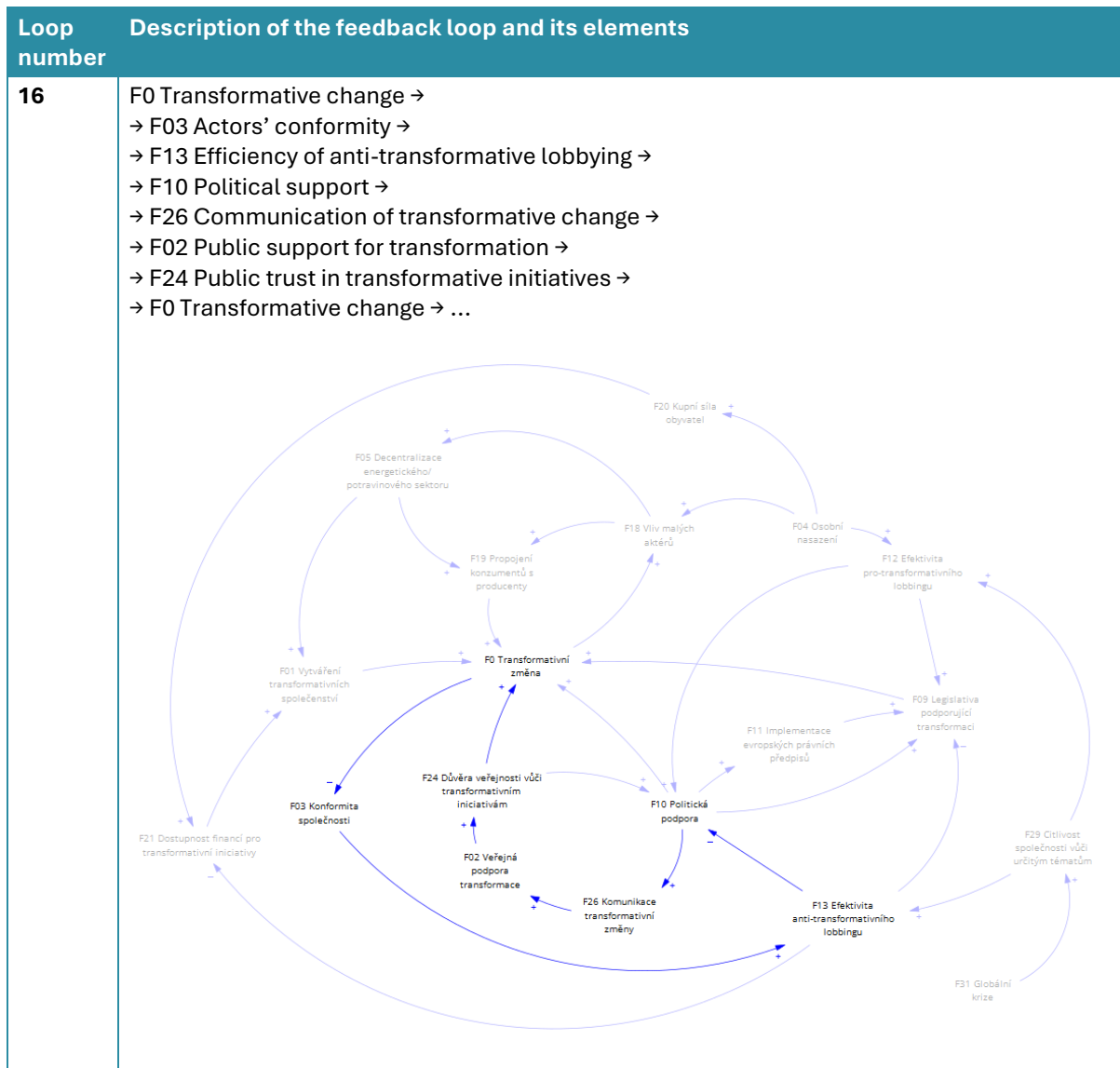
| Loop number | Description of the feedback loop and its elements  |
|-------------|--|
| 11          | <p>F0 Transformative change →</p> <p>→ F03 Actors' conformity →</p> <p>→ F13 Efficiency of anti-transformative lobbying →</p> <p>→ F21 Accessibility of finance for transformative initiatives →</p> <p>→ F05 Decentralisation of the energy/food sector →</p> <p>→ F01 Creating transformative communities →</p> <p>→ F0 Transformative change →...</p> |



| Loop number | Description of the feedback loop and its elements  |
|-------------|--|
| 13          | <p>F0 Transformative change →</p> <p>→ F03 Actors' conformity →</p> <p>→ F13 Efficiency of anti-transformative lobbying →</p> <p>→ F10 Political support →</p> <p>→ F11 Implementation of EU policies →</p> <p>→ F09 Legislation supportive of transformation →</p> <p>→ F0 Transformative change →...</p> |



| Loop number | Description of the feedback loop and its elements   |
|-------------|---|
| 15          | <p>F0 Transformative change →</p> <p>→ F03 Actors' conformity →</p> <p>→ F13 Efficiency of anti-transformative lobbying →</p> <p>→ F24 Public trust in transformative initiatives →</p> <p>→ F10 Political support →</p> <p>→ F11 Implementation of EU policies →</p> <p>→ F09 Legislation supportive of transformation →</p> <p>→ F0 Transformative change → ...</p> |



### 3.4.3.4 The importance of individual factors: dynamic output and analysis

Figure 21 shows the dynamic output of the modified version of the FCM system map of the "Energy" group with the duplicate links removed. The output describes a situation where all "drivers", i.e. factors that influence the rest of the system in the map but are not themselves influenced by any other factor (here *F4 Level of personal enthusiasm/ determination* and *F31 Global crises*), are taken into account ("switched on") in the system map. The driver *F4 Level of personal enthusiasm/ determination* has a positive effect on transformative change, but the driver *F31 Global crises* has a slightly negative effect on transformative change in terms of the dynamic output. At the same time, however, the strength of the influence of each driver varies considerably.

