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RESEARCH ARTICLE

Designing, implementing and embedding transformation-focused evaluation: A framework and insights from a regional food system change initiative

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Abstract

Transformation in societal systems such as food systems is required to overcome global crises. An essential part of stewarding desirable transformations is for organizations and initiatives to develop understanding of whether such transformations are occurring, their contributions (both potential and actual) to transformation, and the impacts of transformations already underway, as well as maintaining capacity for agility and adaptation. These are fundamentally issues of *evaluation*—the process of assigning quality, value or importance to something—that enables learning about transformations. However, the movement towards transformation-focused evaluation is a relatively recent chapter in the evolution of the evaluation field, a major and challenging departure from mainstream evaluation practice, and lacking in case studies of its design and application. Here we provide a rare insight into the collaborative process of designing, and starting to implement and embed, transformation-focused evaluation in the context of a large regional-scale food system transformation initiative, Food for the Future in North Yorkshire. We present the transformation-focused evaluation and learning system designed for the initiative, which shows how core evaluation questions, goals and guides, and different forms of feedback, sense-making and learning could be integrated

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and reinforce each other within an ecosystem of actors striving to support food system transformation. We discuss the innovations, progress and challenges in the framework and its application, as well as our lessons more broadly for the growing number of organizations and initiatives interested in using transformation-focused evaluation to support large-scale system transformation.

Author summary

Transformation of societies is required to overcome global crises. An essential part of enabling desirable transformations is for organizations and initiatives to understand whether such transformations are occurring, their contributions (both potential and actual) to transformation, and the impacts of transformations already underway, as well as maintaining capacity for agility and adaptation. These are fundamentally issues of *evaluation*—the process of assigning quality, value or importance to something—that enables learning about transformations. But the movement towards transformation-focused evaluation is a relatively recent chapter in the evolution of the evaluation field, a major and challenging departure from mainstream evaluation practice, and lacking in case studies. Here we provide a rare insight into the collaborative process of designing, and starting to implement and embed, transformation-focused evaluation in the context of a large regional-scale food system transformation initiative, Food for the Future in North Yorkshire. We present the holistic evaluation framework designed for the initiative, and discuss its innovations as well as the progress and challenges in its application. We also share our broader lessons for the growing number of organizations and initiatives interested in using transformation-focused evaluation to support large-scale system transformation.

Introduction

To transcend intersecting and compounding environmental, social and geopolitical challenges [1]—including climate change, biodiversity loss, social inequality, disinformation, and neofascism [2–8]—societies must be transformed towards futures with radically different, 'regenerative' dynamics that enable human and non-human life to flourish in mutually reinforcing ways [5–7,9,10]. Transformation is broadly understood to involve some kind of major, fundamental change, rather than merely marginal or superficial change [11]. An essential part of stewarding desirable transformations is for organizations and initiatives to develop understanding of whether such transformations are occurring, their contributions (both potential and actual) to transformation, and the impacts of transformations already underway, as well as maintaining capacity for agility, adaptation and evolution [5,12–14]. These are fundamentally issues of *evaluation*—the process of assigning quality, value or importance to something [15,16]—that enables learning about transformations [13].

However, evaluating transformation requires a transformation of evaluation practice itself [5]. Traditional Western modes of evaluation are poorly suited to contexts of transformation in complex systems [17]. Such evaluations have frequently been characterized by: treating evaluands as isolated projects; linear theories of change based on causal linkages for static, pre-planned objectives; time horizons limited by project budget cycles; evidence drawn primarily from the past and present; and an obsession with quantifiable metrics [14,17]. Their power relations and epistemology have also been deemed problematic, including: accountability focused narrowly on meeting donors' needs (e.g., value for money), often to the detriment of a project's wider mission; a technocratic approach with superficial stakeholder participation in shaping the evaluation; and an assumption that evaluators are value-neutral observers independent from the system of interest, which is a fallacy [14,17].

In contrast, propositions of more transformation-focused evaluation (TFE) emphasize how evaluations must: consider the complex interplay of evaluands with wider systems, and their contribution to change (including long-term consequences) in light of many other influencing factors; help transformation initiatives remain nimble to emergent, unpredicted changes; and employ qualitative as well as quantitative methods, and foresight methods, drawing on diverse forms of knowledge [14,17,18]. This echoes trends towards such complexity-informed approaches in various other disciplines, such as organizational and environmental management, particularly since the 1970s [19–22].

More ambitious proposals for TFE advocate further shifts in power relations, epistemology and purpose, including that evaluators should: adopt a more activist, ethically grounded stance that foregrounds, surfaces and reflexively questions *values*, and decolonizes evaluation; strive for more autonomous and professionalized evaluation practice that can speak out against vested interests in the unsustainable status quo; shift power towards the users of evaluations, with a focus on building organizations' capacity to self-evaluate, and evaluation recognized as an intervention that is inextricably part of change processes rather than removed from them; and carry broader accountability for human and planetary flourishing, maintaining the orientation of partnerships towards achieving just transformations towards regenerative futures, and developmental learning from this process [14,17,18].

There is increasing recognition of the need for TFE in the evaluation field [5,13,14,18,23–25] but application and development of TFE in practice remains limited [12–14]. There are inherent challenges in achieving system transformation, facilitating the shifts in mindset that underpin TFE, and overcoming widely institutionalized but outdated assumptions about what evaluation is and can be [17,26]. These challenges are then exacerbated by the messy nature of real-world contexts, where unpredictability, emergence and continually shifting parameters are commonplace, and agility, adaptation and urgency are paramount [5,27]. In such circumstances, evaluators may need to flexibly shift between different roles [14,28], and evaluations may need to be rapidly established and implemented in the absence of extensive resources and expertise [27]. These factors, combined with contexts of working amongst multiple crises and even system collapse [29–31], make it a difficult task to embed the radically different approaches of TFE within traditional systems of governance and management [14,18].

This paper therefore aims to address the question of how we can effectively design TFE and embed it in governance for system change. We present findings from two years of collaborative, action-oriented design research with a large regional food system transformation initiative—Food for the Future in North Yorkshire—to design a transformation-focused evaluation approach. In the following sections we describe our case study and methodology, before presenting the resulting evaluation framework. We finish by discussing the innovations, progress and challenges in the framework and its application, as well as our lessons more broadly for the growing number of organizations and initiatives interested in designing, implementing and embedding TFE to support large-scale system transformation [14].

Materials and methods

This study used a co-creative, action-oriented design research approach to design a transformation-focused evaluation approach for Food for the Future. Below we first introduce our case study, before describing the ontological framing and

epistemology of the research and the methodology through which it was applied. Ethical consent for this research was granted by the University of York's Department of Environment and Geography Ethical Review Committee, with written consent obtained from all participants.

Case study: Food for the future in North Yorkshire

Food for the Future in North Yorkshire (hereafter abbreviated to 'Food for the Future') is a food system transformation initiative currently coordinated by a regional government, North Yorkshire Council (NYC), in north-east England. NYC became operational in April 2023 as part of the UK Government's 'devolution' plan to give greater power to local and regional authorities. NYC represents the merging of eight district councils and the abolishment of the previous North Yorkshire County Council, replacing the previous two-tier district/county council system with a single overarching council. The City of York and North Yorkshire became a single Mayoral Combined Authority with a new Labour Party (politically left of centre) mayor in 2024. The Combined Authority works in partnership with NYC and City of York Council. As in other local councils in the UK, NYC's structure consists of democratically elected representatives (known as councillors—90 councillors in NYC's case) who make key decisions, and officers hired to support the design and implementation of council policies. At the time of writing in 2025, NYC is nominally controlled by the Conservative Party (politically right of centre) with support from some Independent councillors, although the Conservatives lack an overall majority.

NYC was spurred to develop a new food strategy by publication of Henry Dimbleby's National Food Strategy report [32] and consequently the UK Government's food strategy [33] (which has since been updated [34]), alongside the multiple crises and challenges of the COVID-19 pandemic, Brexit, trade wars, climate change, the cost-of-living crisis and the obesity epidemic—highlighting the need for more resilient, sustainable and salutogenic food systems. Food for the Future's development to date has been coordinated by NYC's Public Health team.

NYC recognized that although it had important leverage in some aspects of the regional food system, such as food procurement by public institutions and land use planning, in other food system areas it had little direct control. NYC therefore adopted a partnership approach that enrolled a diversity of different actors into the initiative—including food businesses, charities, regenerative farmers, regional food networks, agri-tech representatives, National Park Authorities, the Department for Environment, Food & Rural Affairs (DEFRA), the Mayoral Combined Authority, the University of York, and many others [35].

North Yorkshire is the largest county in England by area (8,000 km^2), with a human population of over 615,490, a diversity of soils, land cover and farming systems, and a mix of urban and rural environments [35,36]. The county's food system also shares many challenges with other food systems, such as high rates of food insecurity [35,37]. The North Yorkshire case is therefore likely to be of interest to those involved in other regional-scale system change initiatives. Inspired by their prior involvement in Three Horizons [38] workshops in 2022 organized by the research consortium FixOurFood [39] to explore how transformation of the Yorkshire food system towards a regenerative future could be supported [40], NYC aimed to use a similarly transformation-focused approach in Food for the Future. There remained a key question about how the initiative and its impact would be evaluated, motivating a dedicated design process.

The aims of the design process were threefold. Firstly, it aimed to create a transformation-focused evaluation approach that could be applied by Food for the Future. It therefore required that the initiative's stakeholders were sufficiently empowered to apply the evaluation without external support. Secondly, the design process aimed to facilitate participants' learning about TFE and appreciation that TFE requires a fundamental shift in thinking about the role and process of evaluation. The third key aim was to record the design process and participants' learning in a way that could be shared with other interested parties to facilitate similar processes in other transformation initiatives.

Ontological framing

Our study was framed by three key ontological positions. First is the concept of a *regenerative food system*: we recognized the urgent need to support the emergence of a regenerative food system in North Yorkshire. By a *food system* we

meant aspects related to the production, processing, distribution, access, preparation, preservation, consumption, disposal and recycling of food, and the interactions between these [39,41], as well as interactions more broadly between food-related behaviors, technologies, economies, politics, health, environment and society, and the assumptions and worldviews underlying the food system [39,41–43]. This holistic perspective is essential for tackling the interconnected nature of food system challenges [41,42]. Broadly speaking, *regenerative systems* maintain positive reinforcing cycles of health within and beyond themselves, including between humans and wider nature [9], such that 'life creates conditions conducive to life' [44]. Importantly, being regenerative goes well beyond reducing anthropogenic harm to acceptable levels [45,46], with new dynamics that result in 'more good' rather than simply 'less bad', and worldviews that appreciate ecological interdependence and mutualism [9,43,46–48]. While there is no one definition of a regenerative food system, such systems often honor the uniqueness of places and regions, relocalize foodsheds, elevate Indigenous and traditional ecological knowledge, feature regenerative and agroecological forms of farming, and strive for food sovereignty [49]. A regenerative systems framing was used during earlier research to support NYC to push ambition and imagination in the envisioned future food system [35] (see below), whilst also allowing stakeholders to co-create their own understanding of what this would look like in the North Yorkshire context.

Second, achieving a regenerative food system would clearly require *transformation* of the current North Yorkshire food system. Transformation was taken to mean a major, fundamental change, qualitatively distinct from more marginal and superficial change [50]. We also considered transformation to go beyond merely technological, behavioral and policy changes, and involve shifts in underlying beliefs, values, intent, purpose, structures, institutions, power relations, paradigms or worldviews that in turn help to bring about system reconfiguration [51–55]. The substantial current challenges in the North Yorkshire food system, including power imbalances, inequality of food access, poor nutritional health, high levels of food wastage, ecological degradation, and the need to adapt to climate change, made food system transformation imperative [35]. In Food for the Future, the Three Horizons framework [38] was used as a framing for how transformation was expected to occur (Fig 1).