The graph shows that the factor F0 Transformative change first stays at the initial value and then increases rapidly, stabilizing at a positive value (i.e., higher than at the beginning of the simulation). This is also true for all other factors. The only exception is F3 Actors' conformity, which stabilizes at a negative value. This phenomenon indicates that the level of transformative change does not change in the long run, i.e., it does not decrease but does not increase either. Thus, the simulation shows that the driving forces in this system do not initially

cause the F0 factor to change, but a series of feedback loops reinforcing transformative change affect this trend after some time resulting in an increase of the F0 factor.

The most influential factors according to the dynamic output of the model are those that have the highest absolute value at which they stabilize. These are in this case F18 Influence of small actors (+0.25), F12 Efficiency of pro-transformative lobbying (+0.24), F0 Transformative change itself (+0.22), and F29 Sensitivity to certain topics and terms. The system is most sensitive to the behaviour of these factors from a dynamic outcome perspective, and if the final level of stabilisation of F0 Transformative change is to be changed, efforts should be directed towards influencing these factors.

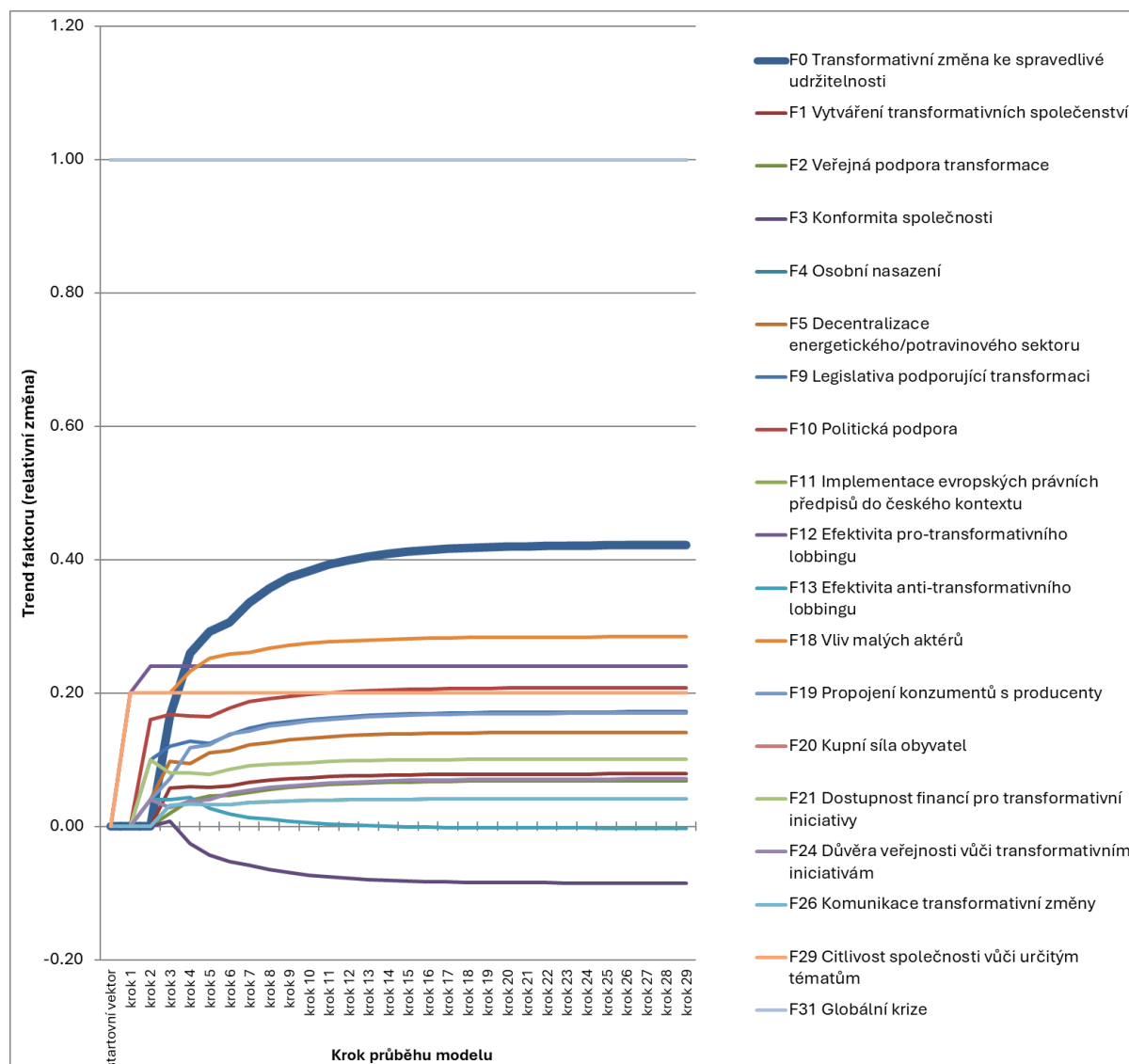


Figure 20. The dynamic output of the base version of the FCM system map "Energy" with preserved duplicate links.

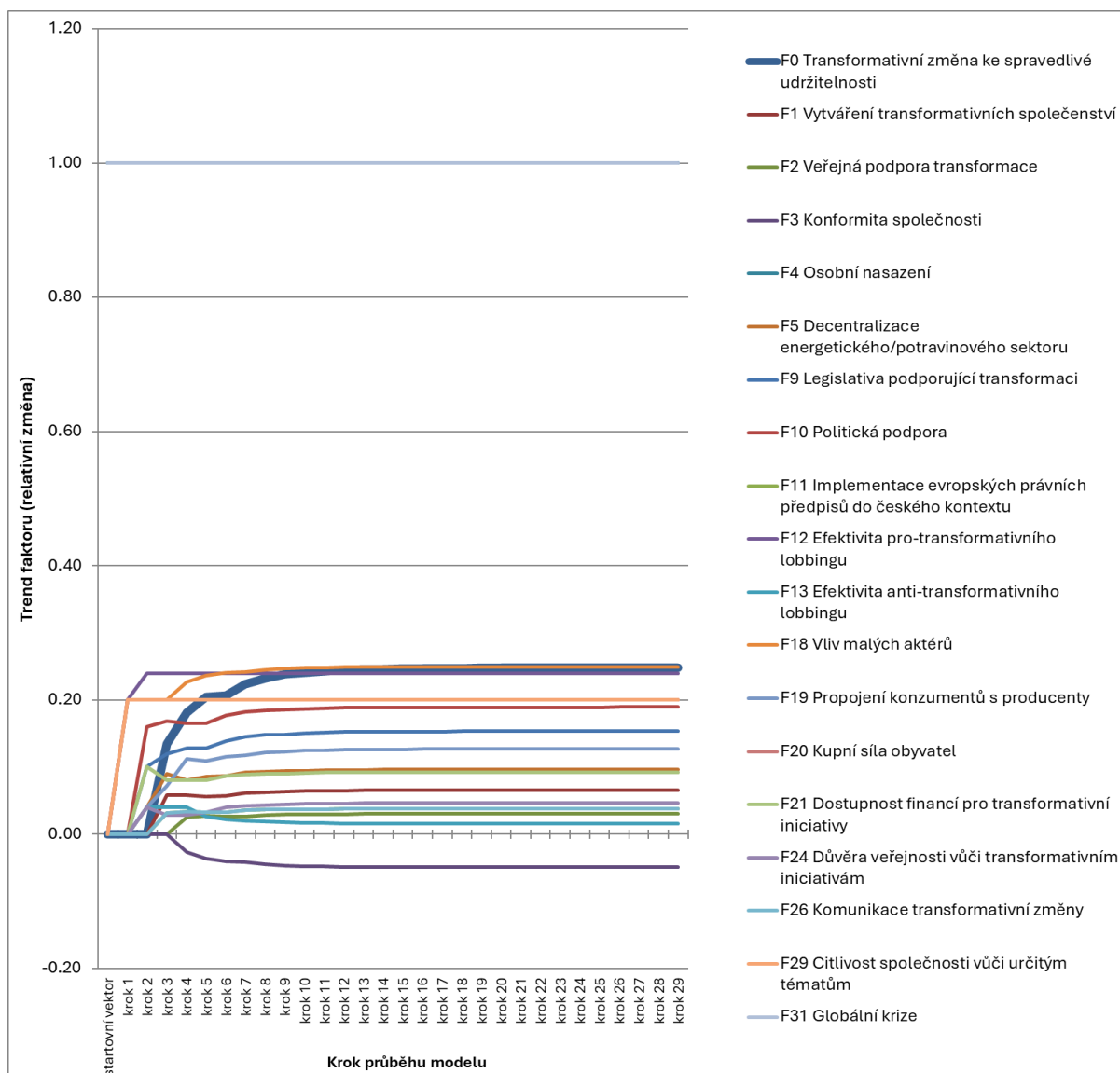


Figure 21. The dynamic output of the modified version of the FCM system map "Energy" with duplicate links removed.