Third, we understood that achieving transformation would not be possible without transforming our approach to evaluation [14,18], as described in the Introduction. Because traditional understandings of evaluation are widely institutionalized (e.g., in policymaking [56]), there is an inherent challenge in shifting mindsets about evaluation in transformation contexts, and not only implementing TFE but *embedding* it within a different culture of working. One of the key roles of TFE is to push people towards deeper forms of *learning* (the change in knowledge and behavior as a result of experience [57]), which some call 'triple-loop learning' or 'transformative learning' [58–60]—about underlying assumptions, values, beliefs and paradigms. Deeper learning is itself characteristic of *transformation* [51,54,61]. We encapsulated these ideas in the term *transformation-focused evaluation and learning system* (TFELS), which defines the system of actors continuously applying TFE and learning from it, as an embedded working culture.

Together, the goal of a *regenerative food system*, brought about by *transformation* of the current food system and supported by a *transformation-focused evaluation and learning system*, provided a powerful ontological framework for this research.

Epistemology

Epistemologically, our study took the form of *design research*. We considered design to be an iterative, ongoing process of creating new desirable ideas, tools and systems [62,63]. We focused on designing a TFELS, although design could also be considered to extend to Food for the Future's process of envisioning a *regenerative food system* in North Yorkshire and trying to stimulate the *transformation* required to bring it into being (see 'Ontological framing'). In design research, researchers 'design and study interventions that solve practical problems in order to generate effective interventions and theory useful for guiding design', recognizing that 'theory and interventions drive each other in complex, iterative ways' [64]. We saw design research as bringing additional methodological rigor and transparency to the process of *design*

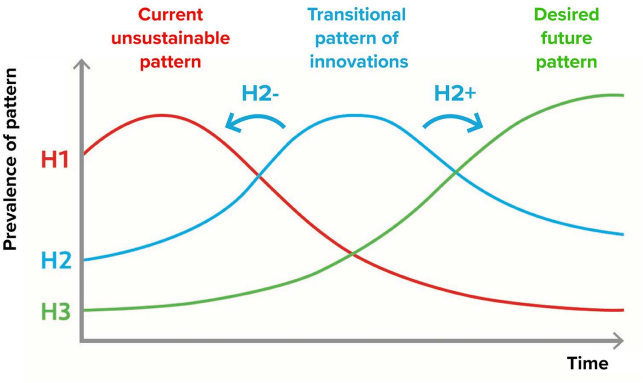


Fig 1. The Three Horizons framework that helped to frame understandings of system transition and transformation in the Food for the Future in North Yorkshire initiative. In Three Horizons, the future is viewed as three horizons, or societal patterns. Horizon 1 (H1) is the pattern that dominates the present, but is declining as many aspects of it—ways of working, values, assumptions, technologies, and so on—lose their fit for purpose as the wider environment changes. Horizon 3 (H3) then represents an envisioned, radically different future—the sense of what a collective wants to bring into being. Horizon 2 (H2) is a transitional pattern of innovations, some of which (H2-) are captured by H1, extend its lifespan and delay the diffusion of H3, whereas others (H2+) create space for H3 to diffuse and ultimately reconfigure the system. The scaling used in the graph is not intended to be taken literally, but rather for rough qualitative comparison. 'Prevalence' describes the relative prevalence of a horizon (e.g., the amount of resources it holds or transmits, or the proportion of human activity taking place related to the horizon). Time flows from left to right: the present is found where H1 is dominant, and all information to the right of this is in the future. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).

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to enhance *learning* (where 'rigor' includes building on prior theory and research, and reflexivity around methodological appropriateness, the role and influence of the researcher, and the underlying cognitive dimensions of design [65–67]). We assumed that recording our own learning, as well as communicating this learning with others, would facilitate our own reflexivity and behavior change [68].

To support our design research, our study was underpinned by a second-order, co-creative and action-oriented approach to generating knowledge. In second-order research, research is recognized as a form of intervention in systems, researchers are engaged in change processes, researchers' positionality is understood to shape their observations and interpretation, and it is acknowledged that no single person will have a full understanding of the system being explored [69]. This is in contrast to a traditional 'first-order' or positivist research process whereby researchers assume their ability to observe systems in an independent and value-neutral way 'from the outside looking in' [69–71], with a belief that knowledge produced in this way, particularly as 'episteme' (pure theory), is its most valid form [69]. A reflexive second-order approach opened up possibilities for more collaborative, co-creative and action-oriented research by levelling the traditional power dynamic between 'expert' researcher and those being researched—enabling those users of research to play a greater role in shaping it, and the value of knowledge and design to be judged by its usefulness and use by its intended users [72], and ultimately by its effectiveness in supporting transformation. Such research is considered to enable a more powerful collective learning journey for the people involved [72,73]. All participants were considered to have legitimate claims to the knowledge produced, and as such were invited to be named as co-authors of this manuscript.

As a result of applying design research underpinned by second-order assumptions, our study included diverse ways of knowing. For instance, prospective, normative, intuitive, creative, and practical forms of knowledge, and 'learning by doing', all play a role in design work and supporting transformations [70,74,75]. The importance of experiential, practical knowledge [69] was particularly clear in our case, given that we intended for the designed TFELS to be operationalized by Food for the Future stakeholders, whilst future-oriented, normative, visionary or imaginative kinds of knowledge [69] were important for envisioning what a TFE approach would look like assuming that it was highly effective and successfully

integrated into the wider governance of the initiative. Such epistemological pluralism is essential to support wise action in stewarding transformations [69].

Together, this approach—incorporating design research, a second-order stance, and epistemological pluralism—gave us greater confidence that the resulting artefact of our design process (namely, a TFELS for Food for the Future) would accurately reflect the needs of the initiative, be useful, applied and embedded, and achieve its intended outcomes, which are ultimately to support *transformation* towards a *regenerative food system* in North Yorkshire.

Methodology

An Evaluation & Learning Working Group (ELWG) was established in September 2023, drawing on interested members of Food for the Future's existing partnership and including members of NYC's Public Health team, a NYC Councillor, and other stakeholders (S1 Table), to undertake the main thrust of the design process. Angela Crossland (AC) was designated the ultimate 'sponsor' of the work with accountability for taking actions forward to the various groups in Food for the Future and to the wider council. Ruth Everson (RE) was designated the working group's coordinator and administrator, with Sam J. Buckton (SJB) as a facilitator. Clarifying these power relationships was important because of the aim to ultimately empower Food for the Future actors to continually apply the TFELS themselves. This required a less directive, more facilitative role for SJB and a more directive role for other Food for the Future stakeholders [76].

Engagement with the ELWG was structured around monthly to bimonthly 1.5-hour online workshops, starting in earnest in September 2023 following initial scoping meetings between SJB and NYC Public Health officers, and continuing until January 2025, at which point the ELWG's focus had switched to engaging more directly in meetings of the Core and Partnership Groups, who had emerged as being the key groups coordinating the decision-making and evaluation of Food for the Future, to build their capacity to implement the TFELS (Fig 2). Initial contracting amongst the ELWG included establishing the aims and a set of principles for the design process and how the group would work (S2 Table), and scoping out the purpose of the evaluation, drawing particularly on the approach of Design-driven Evaluation [63], Mickwitz et al.'s theory-based framework for evaluating transitions [77], and Utilization-Focused Evaluation [72] (Table 1). Questions asked of the ELWG included: What would success look like for this group? What needs to be understood and evaluated to support the governance of the initiative? Who are the users of the evaluation? Are there any key constraints that we need to be aware of? What process will you need that supports you effectively to reach your goals? Contracting was an ongoing, iterative process, particularly because of the adaptive, developmental nature of the food strategy itself, and contracting questions were frequently revisited throughout engagement with the ELWG.

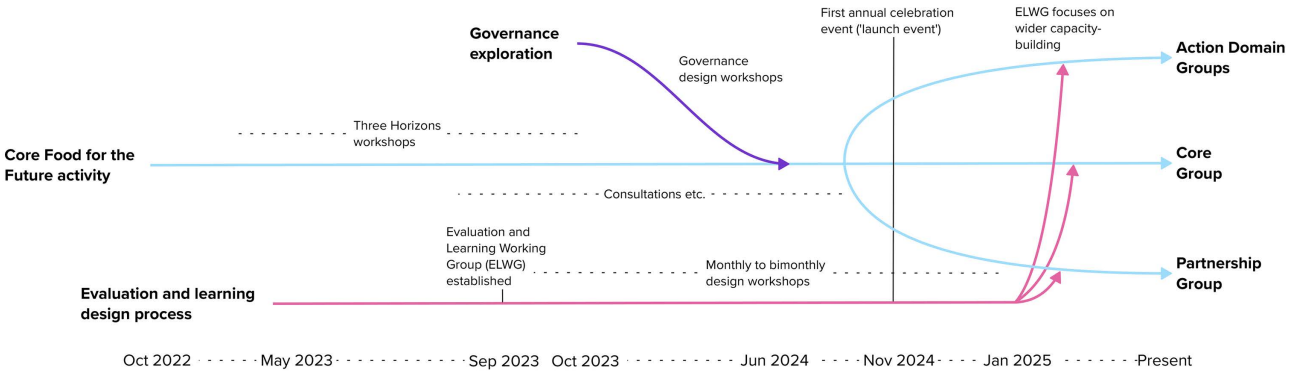


Fig 2. Timeline of the key strands of work feeding into the Food for the Future in North Yorkshire initiative. 'Governance exploration' refers to a set of three workshops exploring possible transformation-focused modes of governance, some aspects of which were integrated into the main food strategy development activity. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).

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As well as discussions about contracting, typical workshops included brainstorming and feedback on TFELS designs, presentations by SJB on different aspects of TFE, and 'learning by doing' sessions where aspects of TFE were actively applied to Food for the Future or other material (e.g., Principles-focused Evaluation). Between workshops, SJB created or updated TFELS designs in Mural, a collaborative online whiteboard platform (https://www.mural.co/), that summarized the workshop discussions and also drew on other evaluation approaches, frameworks and tools that resonated with the case study (Table 1). Some of these were relevant only in the design process, some only in the resulting TFELS design ('design artefact'), and some in both stages (Table 1). This means that some approaches were aspirational and intended to be applied during implementation of the TFELS. This 'bricolaged' approach [78] was considered appropriate to the emergent nature of the evaluation design, the need to create something tailored to the case study, and aligning to TFE best practice identified by others, whilst also having transparent discussions with the ELWG about how the different 'ingredients' were being incorporated and their possible limitations [78] (Table 1). The designs were then presented, critiqued and developed in subsequent workshops in an ongoing iterative process.

Some members of the ELWG were additionally involved in three in-person full-day Three Horizons [38] workshops (between April and October 2023), along with surveys and between-workshop consultations, with NYC officers, councillors and wider stakeholders, to identify priority domains of action for transforming the North Yorkshire food system (Table 2), and three in-person full-day workshops exploring transformation-focused governance approaches for Food for the Future (January, April and May 2024) (Fig 2). These workshops all had implications for the initiative's evaluation, which were fed back to the full ELWG. Between the monthly ELWG meetings, SJB had additional meetings with RE and Rebecca Newman to discuss progress and plans for the ELWG and the coordination between the ELWG and the wider governance of Food for the Future. This integration with the different ongoing strands of the food action framework development (Fig 2) was considered fundamental to the success of the evaluation design process.