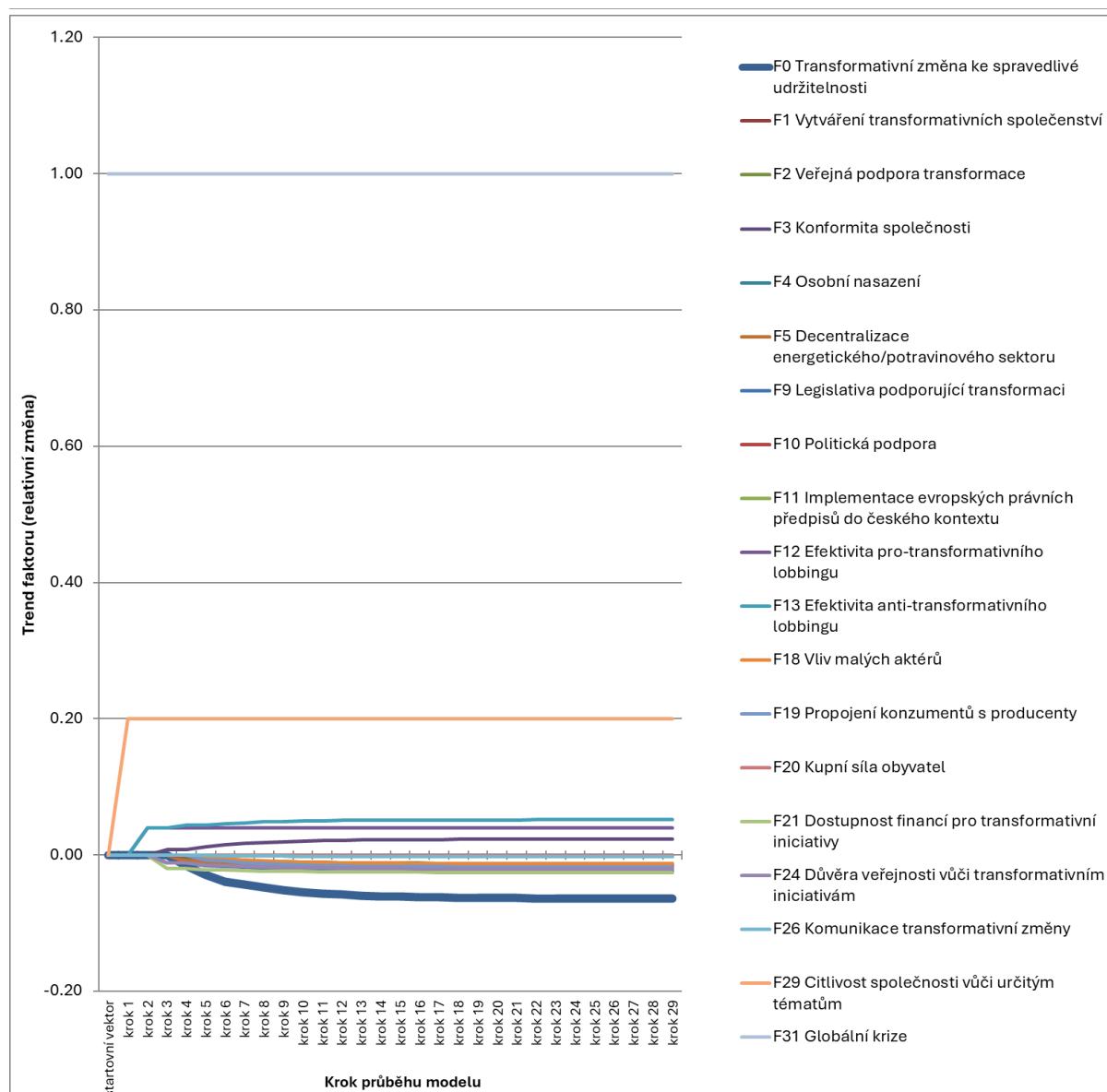


Figure 22. The dynamic output of the FCM version of the "Energy" system map with duplicate links preserved, with the absence of the F4 Level of personal enthusiasm/determination driver.

Lack of driving force F4 Level of personal enthusiasm/ determination leads to a drop in the resulting stabilization level of F0 Transformative change (Figure 23). This suggests that in this specific system, the level of transformative change would be significantly weakened without the role of personal enthusiasm/determination. Along with the F0 factor, all other factors also experienced a drop except for factor F29 Sensitivity to certain topics and terms, which remained at its original level (+0.20).

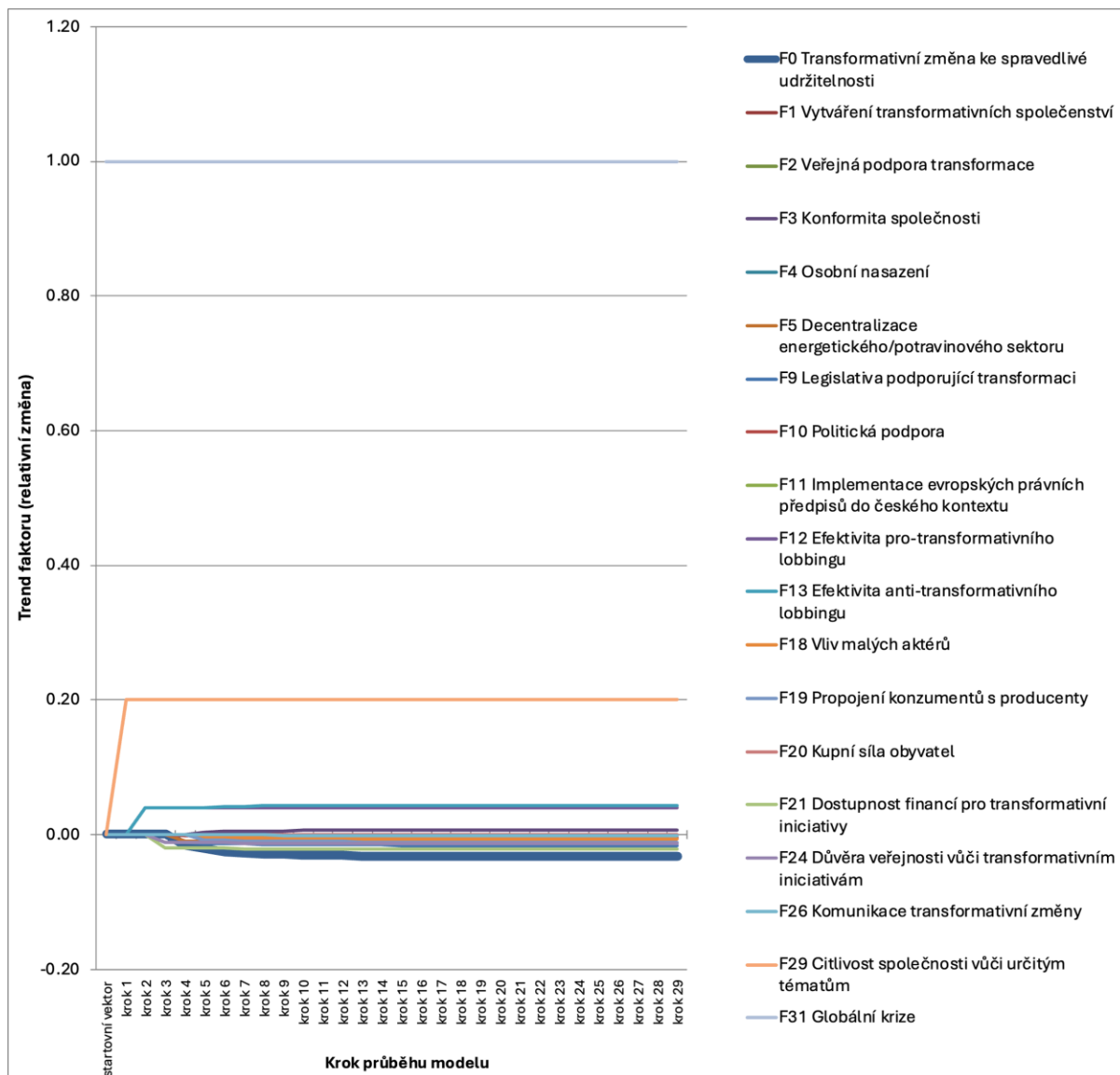


Figure 23. The dynamic output of the FCM version of the "Energy" system map with duplicate links removed, with the absence of the F4 Level of personal enthusiasm/determination driver.

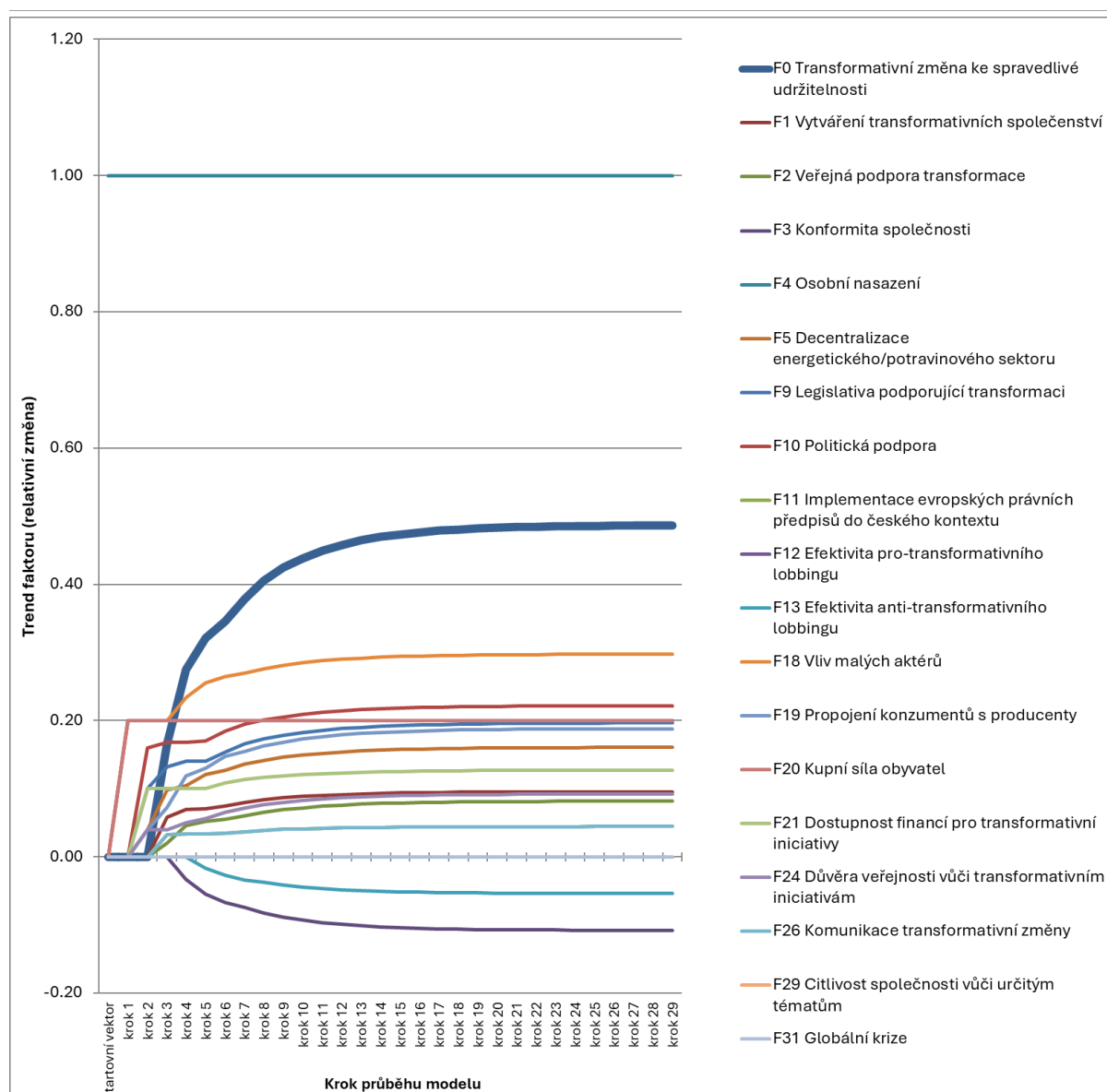


Figure 24. The dynamic output of the FCM version of the system map "Energy" with duplicate links preserved, with the absence of the driver F31 Global crises.

"Switching off" of the driving force F31 Global crises (Figure 25) had the opposite effect, resulting in the increase of factors F18 Influence of small actors, F9 Legislation supportive of transformative initiatives, F12 Efficiency of pro-transformative lobbying, F21 Accessibility of finance for transformative initiatives, and as a consequence, stabilization of F0 Transformative change at an even more positive level than in the baseline (Figure 21). On the other hand, there was a significant decrease in F13 Efficiency of anti-transformative lobbying and F29 Sensitivity to certain topics and terms compared to baseline values.