A full-day in-person 'Partnership in Action' event, effectively a celebration and launch event for Food for the Future, was held in York (UK) on 14 November 2024, involving c. 50 participants comprising members of the initiative's Core, Partnership, Action Domain, and Coordination Groups as well as some wider interested parties. This event applied aspects of the TFELS, including prioritization of transformation-focused actions that Food for the Future should support, and a simplified ripple effects mapping exercise [79]. In this exercise, participants were asked to answer the question: 'What outcomes or impacts have you noticed already from the food strategy development and your involvement in it?'. It was emphasized to participants that it didn't matter how small or seemingly insignificant the outcome/impact was, and that it could be negative as well as positive. Participants wrote their answers individually on post-it notes. SJB thematically analyzed the results in Mural, first grouping them into positive and negative ripple effects and then inductively by theme (see mural). Any links identified by participants between different ripple effects were represented by arrows.

Sense-making and learning were facilitated through various means in addition to ripple effects mapping. A 1.5-hour online focus group in January 2025 with members of the ELWG was dedicated to reflecting on learning from the design process. Participants were asked two main questions, based on the premise of imagining that we were using our experience to advise another organization on how to design a TFELS, and help people to shift their thinking about evaluation towards more transformation-focused approaches: 1) What would we identify as the most important factors to make these processes effective? and 2) What are some of the challenges we would expect others to face? Reflexive practice—understood to include the challenging of underlying assumptions, questioning the influence of power structures, and deeper forms of reflection on how our assumptions changed [80,81]—was also introduced to the design process in several ways. Part of SJB's role was to be a 'sparring partner' who continually encouraged participants to challenge underlying assumptions about evaluation [82]. Throughout the design process, participants also recorded key learning points or 'pivot points' (when the direction or assumptions of the design and strategy development process substantially shifted) along a timeline in Mural. SJB also kept a reflexive diary [83,84], which included reflections on the dynamics and energy within meetings and how these might be affected by the power relations at play, including the tricky navigation between SJB's

Table 1. Approaches and frameworks that informed and inspired the transformation-focused evaluation and learning system (TFELS) and its design process for Food for the Future in North Yorkshire. Multiple approaches and frameworks were drawn upon because none were considered sufficient in themselves for the initiative's purposes. Some were relevant only in the design process, some only in the resulting TFELS design ('design artefact'), and some in both stages. This means that some approaches were aspirational and intended to be applied during implementation of the TFELS.

Approach or framework	Stage where applied	Aspects applied in case study and their relevance	Potential limitations and risks
Design-driven Evaluation [63]	Design process	• A utilization-focused, co-creative, iterative design approach in creating the TFELS (see also Utilization-focused Evaluation) • We applied some of the recommended steps of this approach in early meetings of the ELWG (particularly the identification of evaluation users and principles for the TFELS)	• No significant limitations or risks
Mickwitz et al.'s theory-based framework for evaluating transitions [77]	Design process	• We found the list of questions to ask when designing transition-focused evaluations useful for structuring ELWG conversations and sense-checking the TFELS design	• No significant limitations or risks
Blue Marble Evaluation [78]	Design process/ artefact	• Applied the Blue Marble Evaluation Bricolage Methods Principle ('Conduct utilization-focused evaluations incorporating Blue Marble principles to match methods to the evaluation situation') • Enabled us to make better decisions about what would suit a particular context, given conditions of limited time and expertise, uncertainty, and the fact that no single tool, framework or method was entirely satisfactory for the purposes of Food for the Future • Helped to keep the TFELS utilization-focused (see also Utilization-focused Evaluation below) and useful for its end users, even in changeable circumstances, as well as providing opportunities to weave in key concepts and frameworks related to transformation	• Risk of 'adultery' [87], i.e., slapdash incorporation of ideas from a wide array of sources without considering their fit for the situation at hand
Developmental Evaluation (DE) [87,88]	Design process/ artefact	• Relatively continuous, adaptive, iterative, timely approach to evaluation and its design, appropriate for the dynamic nature of Food for the Future and the North Yorkshire food system • The TFELS is an emergent design as well as the initiative itself • Utilization-focused (see below) • Complexity perspective and systems thinking • Co-creation, with evaluators relatively embedded in the initiative • A positive deviance or appreciative inquiry approach that builds on potential and what is already working well, rather than picking apart problems	• Risk of over-simplifying and trivializing DE rather than seeing it as an intensive, rigorous, approach which may also require discrete periods of focused, structured evaluation activity (the TFELS cannot claim to be a full DE [87])
Empowerment Evaluation [76]	Design process/ artefact	• Building the initiative's capacity to continuously self-evaluate • Increasing sustainability of the evaluation	• Lack of more independent, external feedback • Higher risk of dishonesty or 'washing'
Transformation-focused Evaluation (TFE) [14]	Design process/ artefact	• Implemented TFE's Complexity Principles via the TFELS' systemic, contextually adapted, developmental approach, drawing on various kinds of feedback and knowledge, including creative and prospective knowledge (e.g., from Three Horizons) • Applied the Power Principles in the partnership approach to working and a joined-up approach to action that explores reinforcement between different interventions both within the initiative and beyond it. It also demonstrated a significant shift in power compared to typical evaluator-evaluand relationships, instead blurring this line, and building evaluative capacity across a whole network • Reflected the Purpose Principles in its attention to underlying values, starting to shift the initiative away from more rigid results-based accountability towards a more adaptive culture of learning, and its focus on transformation towards a more regenerative food system	• Considering TFE's Power Principles, there is an explicit drive in the initiative to understand priorities for food system intervention from the perspective of the county's more marginalized or under-represented food citizens (e.g., young people, and those facing greater food insecurity), and to empower them through food system change, although these voices have not been represented in the design of the TFELS per se
Utilization-focused Evaluation [72]	Design process/ artefact	• Shaped the TFELS according to the needs of the users of the evaluation, creating a framework that is more likely to be useful for and applied by the evaluation's primary intended users	• Lack of more independent, external feedback • Losing sight of TFE

(Continued)

Table 1. (Continued)

Approach or framework	Stage where applied	Aspects applied in case study and their relevance	Potential limitations and risks
Contribution analysis [12]	Design artefact	• Aspiration to periodically apply contribution analysis to understand Food for the Future's contributions to change in the North Yorkshire food system	• Will not provide clear-cut evidence of the initiative's causal effects
Orders of Outcomes [89]	Design artefact	• Inspired the TFELS' distinction between enabling conditions and impacts • Earlier iterations of the TFELS followed the framework even more closely	• Orders of Outcomes is based primarily on coastal and marine management projects
Principles-focused Evaluation [90]	Design artefact	• Aspiration to regularly apply Principles-focused Evaluation to assess the initiative's fidelity to its core values and principles, including its focus on transformation	• Its effectiveness depends significantly on the quality and evaluability of the values and principles in question
Ripple effects mapping [79]	Design artefact	• Applied as a routine exercise to capture emerging outcomes of the initiative	• Risk of over-emphasizing positive outcomes over negative ones • Risk of biased anecdotal evidence
Sentinel Indicators [91]	Design artefact	• Aspiration to apply this approach to quantitative indicators of food system health in North Yorkshire—i.e., monitoring indicators that represent processes of change that may be difficult to study in their entirety, are easily communicated, and signal the need for further analysis and investigation	• Sentinel indicators by themselves will not tell us about the impact of Food for the Future • They risk oversimplifying the food system • Indicators are 'limited interpretations, not objective descriptions' [92]—in fact they are often value-laden, including in how we choose which indicators to follow. In effect, the indicators we choose reflect how our particular group conceptualizes the food system • The desired future is contested and chosen indicators may therefore also be contested. No indicator will be universally accepted • Risk of omitting important indicators because they are hard to measure (e.g., qualitative, contextual). It is particularly difficult to measure 'ultimate ends', like wellbeing [92] • Food for the Future could potentially become focused on chosen indicators as ultimate goals, which may discourage efforts to achieve outcomes that are less easily measured
Signals of Transformational Change [28]	Design artefact	• An aspiration to look for signals of large-scale systemic shifts in the North Yorkshire food system and evaluate what, if any, contribution Food for the Future has made to these	• Relatively generalized; not geared towards food systems per se
Three Horizons (Three Horizons) [38]	Design artefact	• Underpins Food for the Future's and the TFELS' goals and guides • Helped to orient the TFELS towards transformation	• Three Horizons has many suggestions for how transformations should best be stewarded, but is not intended to be a theory of change. There is a risk of ignoring other possible theories of change and transformation

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Table 2. The seven action domains identified as critical for food system transformation via the Food for the Future in North Yorkshire Three Horizons process.

Action domain title	Action domain goals	Priority actions
Securing nutritious and affordable food for all	• Tackling the root causes of food insecurity and creating the right conditions for everyone to have equal access to nutritious food, regardless of income, geography, demographic, disability or dependency.	1. Connect local community food providers and set up local joint arrangements. 2. Implement a 'local sourcing' food procurement policy. 3. Improve awareness and knowledge of those in client-facing public roles in food insecurity issues.
Raising Yorkshire pride in food businesses	• Celebrating and supporting a local food economy that prioritizes local food products, connects food producers and food citizens, and progresses more self-reliant and resilient food networks. • Putting good food entrepreneurs and enterprises at the heart of local economic development to ensure that buying local is the healthy and easy choice whilst also creating jobs, businesses and prosperity and regenerating high streets and local places.	1. Develop a North Yorkshire strategy for growth and development of holistic food/business approaches. 2. Establish food enterprise zones. 3. Establish a dynamic food purchasing system*.
Welcoming innovation in food industry	• Developing and utilizing the emerging science and innovation in diet and nutrition to improve the nutritional quality of food produced for our food citizens.	Priority actions merged with those of the action domain 'Raising Yorkshire pride in food businesses'
Shaping local spaces for healthy food communities	• Enabling communities to reach their full potential to access land and capital assets to grow their own food or set up community spaces for making, eating and sharing food, forming strong community connections and resilience. • Making food hubs the centre of all communities and the places to go for local, nutritious produce.	1. Establish 'know how to grow and cook' schemes in schools and communities. 2. Establish a county-wide community growing initiative.
Producing food with nature	• Creating abundant spaces where people, crops, livestock and wildlife can thrive together to produce more food with better managed natural resources (including water, soil, and woodland). • Promoting sustainable practices of land, ocean and freshwater management that improves biodiversity, better captures and stores carbon, and encourages regenerative dynamics.	1. Invest in farmer-led knowledge transfer about regenerative agriculture. 2. Introduce differential lending for regenerative farming investments. 3. Develop a public-facing campaign for direct action in food sustainability.
Creating an eat well culture through valued nutritional health education	• Enabling and inspiring food citizens to have a better understanding of the nutritional value of healthier food and how we can experience this easily and affordably in our everyday lives. • Increasing self-efficacy, skills and motivation to prepare and consume nutritious food.	1. Develop and roll out a 'whole school approach to food' across North Yorkshire's schools via the North Yorkshire & York Healthy Schools Award [93]. 2. Embed Rethink Food's High School Ready programme for Year 6 pupils [94].
Facilitating circular food economies	• Encouraging regenerative food production and effective business solutions to reduce avoidable food loss, waste and pollution. • Circulating products and materials (at their highest value) and regenerating nature. • Ending linear 'take, make, waste' practices.	1. Ensure stronger retail incentives for regenerative farming. 2. Support business clusters** through investment and local planning.

*Dynamic purchasing systems offer a range of services that are searchable, allowing buyers to filter and engage with the suppliers that offer the relevant goods and services they are looking for. It also offers those services on largely preset contract terms, making the procurement process more efficient and creating a more level playing field for smaller businesses. **Business clusters are geographic concentrations of interconnected businesses, suppliers, and associated institutions in a particular field.