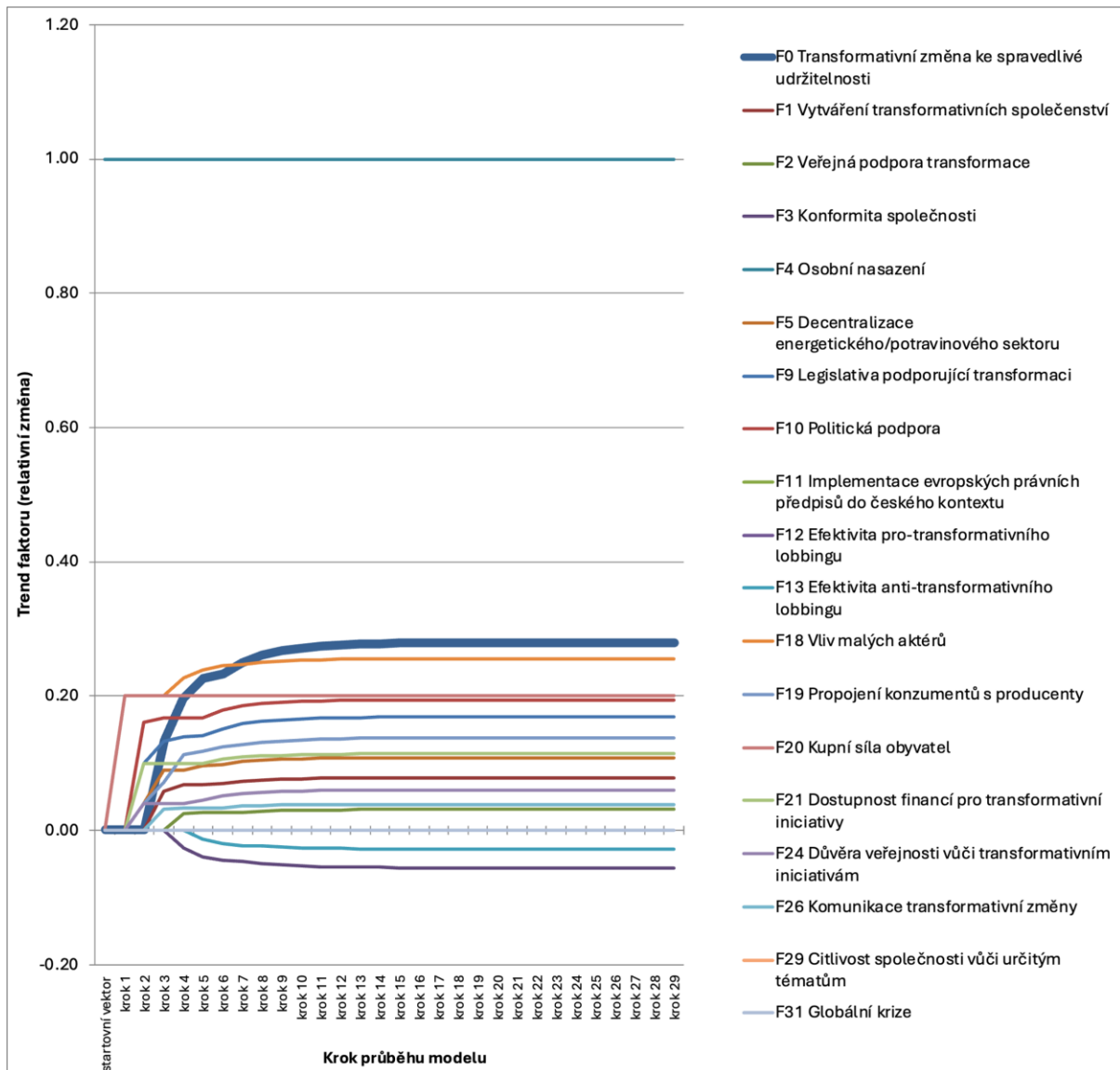


Figure 25. The dynamic output of the FCM version of the system map "Energy" with duplicate links removed, with the absence of the driver F31 Global crises.

### 3.4.3.5 Summary of the importance of each factor

Table 12 shows the importance of the different factors in terms of the different methods of FCM analysis of the system map "Energy". In terms of two of the three types of analysis, a single factor, *F13 Efficiency of anti-transformative lobbying*, was the most significant one.

Other significant factors from the perspective of at least one type of analysis included both phenomena based on the broader society, such as *F3 Actors' conformity*, *F4 Level of personal enthusiasm/determination*, *F18 Influence of small actors*, *F24 Public trust in transformative initiatives*, and *F29 Sensitivity to certain topics and terms*, and phenomena related to systemic or political functioning, such as *F9 Legislation supportive of transformation*, *F10 Political support*, and *F12 Efficiency of pro-transformative lobbying*.

This conclusion suggests that transformative change in the energy sector is, from the perspective of the “Energy” group, the result of opposing dynamics, where transformative change is supported by the level of personal enthusiasm/determination, transformative legislation, political support, power of small actors and pro-transformative lobbying, and, on the other hand, slowed or blocked by societal conformity and anti-transformative lobbying.

Table 12. The most important factors in the “Energy” group

| Factor   | Centrality | Feedback loops | Dynamics |
|--|------------|----------------|----------|
| F03 Actors’ conformity                           |            | ✓              |          |
| F04 Level of personal enthusiasm/determination   | ✓          |                |          |
| F09 Legislation supportive of transformation     |            | ✓              |          |
| F10 Political support                            | ✓          |                |          |
| F12 Efficiency of pro-transformative lobbying    |            |                | ✓        |
| F13 Efficiency of anti-transformative lobbying   | ✓          | ✓              |          |
| F18 Influence of small actors                    |            |                | ✓        |
| F24 Public’s trust in transformative initiatives |            | ✓              |          |
| F29 Sensitivity to certain topics and terms      |            |                | ✓        |

Audio and video recordings of the working group and plenary discussions were transcribed verbatim and then thematically inductively-deductively coded using MAXQDA software. The transcripts were used to identify key generalizing insights from each focus group and subsequent discussion. A summary of additional themes is presented below.

### Discussion Cluster 1: Meta-level

#### 3.4.4 Transformative perspectives

Whether or not a transformation towards a sustainable and equitable future is taking place is always to some extent also a question of the perspective of the particular group of actors working in the sector. Simply put, it depends on whose lens one looks at the issue of transformation. During the workshop, there was a perception, especially among participants from food systems transformation initiatives, that transformation is rather not taking place in their sector (this is also partly in line with the dynamic outputs of the FCM, see above). However, in the view of some of the participants, transformation is taking place in the mainstream agricultural sector, with powerful players such as the Chamber of Agrarians and others pushing for steps that are consistent with their vision of agricultural transformation (support for regenerative agriculture through new subsidy titles, carbon sequestration benefits,

etc.). However, these changes are insufficiently progressive from the perspective of transformative initiatives, and they are primarily aimed at those who have not yet applied any environmentally friendly and sustainable approaches or have done so only to a limited extent (see further in the chapter 4.6.2).