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positionalities as early-career researcher, evaluator and facilitator [85] as well as North Yorkshire 'food citizen' [86]—a term used by the initiative to describe consumers, producers, food businesses, and other people actively participating in the food system—and how he was perceived by other participants. The process of paper writing, editing and review was additionally seen as a core part of the co-creative and reflective process, in shaping and consolidating ideas and learning. Such sense-making was particularly important in meeting the aim of sharing our learning with other interested parties to facilitate similar processes in other transformation initiatives.

Results

The output artefact of our design research was the conceptualization of a transformation-focused evaluation and learning system (TFELS) for Food for the Future in North Yorkshire, aspects of which have already been put into practice (Fig 3). The TFELS treats evaluation holistically, considering its integration with the initiative's wider governance, and combines knowledge descriptive of the past and present (describing the existing TFELS) with prospective knowledge (what we identified as necessary in an effective future TFELS, even if this was not yet being implemented). Five dimensions comprise the TFELS: 1) intended outcomes from the TFELS if it were functioning successfully; 2) evaluation questions; 3) goals and guides; 4) sense-making, learning, and their feedback into decision-making; and 5) integration with actors' organizing for transformation (Fig 3). These five dimensions would in turn be reinforcing each other to produce desired outcomes. Below we describe each of these dimensions in turn, and their interactions, based on the collective design and sense-making process that emerged through the workshops and writing of this paper. More succinct versions of the TFELS illustration focused on dimensions 2–4 are used for communication within and beyond the initiative (S1 and S2 Figs).

1. Intended outcomes

If the TFELS were functioning successfully, it would have numerous outcomes driving the transformational potential of Food for the Future (Fig 3; S3 Table). Broadly, these outcomes relate to food system action, the initiative's learning, and maintaining motivation and transformative intent. Action-related outcomes would include the initiative keenly sensing food system conditions, enabling rapid adaptation, and ultimately supporting more effective transformative action. This is vital in the context of the dynamic, often unpredictable context of the North Yorkshire food system, and in order to intervene in the system in ways that enable the emergence of radically different patterns, rather than more superficial action that fails to disrupt the status quo.

Learning-related outcomes would include a transformed understanding of evaluation as something that genuinely supports transformation, and maintaining a critical, reflexive approach to evaluation that avoids greenwashing and cherry-picking results, with 'failures' recognized as valuable learning opportunities. This is important because TFE requires a major shift in mindset from traditional forms of evaluation, not least to recognize evaluation as intrinsically part of transformation efforts rather than an isolated, technical exercise [14]. Furthermore, without a sufficiently critical and humble approach, the deeper, more useful forms of learning—that truly inform us how to more effectively navigate and steward transformations—are unlikely to occur. Making the learning of Food for the Future explicit and transparent also aids the initiative in sharing its lessons with like-minded organizations and initiatives to positively influence their behavior.

Lastly, the TFELS would be maintaining hope and transformational intent. These are all too easily lost without dedicated effort to maintain them. Transformations are hugely challenging; the complexity of a food system and its resistance to fundamental change can feel overwhelming, and lead to paralysis, hopelessness, and a temptation to resort to smaller-scale, isolated interventions where actors can regain a sense of control [95,96]. This calls for an approach that works with existing positive action and momentum, builds on strengths, celebrates successes, and continually reiterates the motivation for systemic transformation, and supporting joined-up domains of action (Table 2). Through maintaining the initiative's hope, transformational intent and momentum, and ultimately its success in supporting transformation, the TFELS and the initiative more widely would be continuously enrolling new actors, maintaining the system's integrity over time.

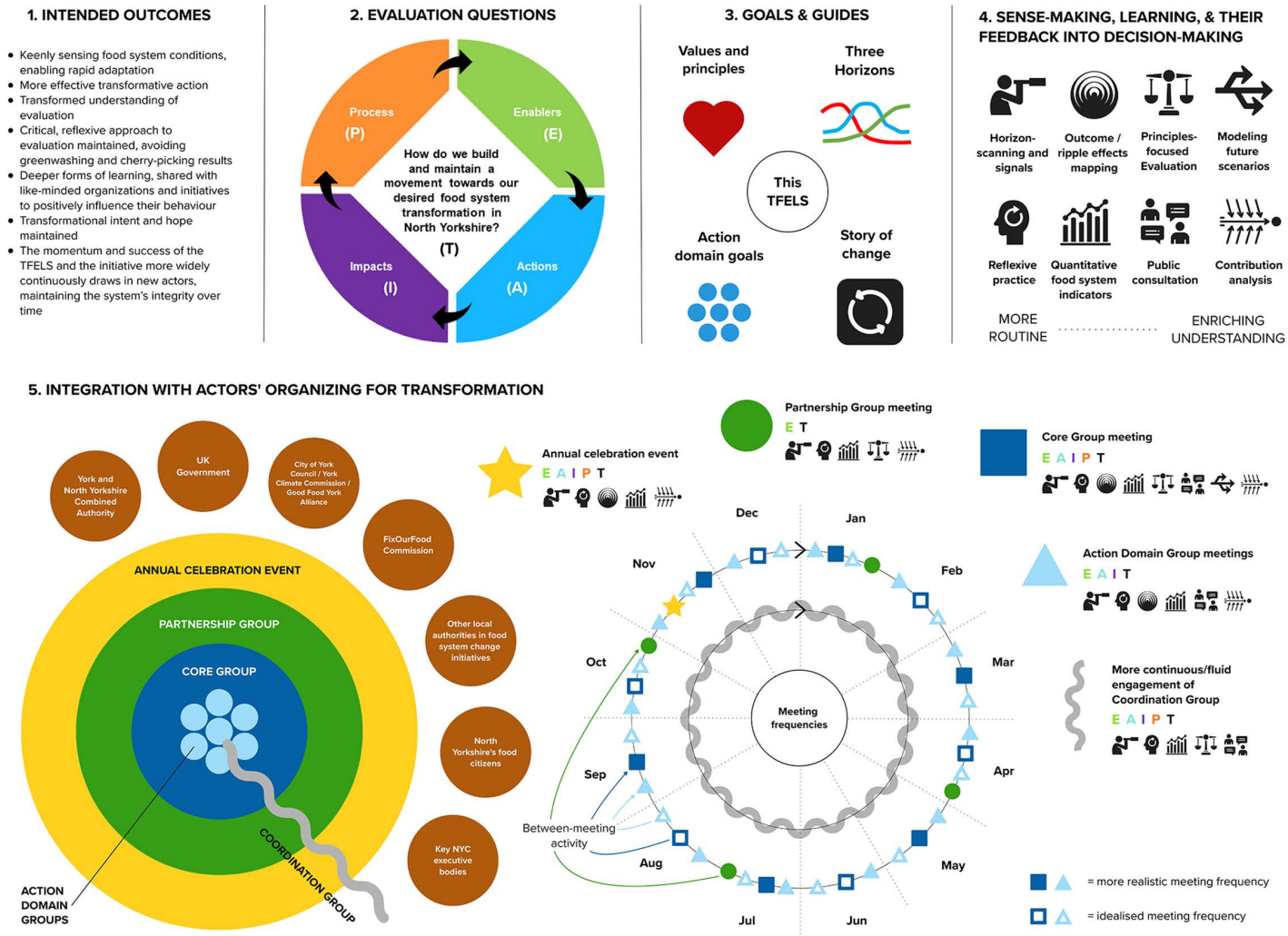


Fig 3. The Food for the Future in North Yorkshire transformation-focused evaluation and learning system. Image produced by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural). See the mural for details.

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2. Evaluation questions

Asking the right questions, and ensuring that they continue to be asked, is essential for an initiative to remain transformation-focused [5,72,88,97]. The evaluation questions frame the whole purpose and focus of Food for the Future as a learning- and transformation-oriented initiative. They focus attention on enabling conditions for a successful and transformational initiative ('enablers'); transformative actions that the initiative should choose to support ('actions'); impacts of the initiative and their contribution (in light of contributions from other sources) to food system transformation and regeneration ('impacts'); and deeper reflections on the initiative's processes and learning ('process'), which, if framed appropriately, could lead to more transformational forms of learning that spotlight the underlying conditions and paradigms needed for effective transformation (Figs 3 and 4). These questions would be addressed in a roughly cyclical way

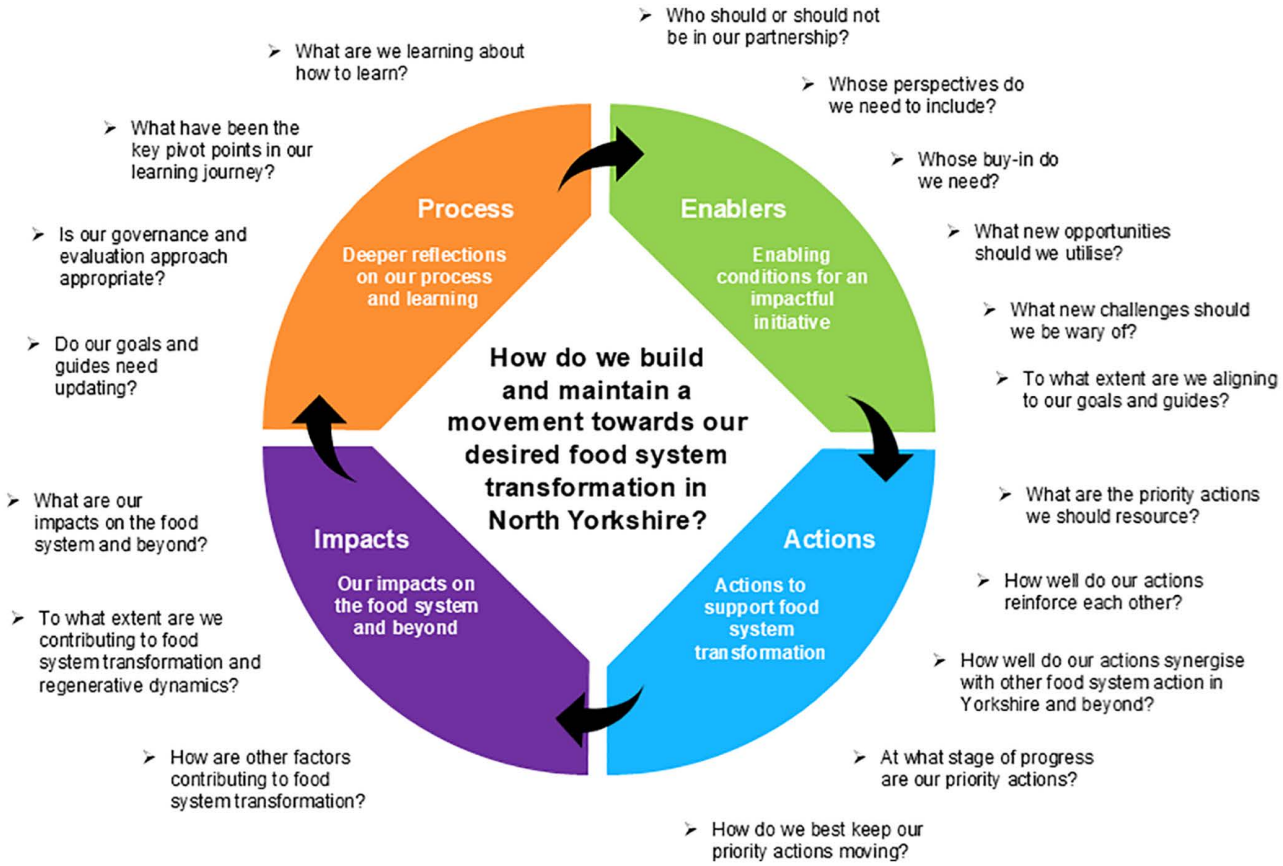


Fig 4. The core evaluation questions of the Food for the Future in North Yorkshire transformation-focused evaluation and learning system. Image produced by Sam J. Buckton.