---

*"What we see is that transformative change is not happening at the moment because we have seen it through the lens of our community. But when we look at it through the lens, the lens of the agro-industrial power players, they are actually succeeding in making transformative change. Radical change. So we started to look at all of this through the lens of these actors and that's what actually transformed the whole thing, that actually..."*

(Workshop participant)

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## Discussion Cluster 2: Reflection on specific dynamics

### 3.4.5 (Counter)productive setting of financial mechanisms

One of the main tools to support the introduction of more sustainable solutions in the energy and food systems sectors are various financial mechanisms such as subsidies or compensation schemes. However, from the perspective of the workshop participants, these financial mechanisms are often designed in a way that either contributes to maintaining the status quo or even hinders the transformation. Examples include relatively generous compensation schemes for crop damage due to extreme weather events such as droughts or spring frosts. Because of the compensation, farmers do not have an economic incentive to change their practices in the light of the climate crisis but rather rely on support from the state.

---

*I think that the frog-in-the-pot effect applies there more than anywhere else, that the change, however fastest historically, is so slow that the sector is partly adapting. It's just some new crop variety that the researcher says is sort of adapted, a change in cropping practices and technology and other things, insurance and the belief that it was an exception this year that we had a fruit freeze. And so they keep like believing that actually they're still going to survive, right?*

(Workshop participant)

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As for subsidies, it is often problematic to implement them because they primarily target farmers who have farmed conventionally so far. Workshop participants mentioned in particular the subsidies and benefits arising from soil carbon storage in agricultural production, which mainly favour those farmers who currently contribute most to soil degradation. At the same time, these subsidy mechanisms are often not set up in a systemic way and only address a certain part of the overall environmental degradation problem (e.g. support for soil conservation technologies without the need to reduce the use of agrochemicals). Another problematic aspect of the subsidy setting is the availability of subsidies to organic farmers who

farm on healthy land and cannot access these mechanisms because they no longer have any carbon to store in the soil.

---

**Participant A:** *Well, there's a bigger need... of course, it's not just about the Czech Republic, but those farmers who are sort of not farming well and we would like that transformation, so of course the lobby is huge and there will be new subsidies, of course. So carbon farming. Europe is going to pour a huge amount of money into this if farms are going to store carbon in the soil, so that means who gets the most money? How much carbon goes into the soil when it's healthy? An environmentalist won't be able to put any carbon in the soil because...*

**Participant B:** *He's already got a lot of it in there. So you're not getting any better at all.*

(Discussion among workshop participants)

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*So even if they use some new soil conservation technology and they get benefits for it, they will continue to spray as they are used to, they will continue to actually sort of... partly improve the quality of the soil and then the second time they will degrade it again with these agrotechnical measures for plant protection. So it's... maybe this is not solved at all. And that's where I see the role of the lobby. But in that first phase of actually like let's actually increase the carbon share, that actually makes some systemic sense for soil improvement. (Workshop participant)*

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### 3.4.6 Relations between producers and consumers and their impact on the transformation

One of the themes that ran through all the discussions at the workshop was the relationship between producers and consumers, or the role of consumer behaviour in the transformation. From the perspective of the participants, one of the key factors of transformation is the (un)willingness and (in)ability to pay for products that are produced in an environmentally friendly way. If consumers are willing and able to pay for such products, they create pressure for their presence on the market. Conversely, in the event of economic and other crises (see below 4.6.6), this ability decreases, and thus the pressure to produce environmentally friendly goods decreases significantly.

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*And it's going to be hard to convince those customers, if we're in capitalism, the customer holds the major cards, to just want more.*

(Workshop participant)

---

Another problematic point in the relationship between consumers and producers is the fact that most consumers are unaware of the real costs of producing the final products. An example of this is the farm price of milk, which has remained almost unchanged over the last twenty years despite rising prices in supermarkets, even though the cost of producing it is rising. In practice, this means that consumers are paying more and more for milk while farmers are earning less and less. As some of the participants pointed out, it is therefore crucial for the transformation that the relationship between consumers and producers is straightened out.

---

**Participant A:** *Like commodity prices. They're always the same.*

**Participant B:** *They've been the same for twenty years. (...) The milk just costs the same as in 1995.*

**Participant C:** *Sorry, buyout, buyout.*

**Participant A:** *Well, sure, for farmers.*

**Participant C:** *But prices are going up for consumers.*

**Participant B:** *Well, unfortunately, that doesn't change the system at all.*

*There's no consumer pressure, so it doesn't matter either. That's why the global crises are no drivers for us because it's not really anything.*

**Participant A:** *That it would force farmers to change the way they farm in some way? No. Their prices are still the same for several years.*

*(Discussion among workshop participants)*

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### 3.4.7 Support for transformative change from policymakers

Workshop participants agreed that there is rather little support from policymakers for transformative change in the energy sector and in the functioning of food systems. One of the reasons for this is that these sectors are inherently aimed at meeting basic needs such as food and nutrition security, or light and heat. It is therefore crucial for policymakers to meet these needs of the Czech population in the most efficient way possible, which often means favouring larger producers at the expense of smaller ones. At the same time, there is little pressure from end consumers in this regard (see above 4.6.3).

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*"So that's where it's hard, the customer here doesn't expect any innovation, they just want warmth and light and I'm afraid a lot, I'm not saying most, but a lot of those clients pretty much don't give a shit what caused it along the way, yeah...as long as I'm warm. Or let me just move from A to B and whether it's diesel or petrol or electricity or hydrogen, like mainly make it work, make it transport me, transport me somewhere, yeah? And it's going to be hard to convince those customers if we're in capitalism, the customer holds the major cards, to just want more." (Workshop participant)*

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*"Yeah, how can you and I compete like on the same field... well I must have a different field. And the politicians don't quite get that... hey, why do you want to compete here when we're going to build another Temelin and you're completely useless? Small farmers don't reap in 8 hours what that 12 metre combine harvester does in like 20 farms in a year."*

(Workshop participant)

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### 3.4.8 Conservatism of sectors and access of new actors

Another important issue related to transformative change was the question of conservatism or the status quo of individual sectors, especially with regard to the entry of new players into related markets. In terms of participation, the food systems sector can be described as very conservative, as there is de facto no free agricultural land in the Czech Republic to allow new actors to pursue more progressive visions. From the perspective of the energy sector, however, the situation is quite different and can be considered very dynamic at present. Recent legislative changes and technological innovations have allowed new players (mainly energy communities and cooperatives) to enter the energy market, creating a competitive environment.