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(enablers to actions to impacts to process to enablers, and so on) but also concurrently and continuously. The four strands feed into answering the overarching evaluation question for Food for the Future: 'How do we build and maintain a movement towards our desired food system transformation in North Yorkshire?'.

First, enablers include Food for the Future's partnership of stakeholders and their buy-in (financial or otherwise), the extent to which the partnership represents the North Yorkshire food system and the agency within it, the diversity of voices shaping the initiative, emerging food system opportunities and challenges to utilize or be wary of, and the partnership's fidelity to core values and principles (e.g., the focus on transformation). Answering these questions helps the initiative to maintain its potential to stimulate food system transformation, and contributes to the intended TFELS outcome of an agile, adaptive initiative.

Second, evaluation questions related to actions deal with how to choose priority actions for the initiative to resource, how effectively the chosen actions potentially reinforce each other and synergize with other food system action in Yorkshire and beyond, how priority actions are progressing, and how best to keep them moving. Key to this action evaluation is an understanding of 'H2+' actions: in the Three Horizons framework, these are transformative innovations that creatively disrupt the current food system and enable a radically different future food system to emerge, as opposed to 'H2-' actions that are captured by the current food system and extend its lifespan [38] (Fig 1). H2+ actions are those prioritized by Food for the Future. An example of this prioritization exercise took place at the initiative's launch event on 14 November 2024

(hereafter referred to as the 'launch event'), where participants selected two to three priority actions per action domain (Table 2) based on a set of H2+ criteria. The criteria included the extent to which the action disrupts H1 ('disruption'), protects 'pockets of the future in the present' with radically different ways of doing things ('incubation'), encourages deeper shifts in the underlying values, paradigms, purpose and worldviews towards those that align with the vision of a regenerative food system ('depth'), and supports more system-wide change ('breadth'), along with an extra criterion of additionality (the extent to which an action is novel and does not unnecessarily duplicate existing action). Continually revisiting these questions contributes to the intended TFELS outcome of more effective transformative action.

Third, impact evaluation questions ask about the initiative's impacts on the food system and beyond, the extent to which the initiative and other factors are contributing to food system transformation and regenerative dynamics. Importantly, these questions adopt a more complexity-informed perspective on impact that recognizes how multiple influences will affect observed system changes, and considers both positive and negative impacts, both intended and unintended. Answering these questions informs us whether the initiative is being effective in supporting desired food system transformations. If appropriate learning takes place, this should also inform the design of more effective transformative action.

Fourth, process evaluation questions reflect on the initiative's learning journey and the key 'pivot points' (points of inflection where important learning occurred and resulted in a significant shift in behavior), whether its governance and evaluation approaches remain fit for purpose, and whether its values, principles, vision, goals, or story of change need updating (see 'Goals and guides' below). Examples of pivot points have included: realizing the need for a stronger consumer voice in the initiative (October 2023), resulting in the Let's Talk Food survey in spring 2024, with over 2000 respondents [98]; seeing the initiative as a fluid, adaptive movement and 'action framework' [35] rather than a discrete strategy (early 2024); appreciating the initiative's governance and evaluation as more intertwined (April 2024); and diverting the focus of the ELWG towards supporting the Core and Partnership Groups more directly in implementing the TFELS (November 2024). Dedicating time to these process-focused questions and making learning explicit helps not only to keep the initiative's goals and guides, TFELS and governance relevant and effective, but also for sharing its insights with other like-minded initiatives and organizations to enhance their effectiveness in supporting food system transformation. At their most effective, the process evaluation questions would be enabling 'triple-loop learning' or 'transformative learning' [58–60] about the underlying assumptions, beliefs and paradigms at play and whether they remain relevant and appropriate, and learning about *how to learn*. In effect, while the enablers, actions and impact evaluation questions encourage single-loop learning ('are we doing things right?') and double-loop learning ('are we doing the right things?'), the process evaluation questions additionally encourage triple-loop learning ('how do we decide what's right?' or 'what are we learning about how to learn?') (Fig 4) [58].

The TFELS then needs to ensure that mechanisms are in place for this plurality of questions to be continually revisited, and that the learning from them is taken forward. It does this for instance by explicitly integrating the questions into templates for meetings of the actors involved (see 'Integration with actors' organizing for transformation' below), elevating the prominence of the evaluation questions within the overall TFELS (S1 and S2 Figs), and trying to support reinforcing cycles between the different dimensions of the TFELS (see 'Reinforcement between the dimensions of the TFELS' below).

3. Goals and guides

As well as the core evaluation questions, several key 'goals and guides' anchor and orient the initiative and therefore the TFELS, including the values and principles (both explicit and implicit) that the participating actors stand for, the initiative's Three Horizons findings, the goals of each of the seven action domains, the initiative's story of change, and the TFELS itself (Fig 3; Table 2; S3 Fig). These 'guiding stars' are also powerful ways of maintaining hope and a focus on transformation, assuming that they are salient, understood, and genuinely embodied by Food for the Future actors. Making them explicit also makes them evaluable: we can then ask, for instance, whether they remain relevant and effective (see the

'process' evaluation questions above), and ultimately whether they continue to encourage transformative, joined-up action and learning feedbacks.

Values (statements based on beliefs and moral reasoning [90]) that orient Food for the Future include four values agreed upon by stakeholders during a series of workshops exploring transformation-focused modes of governance (Fig 2): 1) we are inclusive and value the diverse perspectives of our partnership; 2) we are ambitious and encourage creativity; 3) we are reflexive and create space for learning; and 4) we are collaborative and support each other to achieve our shared goals. These values are largely based on NYC's four core values (inclusive, ambitious, creative, and together, abbreviated to 'I ACT') [99], and intend to shape the conduct of actors in the initiative. Other explicit values include those from a 'value contrasts' exercise in the Three Horizons process [38], which contrasted the values, assumptions, beliefs and worldviews underpinning the current problematic food system with those underpinning the desired future regenerative food system [35]. For instance, whereas current food system values were seen as overly profit- and cost-driven, empowering large businesses at the expense of smaller ones, dependent on volatile globalized supply chains, reactive, and distanced from nature, in the future food system these values were seen as transformed to being driven by purpose and health for people and planet, empowering smaller purpose-led businesses, built around local food self-sufficiency, proactive, and connected to nature [35]. These value contrasts are a short-hand way of describing the desired transformation, and help to evaluate the kinds of action that will support such value shifts and thus stimulate transformation. Indeed, an important overarching value of Food for the Future, foregrounded particularly by the Three Horizons framing, is transformational intent (i.e., focused on supporting major, fundamental, systemic change, not just superficial change).

Principles are more actionable statements based on various forms of reasoning (including values) that provide more concrete guidance on how to act [90]. Orienting principles arise in Food for the Future from various sources. Many of the values described above are effectively principles when they suggest more explicit ways of acting, such as transformation-focused values that shape the criteria for evaluating possible actions that the initiative should invest in (Fig 3). The initiative also strives to align to principles for TFE [14], and various other principles from different evaluation approaches and frameworks inspired its TFELS design (Table 1), along with a set of principles to guide the design identified by the ELWG (S2 Table).

Other more implicit values and principles play a role in guiding the work of the TFELS actors. One example is *reciprocity*, which is reflected in the mutual reinforcement between action domains in the initiative's story of change (S3 Fig), and is also an aspiration for stakeholder relationships, whereby stakeholders actively benefit from their involvement in the initiative as well as contributing their time, effort and expertise. One such benefit reported by stakeholders is that some of the food system action they are already undertaking has been given a new strategic home within the initiative, increasing its credibility and significance (see mural). Other examples of implicit values and principles include the initiative's enterprising and opportunistic approach to taking action—characterized by 'imperfect action rather than perfect inaction' and avoiding 'paralysis by analysis' (i.e., getting into action to respond to the urgent need for food system transformation, even if such action is incompletely planned, rather than losing time and momentum by waiting to craft more refined action; an idea popularized by Henry Mintzberg [100,101]), and working with existing momentum in the food system rather than continually creating something entirely new. Overall, Food for the Future's explicit and implicit values and principles guide decisions and choices in the initiative, play into various aspects of evaluation, particularly of enablers and actions (see 'Evaluation questions' above), and shape the ongoing design of the TFELS (Figs 3 and 4; S2 Table). Evaluating the fidelity to values and principles is the remit of Principles-focused Evaluation [90], and is important for keeping the initiative and its partnership transformation-focused and aligned to its other core values and principles.

Another important guide is the findings of the Three Horizons process that helped to shape the priorities of Food for the Future [35]. As well as the value contrasts described above, these findings include a more detailed vision of the desired future regenerative North Yorkshire food system (Horizon 3) [35]. While the aim of Three Horizons is not to create a perfect future vision, the role of Horizon 3 is more to establish a radical contrast to current patterns, in order for people

to make better choices about the kinds of action needed to stimulate transformative, systemic change. Horizon 3 was summarized as 'everyone has affordable, nutritious and sustainable food in North Yorkshire, for North Yorkshire' [35]. This statement remains a useful guiding star for the initiative. The Three Horizons process also identified seven 'action domains' critical for supporting food system transformation (Table 2), which are fundamental in informing the actions resourced by the initiative—the goals of these individual action domains, and consideration of how they reinforce each other (S3 Fig), are important guides in themselves. Lastly, this TFELS design itself is a guide for Food for the Future, providing an integrated framework in which to situate and make sense of the initiative's evaluation activity. In considering the reinforcing effects between its components in a successful TFELS (see below), the TFELS also in effect provides a higher-level theory of change that complements the envisioned story of how Food for the Future's actions will support food system transformation (Table 2; S3 Fig).

In a well-functioning TFELS, these goals and guides would be strongly steering Food for the Future to focus on stimulating transformative change towards a regenerative food system, and maintain fidelity to this and its other values and principles, aided by frequent Principles-focused Evaluation. The initiative's actors would all feel familiar and comfortable working within the guiding framework of the TFELS itself, which would be helping people to appreciate how their individual activity feeds into the wider TFELS and initiative. The initiative's goals and guides (including the ongoing iterative design of the TFELS itself) would also be kept up-to-date, relevant and effective through frequent review.

4. Sense-making, learning, and their feedback into decision-making

Food for the Future would be 'flying blind' if it had no way of monitoring its progress and impact, making sense of what this collectively shows, and using that learning to alter its activities accordingly. In contexts of transformation in complex systems, particular care is needed to: draw on diverse perspectives and monitoring methods to obtain a richer, more robust picture of the system and how interventions influence it; shift thinking from causal *attribution* (which implies certainty and control) to the *contribution* of an initiative to system change, taking into account other contributing factors outside the initiative's control; focus attention on systemic 'signals' of transformation and regeneration, which might integrate many different indicators; and ensure that learning is fed back into decision-making and action at a speed and timeliness appropriate to the dynamism of the system in question [14]. These considerations shape the fourth component of the designed TFELS: the different forms of feedback from Food for the Future's actors, the food system, and beyond (including horizon-scanning and signals, reflexive practice, outcome or ripple effects mapping, quantitative food system indicators, Principles-focused Evaluation, public consultations, modeling future scenarios, and contribution analysis), how they are made sense of, and how they enable learning about the initiative's enabling conditions, actions, impact, and fitness for purpose of its processes (Figs 4 and 5).

Some feedback derives from horizon-scanning or collective sense-making by the groups in the initiative, including to assess broader signals of transformation and regenerative dynamics. This involves group members sharing anecdotal evidence and their overall sense of significant trends and emerging opportunities and challenges relevant to the North Yorkshire food system. More routine feedback might include: staying abreast of new policy initiatives and priorities that Food for the Future could align to (such as the 'Good Food Cycle' food strategy for England [34] and priorities of the York and North Yorkshire Combined Authority); upcoming opportunities to network or showcase the initiative's work; upcoming funding opportunities; emerging food system crises that the initiative should urgently address; and upcoming events that might affect partners' capacity to engage with the initiative. The PESTLE analysis framework is a helpful reminder of the different political, economic, social, technological, legal and environmental changes to remain wary of [102,103]. Groups would also periodically embellish their horizon-scanning with frameworks such as the Signals of Transformational Change [28,104] (Table 2) to identify evidence of systemic shifts rather than more isolated, smaller-scale change, and the Regenerative Lens [9] or 4 Returns Framework [105] to help identify evidence of regenerative dynamics.

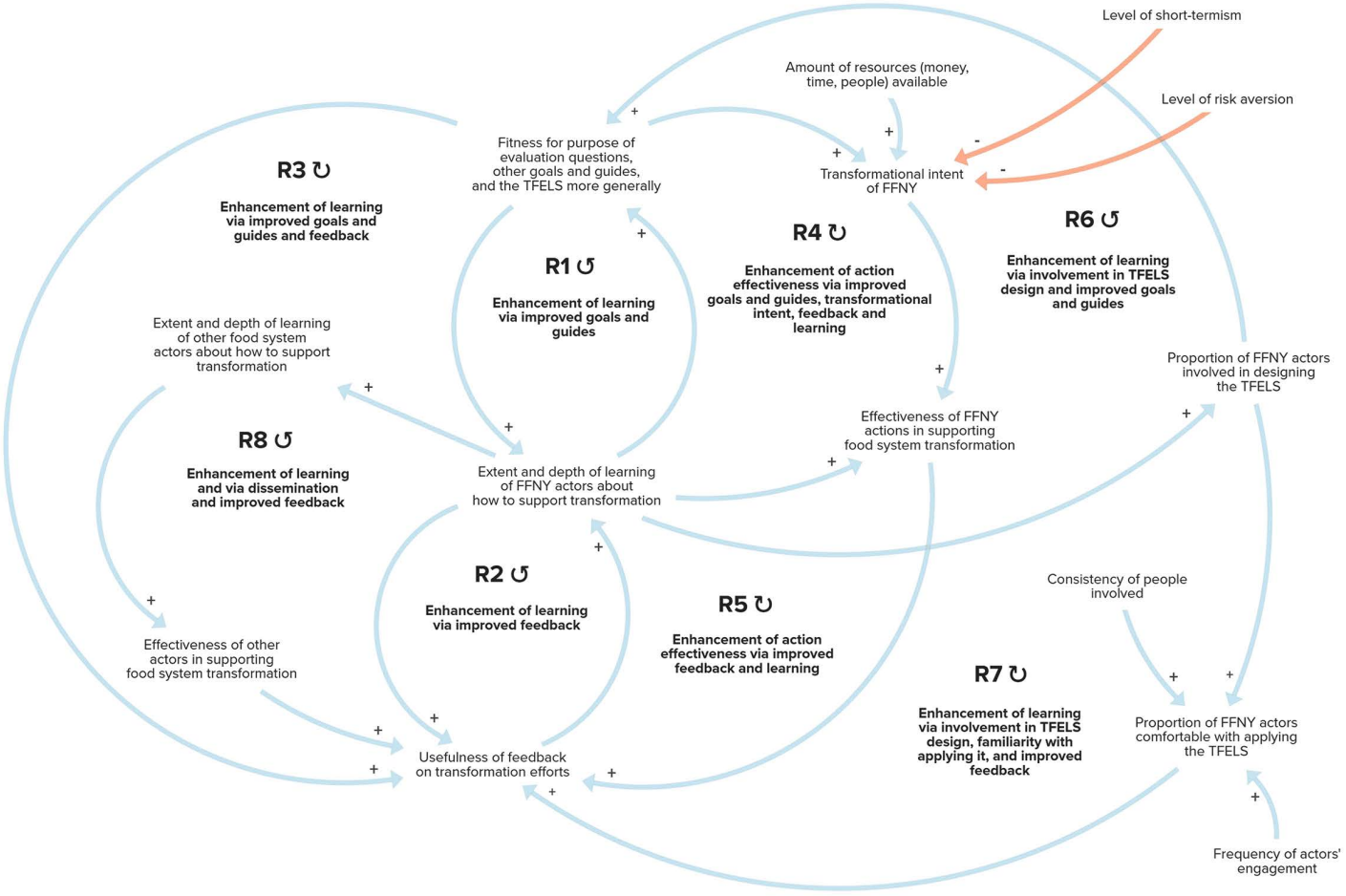


Fig 5. Causal loop diagram for the different components of the Food for the Future in North Yorkshire (FFNY) transformation-focused evaluation and learning system (TFELS), and their reinforcing dynamics assuming a successful TFELS. The diagram shows 'variables' (e.g., 'Usefulness of feedback on transformation efforts') connected by arrows that denote causal influence. A '+' sign at an arrow tip denotes that when the variable at the tail of the arrow increases, the variable at the arrow tip is also expected to increase; a '-' sign denotes that when the variable at the arrow tail increases, the variable at the arrow is expected to decrease. 'R1', 'R2', etc. denote reinforcing loops, where arrows can be followed directionally from and back to the same variable. Text in bold underneath a reinforcing loop name characterizes the loop's dynamics. Some of the variables represent important risks that may disrupt the desired dynamics of the TFELS (e.g., 'Level of short-termism'). Figure created by Sam J. Buckton in Kumu (https://kumu.io/).

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Such analysis would ideally take into account *all* of the various other strands of the initiative's evidence-gathering, and discern the broader story that they collectively tell, as well as people's more intuitive sense of the change taking place in the food system. Participants of these groups therefore matter greatly. In theory, by ensuring a more diverse range of members from different parts of the system, as well as relatively well-connected people with a good overview of substantial parts of the system, a more complete, accurate and up-to-date picture of the system can be obtained. This is important for the initiative to remain adaptive and agile, exploit new opportunities, and pivot to avoid or navigate new challenges—as characterizes a more developmental approach to evaluation, in which evaluation is more continuous and responsive to emerging needs rather than at relatively few discrete time points [87,88]. This enables adaptation to dynamic, unpredictable, and constantly shifting system conditions. Staying attentive to emerging change and signals of more systemic shifts also raises awareness of other factors influencing change in the food system, which are important to take into account

when evaluating the initiative's relative impact and contribution to food system transformation (see contribution analysis below).

Reflexive practice more generally is also intended to be a routine part of Food for the Future's activities. The initiative treats reflexive practice as a deeper form of reflection that continually and critically re-evaluates the values, assumptions, structures and processes underpinning its actions [81], helping them to remain relevant, appropriate and effective. This is particularly important for the process evaluation questions and encouraging triple-loop learning (Fig 4; see 'Evaluation questions' above). Ideally this would include periodic updating of the Three Horizons findings, particularly the future vision (Horizon 3) and value contrasts between Horizon 3 and the current food system (Horizon 1), as well as the action domain goals and story of change. Reflexive discussions around the process evaluation questions (Fig 4) could be facilitated and framed by prompts like: 'Considering everything that's going on, do we feel our assumptions about how we're going to achieve transformation are still broadly correct, or are we actually telling a different story of change?.'

Outcome or ripple effects mapping is a more structured feedback process employed by Food for the Future, used to capture emergent outcomes and impacts of the initiative (both positive and negative) regardless of whether they were planned or expected. An example of this exercise applied at the initiative's launch event asked participants to write their answers to the question: 'What outcomes or impacts have you noticed already from the food strategy development and your involvement in it?'. Subsequent analysis of the results provided a useful snapshot of positive outcomes already emerging from the initiative (such as the space it provided for discussion, networking, and learning about the food system, and its influence on other ongoing strategy development within NYC), suggesting aspects to continue and build on, as well as areas that needed improvement, such as including the under-represented voices of young people, farmers, and healthcare representatives, and ensuring stronger buy-in and commitment from senior levels in the council (see mural). Like horizon-scanning, mapping emergent outcomes helps Food for the Future to remain agile and adaptive.

Quantitative indicators complement the qualitative dimensions of food system feedback. A centralized, accessible, interactive, quasi-real-time, digital dashboard visualizing key quantitative 'Sentinel Indicators' [91] of food system health and their change over time is currently in development, with the intention of making it available to Food for the Future stakeholders. The indicators, including measures of dietary health, food economy and security, carbon emissions, biodiversity, environmental health, etc., would be updated as new data became available. This dashboard would enable frequent and rapid 'pulse checks' of the North Yorkshire food system and illustrate trends in its health over time. Realistically, linking Food for the Future actions to changes in broad-brush food system indicators will be extremely difficult, if not impossible. To do so would require experimental randomized controlled trials with counterfactuals and/or in-depth contribution analysis (see below). The proposed dashboard is nevertheless likely to be useful as a complementary source of information about the state of the food system and what this suggests the initiative should prioritize. Integrating this quantitative evidence with more qualitative and intuitive forms of feedback will be important for evidencing decisions in a more robust, traceable way.

Less routine feedback-gathering includes consultations, scenario modeling, Principles-focused Evaluation, and contribution analysis. Surveying or interviewing North Yorkshire's food citizens provides important qualitative feedback on food system challenges and priorities, an example being NYC's Let's Talk Food survey [98]. Over 2000 North Yorkshire residents responded to a questionnaire focused primarily on accessibility of healthy food and the problem of food waste; amongst other findings, this highlighted the importance of reducing the cost of healthy food, reducing junk food advertising, supporting local food-growing spaces, and addressing the issue of retailers selling food in larger quantities than needed (increasing food waste) [98]. These insights continue to influence the priorities of Food for the Future. In future, such consultations might also directly comment on interventions undertaken by the initiative. Methods such as Qualitative Impact Protocol (QuIP) and Most Significant Change could be used to structure feedback in such cases [106,107]. Another form of quantitative feedback comes from modeling future food system scenarios, which is possible using FixOurFood's AgriFood Calculator [108,109]. For instance, greenhouse gas emissions from different dietary changes in the

UK can be modelled. This could help to gauge the scale of changes needed in the North Yorkshire food system to achieve desired outcomes. Principles-focused Evaluation [90] is required to assess whether Food for the Future remains faithful to its values and principles, and whether these remain relevant (see 'Goals and guides' above).

Lastly, contribution analysis is a rigorous, qualitative, deductive evaluation of the initiative's contribution to observed food system change [12]. This analysis might assess whether the initiative made minor or major contributions to an observed food system change, for instance. Contribution analysis is based on a previously articulated theory of change or contribution story and iteratively refines it in the process, highlighting the importance of a well-defined story of change (S3 Fig). One early finding is that Food for the Future is considered to have accelerated progress in designing a new regional public food procurement policy that prioritises smaller purpose-led businesses and local sourcing (see 'Securing nutritious and affordable food for all' action domain, Table 2)—progress that is unlikely to have occurred as rapidly in the absence of the initiative, and due particularly to the cross-system engagement that it stimulated.