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*"In agriculture, there is basically no available farmland. So the idea that, as in the energy sector, 80,000 new players enter the sector year after year, that is the number of people who put photovoltaics on their roof in the Czech Republic and become a small player, in agriculture it is not possible. I can't just come in and say I bought a thousand hectares of farmland here and I'm going to start a biofarm, okay? So that's, that's maybe one barrier why there's not exactly an easy change."*

(Workshop participant)

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The conservatism of the food/agriculture sector is also related to being risk-averse. In fact, new and environmentally friendly practices often lead to increased yields and incomes after more than one season, but this can be very problematic for many (especially small) farmers and potentially lead to fatal losses. This leads to the fact that the willingness to adopt new practices requires a certain degree of economic stability.

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*"Well, maybe that too... it just occurred to me that it's holding back the transformation. That very few of the farmers are taking the risk because at the moment it's two years in the red. (...) A huge struggle... As a matter of fact, those businesses are being bought up. That there is not much room to play and not have a few years..."*

(Workshop participant)

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*"Another factor that reinforces the status quo is that the agricultural sector is conservative. Therefore, the change will not only be financially but also factually. In x years, I will change farming, I will go organic, and it will come... it will bring me something maybe after a transition period of x, y, years, yeah. Also, I have a huge investment with this now and I'm already mortgaged and quite indebted and maybe it will bring me a benefit and some public benefit. Well, that's a whole other thing." (Workshop participant)*

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### 3.4.9 The role of crises in transformation

While the energy crisis associated with the war in Ukraine has stimulated the transformation of the energy sector, there have been no significant changes in the food system. From the perspective of the energy sector, the rapid increase in energy prices had a particular impact on individual households, for whom the sudden provision of heat and light often meant a sharp drop in real incomes. This is also why consumers began to reassess the current state of the energy sector and the issue of dependence on large suppliers, leading to steps towards decentralisation of the energy sector. From the perspective of food systems, however, the energy crisis has primarily affected producers (farmers, food manufacturers), who have experienced high-cost increases but have been far less intensive in final food prices than in energy prices. According to the workshop participants, the end consumers did not reflect and initiate transformative change as strongly as in the case of the energy sector.

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*"And the second big, differential parameter we sometimes joke about is that the medal for energy change in the Czech Republic should go to Vladimir (...) Putin (...). And for the way he moved it yeah, with that aggression on Ukraine and that didn't actually happen in agriculture. There was no crisis in agriculture that food prices went up to three times or five times the price of gas. So this crisis actually kicked us into doing something and not being conformist when it didn't actually happen in food." (Workshop participant)*

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With regard to food systems, the climate crisis was also discussed as a potential driver of transformation in the food and land management sectors. Here again, participants agreed that this unprecedented global crisis cannot yet be considered a major driver of transformation, as most of the losses caused by extreme climatic conditions are currently compensated by the state, which to some extent discourages producers from changing their current practices (see above 4.6.2).

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*"Well, unfortunately, that doesn't change the [food] system at all. There's no consumer pressure, so it doesn't matter either. That's why the global crises are no drivers for us, because it's not really anything."*

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(Workshop participant)

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*"From my point of view, those global crises in agriculture have a very limited short-term effect. They're disrupting it for a while, but it actually goes back to the way it was very quickly. That's how I see it."*

(Workshop participant)

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*"Why would they do anything good? Why would they transform when they always see up front that there will be compensation for polluted water, so maybe there will be compensation for water treatment and they'll get it back here... Like they always do. Like the lobby is so terrible that they already know in 10 years they're going to get something. So carbon farming is the big thing right now, but of course with that comes, like regenerative agriculture, a lot of good ideas, yeah? They're going to have cover yeah? But that's going to keep the, even the ones that are doing it stupidly and they're going to be the first ones to use up those subsidies again because they've got the business and they've got the consultancies."*

(Workshop participant)

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*"So agriculture as big as that is not actually like, not dependent on what large-scale agriculture produces. That is, the profit from that production is only some fraction of the turnover of those farms. So if they produce less as a result of the drought, it doesn't really mean anything in the big picture. Yeah, either they're compensated for it, or it's such a small percentage of that total turnover that it doesn't really hurt them economically. Which means that global change is not a problem right now."*

(Workshop participant)

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#### 3.4.10 (Un)fair transformation

The transformation towards a sustainable and just future is based, among other things, on balancing power relations. This involves issues of fairness and possible adverse impacts on already disadvantaged groups. One example of this is the issue of setting fair price levels in order to adequately and decently reward the work of environmentally and socially responsible producers. However, there was concern among the participants that this may lead to the exclusivity of products and goods that become even more inaccessible to the majority of

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the population. In this respect, the participants mentioned the need to set up mechanisms that would in turn lead to greater availability of the products in question.

#### 4 Next steps in the project

In the framework of the TRANSPATH project, the results of the workshop will be used to analyse transformative pathways towards sustainability across contexts, with the main task of analysing and comparing leverage points and mechanisms of transformation between Western and Eastern Europe. Furthermore, the project team will also focus on the role of the financial sector in the transformation towards sustainability. Last but not least, the project will also look at comparing theories of transformative change between Western and Eastern Europe and the question of designing European policies that respect and reflect the different transformative mechanisms depending on the context.