In a well-functioning TFELS, horizon-scanning, reflexive practice and outcome mapping would be a routine part of every meeting of all groups involved and enabling deeper forms of learning to occur. This would not only be helping Food for the Future actors make sense of their own experiences and transform their ways of working, but also to communicate these insights with other initiatives on similar journeys. An easily accessible dashboard would be providing quantitative updates on food system health, and regular consultation with North Yorkshire's food citizens would be providing qualitative feedback on Food for the Future activities, impact stories, and updates on food system challenges and priorities. Scenario modeling would be helping to keep ambitions high and sense-check priority actions. Periodically (e.g., every other meeting), the initiative's Partnership Group (see below) would use Principles-focused Evaluation techniques to check whether the initiative's values and principles remain relevant, and whether they are being adhered to (particularly the focus on transformation). Contribution analysis would be a central activity at annual celebration events, and the initiative's story of change would be continuously updated throughout the year as new evidence of its impact arises. These multiple forms of feedback would be analyzed both individually and collectively—by diverse representatives of the initiative and those more external to it—to make sense of what, overall, they are telling the initiative about the signals of transformation and regeneration in the North Yorkshire food system, and the initiative's direction, progress, contributions, and impact. Food for the Future actors would also remain sensitive to what forms of feedback are *missing* and necessary for deeper learning to occur.

Overall, this use of diverse forms of feedback would be keeping Food for the Future agile and adaptive, providing a rich picture of food system conditions and the initiative's impact, keeping the initiative true to its transformation focus and its other important values and principles, and refining the initiative's story of change. Sharing evidence of positive impact would be keeping morale and motivation high, while negative impacts would be seen as equally valuable opportunities for learning and adaptation.

5. Integration with actors' organizing for transformation

TFE rests on the assumption that all actors within an initiative, in some way, need to take part in the evaluation and learning that supports the desired transformation [14]—in other words, that evaluation must be considered an integral part of change processes—even if some actors are focused more on taking action, and others more on the evaluation itself. Conversely, appropriate governance-related processes—such as the membership of groups, how partnerships are coordinated, the frequency and structure of meetings and workshops, how decisions are taken, etc.—are essential for producing the desired outcomes of a TFELS. Even something as simple as the frequency of meetings has major implications for how momentum and transformational intent can be maintained, and how quickly an initiative can adapt to changing conditions. As such, any TFELS design needs to be closely integrated with an initiative's wider governance and organizing for transformation. The Food for the Future TFELS therefore considers how evaluation hinges on the effort, interaction and evaluative activity of the various groups of people involved (Fig 3).

Ten groups are central to the TFELS, with various other groups playing important peripheral roles. The 40-strong Partnership Group plays more of an advisory and peer support role in steering the initiative. The Core Group, with 12 members, comprises the leaders of the groups associated with each action domain (seven Action Domain Groups), and is more heavily involved in coordinating the activity of the Action Domain Groups and the initiative's priority actions. Having some overlap in the membership of these groups is important for the coherence of the initiative. The Coordination Group, consisting of four NYC Public Health officers, attends Core and Partnership Group meetings, prepares meeting agendas and minutes, organizes events, and generally coordinates the initiative, the TFELS design, and evaluation and learning activities, supported by three University of York researchers from the FixOurFood programme [39]. All of these groups come together for the annual celebration events. Each group plays an evaluative role in the TFELS (Fig 3) and provides, collates and shares different forms of feedback for the initiative.

Several other actors play important, more peripheral, roles in the TFELS, albeit potentially using different evaluation criteria to actors within Food for the Future. One example is the York and North Yorkshire Combined Authority, which has significant financial resources, provides a link between NYC and City of York Council, and whose strategies are important for NYC to align to. Strategies and policies of the UK Government that intersect with food (e.g., the ongoing 'Good Food Cycle' national food strategy development [34]) also have a bearing on what actions Food for the Future prioritizes. Because North Yorkshire is a key 'foodshed' or food-growing hinterland that supplies the city of York, the City of York Council, York Climate Commission, and the Commission's Good Food York Alliance working group provide important linkages for aligning city and regional food system action. The FixOurFood Commission grew out of the FixOurFood research programme [40,110], and aims to support and cohere food system transformation in Yorkshire, particularly by integrating scientific research with practical experience to bridge the gap between theory and action in the food sector; it has close ties with members of FFNY's groups. Other local authorities in food system change initiatives (e.g., Leicestershire County Council [111]) provide opportunities for sharing learning. North Yorkshire's food citizens more generally provide feedback to the initiative via consultations and more informal channels. Finally, the main executive bodies of NYC are important peripheral actors. Any Food for the Future actions that significantly affect NYC services or require substantial financial investment must be escalated and approved through a hierarchy of directorates, boards and other decision-making bodies in the council, which can be time-consuming. Having the regular engagement of one NYC Councillor in the Action Domain, Core and Partnership Groups, and strong buy-in of another, has helped to legitimize Food for the Future and increase the likelihood of its actions obtaining wider senior-level approval and committed resourcing. Less substantive actions, particularly if they update an existing action or strategy, can obtain more informal sign-off.

In a well-functioning TFELS, the Food for the Future groups would be meeting regularly to: maintain momentum; enable more regular assessments of, and rapid adaptation to, dynamic food system conditions; and continually reiterate commitment to supporting transformation. Action Domain Groups would be meeting at least fortnightly, the Core Group at least monthly, and the Partnership Group at least quarterly (with group member activity continuing in the interim), alongside an annual celebration event involving all groups, and more continuous, flexible engagement of the Coordination Group. Annual celebration events would offer an opportunity to take stock of progress and impact during the year, examine overall signals of system change, celebrate successes to maintain hope and commitment, reiterate the cross-system intent and reinforcement of actions, and revise key aspects of the TFELS (e.g., the initiative's story of change, or how the its action domains are expected to reinforce each other to support food system transformation; see S3 Fig and 'Goals and guides' above). There would be relatively low member turnover, enabling consistency and the development of strong, trusting working relationships, and reflecting actors' commitment to support the initiative over time, although a co-leadership approach (e.g., at least two people spearheading an Action Domain Group) would be ensuring some resilience in cases of people having to drop out (e.g., due to illness).

Importantly, a balance would be struck between Food for the Future responding to wider food system actors, and those actors aligning with Food for the Future: the initiative's inspiring collective mission, particularly when evidenced with

stories of success, would be encouraging wider actors to support it. Harnessing this networked agency is imperative to extend the initiative's influence in shaping food system dynamics.

6. Reinforcement between the dimensions of the TFELS

The intended outcomes of the TFELS (Fig 3) would be arising not just from its five components individually, but also through reinforcement between them (Fig 5). Eight positive reinforcing loops are key (Fig 5). First, the TFELS would encourage deeper reflexivity and 'learning how to learn,' informing improvements of the TFELS and its goals and guides that further facilitate learning (R1). Second, more effective learning means that FFNY actors provide more useful feedback on the initiative (e.g., that addresses the initiative's underlying paradigms and assumptions), resulting in more effective learning (R2). Third, the initiative's actors improve the TFELS based on feedback and learning, thus identifying more useful forms of feedback that need to be gathered (R3). Ensuring that the 'process' evaluation questions are embedded in initiative's activities, that they draw attention to deeper kinds of learning and what kinds of feedback are *missing*, and that there are clear mechanisms for how this learning is used to adjust the TFELS and the initiative's activities, will be key for generating these reinforcing effects.

Fourth, the TFELS increases and maintains the initiative's transformational intent, leading to more effective action that via feedback and learning shapes a TFELS that more effectively encourages transformational intent (R4), e.g., because actors see that effective transformative action is possible. Fifth, more effective action generates more useful feedback and learning about what is needed for food system transformation, leading to design of more effective action (R5). While learning from ineffective action is also useful, this only reveals what *does not* work, whereas effective action reveals what *does* work in a particular context. Generating these reinforcing effects will require Food for the Future actors to be strongly action-oriented and prepared to take risks, and also to share and celebrate successes and progress.

Sixth, as more Food for the Future actors appreciate the usefulness of the TFELS, more are encouraged to get involved in its continuous improvement, further enhancing its usefulness (R6), e.g., because it will better reflect the diverse needs of the actors involved. Seventh, greater involvement of Food for the Future actors in designing the TFELS increases their familiarity with applying it, resulting in more actors generating useful feedback that deepens learning and encourages more actors to engage with the TFELS (R7). These reinforcing effects will require a 'minimum viable pattern' to be created where a critical mass of actors are familiar with the TFELS and can start enrolling others, and therefore substantial effort initially to normalize use of the TFELS amongst Food for the Future actors.

Eighth, dissemination of Food for the Future's learning improves the effectiveness of other actors' actions in supporting food system transformation (e.g., the food strategies of other local authorities and cities), in turn generating useful external feedback for the initiative that enhances its learning (R8). Supporting this reinforcing effect will require good cross-system communication and transparency between different initiatives. Overall, these eight reinforcing dynamics would be 'spiralling up' the effectiveness of Food for the Future and its TFELS in supporting food system transformation (S3 Table). At the same time, the TFELS highlights important risks that could disrupt these desired dynamics. For example, lack of resources (money, time, people), short-termism and risk aversion could all water down the initiative's transformational intent, while the frequency of actors' engagement and consistency of the people involved both have implications for the proportion of Food for the Future actors comfortable with applying the TFELS (Fig 5).

Discussion

The movement towards transformation-focused evaluation (TFE) is a relatively recent chapter in the evolution of the evaluation field, a major and challenging departure from mainstream evaluation practice, and lacking in case studies of its design and application [14]. Our study provides a rare insight into the collaborative process of designing, and starting to implement and embed, TFE in the context of large regional-scale food system change. Food systems are major contributors to global crises and require urgent transformation [112–116]. A growing number of initiatives across the world are

taking up this challenge and evaluating the effectiveness of their efforts [117–120]. The Food for the Future in North Yorkshire transformation-focused evaluation and learning system (TFELS) shows how core evaluation questions, goals and guides, and different forms of feedback could be integrated within an ecosystem of actors striving to support food system transformation (Figs 3 and 5). The TFELS also illustrates how reinforcing dynamics would be set up between its different components, driving desired outcomes that support food system transformation (Fig 5; S3 Table).

Innovations, progress and challenges in the Food for the Future TFELS

Two aspects stand out as innovative in our study. First is its consideration of evaluation in a holistic way, interwoven with the wider governance and work culture of a change initiative, rather than an isolated technical exercise or focusing primarily on measuring and monitoring indicators of change. Most existing evaluation frameworks for food system transformation focus on specific metrics, for instance [118,120–122]. Instead, Food for the Future considers these as components of a higher-level TFELS. This resonates with the recent 'explosion of interdisciplinary hybridization' [18] combining evaluation, monitoring and learning with other professional fields, including strategy, impact, and futures studies, which has been characterized by some as a move towards 'SMILE' frameworks (Strategy, Monitoring, Impact, Learning and Evaluation) [18,123].

The relatively autonomous, integrated nature of the Food for the Future TFELS reflects its context. Although aspects of TFE are now more frequently being applied to evaluate the impact of major funders—such as the Climate Investment Funds and other multilateral development funds, and philanthropic foundations [14,18,28,104]—such evaluation is usually carried out periodically by an independent evaluation team in order to hold the organization in question to account. In the case of Food for the Future, several factors made a more embedded, user-empowering approach appropriate. One is cost: NYC (and its wider partnership) would struggle to afford external expert evaluations. Another is the speed of contextual change: the dynamic conditions of NYC and the North Yorkshire food system necessitated relatively continuous, developmental forms of evaluation that could be called upon immediately in response to emergent needs. The third factor is that it was considered possible for the initiative to fairly hold itself accountable. It then became imperative to build the initiative's capacity to reflectively self-evaluate, and to weave evaluation into the fabric of the initiative's networked governance. In this sense our case study resonates with ideas about 'adaptive management' [124] and 'dynamic capabilities' [125], and bears similarity to the various exemplars of Developmental Evaluation and Empowerment Evaluation applied around the world [76,126] (see also Table 1), but emphasizes the focus on large-scale transformation and systemic change not necessarily present in those examples.

A second innovative aspect of our study is that it is, to our knowledge, the first to show how Three Horizons could be integrated into a wider evaluation and learning system of an ongoing transformation effort. Most case studies use Three Horizons only as an initial scoping and strategy exercise [38], whereas here we show the implications of Three Horizons for choosing what system interventions to resource, shaping a story of change, ensuring fidelity to transformational values and principles, evaluating impact, and overall as a key guide for the TFELS. Overall, these advances mean that our findings are likely to be most relevant to other relatively ground-up, transformation-focused, networked, emergent change initiatives, particularly those coordinated by or otherwise involving local authorities at regional or city levels. In the UK, this scale of governance is becoming an important frontier for innovative food system change [127–130], despite the financial constraints faced by many local authorities.

The TFELS design has now effectively become one of the goals and guides of Food for the Future, and an important orientation towards actually implementing TFE. Some aspects of the TFELS are already being implemented and embedded. Most of TFELS' key groups of actors are in place, and the TFELS has been used to create and trial templates for structuring meetings of the Action Domain, Core and Partnership Groups, including suggested periodic activities such as horizon-scanning, reviewing membership of the Food for the Future partnership, evaluating progress on priority actions, outcome mapping exercises, identifying any evidence of impact or feedback mechanisms that need to be put in place

to gather evidence, and reviewing the initiative's story of change. All four strands of the evaluation questions (Fig 4) are already being addressed to some extent, with particular attention on enablers and actions (reflecting the early stage of the initiative). For example: the initiative's groups are already adept at horizon-scanning thanks to their high connectivity and attunement to activity affecting the food system (enablers); multiple stages of H2+ action prioritization have taken place, including at the launch event (actions); there is precedent for ripple effects mapping (impacts); and the Coordination Group is familiar with reflexive practice, such as recording pivot points (process). Food for the Future is also strongly guided by many of its values, Three Horizons findings and action domain goals, and is applying many principles of TFE (Table 1). Alongside horizon-scanning, reflexive practice and ripple effects mapping, it is already clear how feedback could be obtained via public consultations (such as the Let's Talk Food survey). It can thus be seen how key actors, evaluation questions, goals and guides, and various forms of feedback are starting to fall into place as building blocks of a functioning TFELS in Food for the Future. We are struck by how concepts such as transformation, H2+ actions, and ripple effects are now strongly part of the initiative's mutual language and understanding—which has enabled a more sophisticated level of conversation, planning and organizing to occur in support of transformation, as identified by participants at the initiative's launch event (see mural).

Some of the intended outcomes of the TFELS are also becoming apparent. For instance, Food for the Future is already rapidly sensing and adapting to observed changes in the food system. At least amongst the Coordination Group and ELWG, we have also started to develop a transformed understanding of the role of evaluation that aligns with transformation-focused evaluation [14]. The TFELS also appears to be enabling deeper forms of learning, at least amongst the Coordination Group, as evidenced by the various pivot points since the initiative's inception, for instance, and the initiative has been actively sharing its insights more widely, both within and outside North Yorkshire Council (e.g., with Bradford City Council, Birmingham City Council and Sheffield City Council, and via other regional connections through the Office of Health Improvement and Disparities Community of Improvers Food Systems Network). Collectively writing this paper, for example, has consolidated and is disseminating our learning.

The initiative has even started to have wider positive ripple effects, many of which were not foreseen. An interesting example was a fundamental shift from seeing Food for the Future as a relatively discrete strategy to seeing it as more of an adaptive 'framework for action' [35], which we feel reflects a more fluid, developmental approach to action and evaluation that has already been embraced by the initiative. Furthermore, the sharing of emerging findings of the ELWG at one of NYC's 'Lunch and Learn' sessions in June 2024 has since led to a new transformation-focused collaboration between the University of York, NYC Public Health, and the council's Transformations Team that oversees innovation, thus disseminating new approaches more widely within the council. Food for the Future has also informed and inspired other ongoing strategy development, such as NYC's Green and Blue Infrastructure Strategy (see mural), as well as a new transformation-focused initiative, Moving North Yorkshire (coordinated by NYC in collaboration with North Yorkshire Sport), to create a physical activity and movement framework supporting people in North Yorkshire to be 'stronger for longer' in mind and body through movement, play, and sport. Moving North Yorkshire is applying a similar Three Horizons-informed approach which, notably, is being facilitated primarily by NYC and North Yorkshire Sport rather than FixOurFood facilitators, reflecting a substantial degree of normalization and confidence in applying transformation-focused methods within these public service providers.

Nevertheless, Food for the Future still has considerable work to do to refine, apply and embed its TFELS before it reaches the level of sophistication that the TFELS design describes. For instance, only the Partnership Group and Coordination Group currently meet at the frequency considered necessary for an optimally functioning TFELS. The Action Domain and Core Groups meet less frequently because of members' other time commitments (members contribute to the initiative in a voluntary capacity), and/or some Action Domain Groups are still in the process of establishing themselves and finding their way into a meeting pattern that works for their members. A more realistic frequency of engagement at present is monthly meetings per Action Domain Group, and bimonthly meetings for the Core Group (Fig 3). Food for the

Future has also had to adapt to significant member turnover (e.g., due to people changing jobs) and some members having to miss scheduled meetings and events, e.g., due to illness, holidays, and clashes with other commitments. For instance, the 'Welcoming innovation in food industry' and 'Raising Yorkshire pride in food businesses' action domains (Table 2) have occasionally been merged (e.g., at the launch event) due to insufficient representation of the former group. Overall this highlights the challenge of achieving the necessary level of commitment and consistency from people in the busy reality of their working lives (Fig 5), which might become easier as the initiative moves more deeply into phases of action and impact. In practice, the priority becomes more about ensuring a relatively small critical mass of people remains committed and keeps the initiative ticking over.

Regarding the TFELS' evaluation questions and other goals and guides, there has been limited normalization beyond the Coordination Group of the kind of reflexive practice required for the 'process' evaluation questions (Fig 4), particularly around the political dynamics of the initiative. Moreover, some of the initiative's values and principles remain relatively aspirational, identified as crucial to achieve food system transformation but not necessarily well-reflected in actual behavior. Two important examples are remaining transformation-focused (i.e., focused on supporting major, fundamental, systemic change, not just superficial change, and embodying this focus in action and how the initiative holds itself to account through evaluation), and supporting the health of non-human nature. Both are at high risk of being overridden by people's tendency to opt for whatever is easiest, quickest, cheapest and least contentious, and to focus on human needs, often at the expense of wider nature. Although undertaking Three Horizons has left transformation at the forefront of the Coordination Group's minds, like many other initiatives [131] Food for the Future risks losing sight of its transformational imperative (Fig 5) and systemic, joined-up nature of its action, there having been limited engagement with its story of change to date (S3 Fig). More generally, there has been little effort thus far to revisit the initiative's goals and guides to assess their continued relevance, and the TFELS as a whole is only a recently cohered framework that has had limited sharing and habituation across all of the initiative's stakeholders, particularly outside of the Coordination, Core and Action Domain Groups. Overall, this highlights the importance of continually reiterating the initiative's transformative intent, actively embedding frameworks such as the Regenerative Lens [9] in the initiative's goals and guides to maintain a focus on regenerative dynamics and ecological flourishing beyond merely human health, and helping stakeholders understand the value of a more developmental, and adaptive and reflexive approach to evaluation, ideally through applying and experiencing the TFELS themselves.

While some forms of feedback are well-established, in practice others are not yet familiar or embedded across all actors in the TFELS. Many priority actions are in pre-implementation phases, so one of the key forms of feedback in the TFELS—namely, feedback about the effectiveness of Food for the Future's food system interventions—is not yet widely provided. Aspects like Principles-focused Evaluation, scenario modeling and contribution analysis are still relatively unfamiliar and require considerable competency- and capacity-building to implement, and a dashboard of quantitative indicators has yet to be materialized. It is also currently unclear how multiple sources of feedback would be integratively analyzed to reach overarching evaluative judgements about signals of transformational change and regenerative dynamics, and about the initiative's effectiveness in a way that avoids over- or under-playing its impact. Ultimately, although many aspects are already in place, the TFELS also highlights the importance of reinforcing dynamics between these aspects (Fig 5), which are not yet well underway. But this is where the TFELS design can continue to act as a guiding star that pushes the aspiration and ambition of Food for the Future, and a template for continual assessment of the initiative's progress in embedding the various dimensions of the TFELS.

A key challenge for the TFELS' dimensions of sense-making, learning, and their feedback into decision-making, is the balance between monitoring and adapting to emergent food system outcomes, and accountability for actually stimulating a desirable transformation as described by the initiative's theory of change. On the one hand, TFE requires us to relinquish our assumption that we can easily control systems' behavior, but on the other hand it still requires initiatives to remain transformation-focused in their thinking and action, intent on reaching regenerative futures and building on existing

regenerative practice in the present, and attentive to whether desirable transformations are indeed occurring, and what contribution the initiative has made to such changes. The latter is particularly important for maintaining the trust and commitment of an initiative's partnership of stakeholders, and would include some reflecting back to the initiative's original Three Horizons findings and the extent to which these match reality, including the regenerative food system of 2043 (i.e., 20 years into the future) that it envisioned. Local authorities such as NYC also carry a responsibility to use public money effectively. Overall, this highlights the importance of maintaining some accountability for the *efficacy* of Food for the Future, whilst also broadening its accountability to include wider developmental learning and adaptation to unpredictable conditions.

A related challenge concerns how diverse perspectives of stakeholders are navigated and integrated, and what decisions and actions ultimately get taken forward. Thus far, there has been relatively little in Food for the Future's story that has been strongly contested within the partnership. Currently, the initiative aims to reach broad rather than full consensus amongst its partners, and accepts that some executive decisions ultimately need to be made (after taking into account different views) by the initiative's Coordination Group, Action Domain Group leads, etc. that will not satisfy all parties. Three Horizons also tends to integrate and juxtapose different views rather than resolving them [40]. But more controversial decisions will inevitably arise in the future—such as stances on meat and plant-based diets [132,133]—and shifts in party leadership within NYC following elections will also test the resilience of the initiative.

These challenges, indicative of the early stage of Food for the Future as a whole, highlight some of the caveats in the presented TFELS design. Our study nonetheless provides valuable insights particularly for similar emerging system change initiatives navigating their design phases. Future research with Food for the Future will focus on identifying key enablers for implementing system transformation and maintaining commitment, transformational and regenerative intent, and transformation-focused evaluation, through appropriate communication, dissemination, engagement, and valorization activities with respect to the TFELS. The initiative's 'story of transformation' will also be fleshed out, particularly with a view to applying contribution analysis. More broadly, we suggest that future research and practice could usefully investigate aspects such as: when and how powerful actors of the status quo (e.g., supermarkets) can be strategically enrolled so that they become active players in supporting transformation rather than holding it back; the most effective forms of governance for transformation-focused partnerships and their evaluation; and how organizations and initiatives can adopt more transformation-focused evaluation whilst dealing with deepening crises and institutional, ecological or societal collapse [31,131], or possibly even taking advantage of these conditions 134].

Our study also suggests an important hybrid role for action-oriented collaborating researchers embedded in change initiatives, acting flexibly as facilitators, mentors, advisors, stakeholders and advocates as well as researchers. In Food for the Future, this relationship between academia and policymakers has been a win-win—albeit whilst navigating the challenging power dynamics of SJB and the other academics involved being perceived as ultimate experts (spoiler: this is often not the case!), which makes it harder to facilitate a more empowering, utilization-focused process. We would even question whether an initiative like Food for the Future would have been possible to get off the ground without the combination of an 'anchor institution' like NYC in a coordinating position and committed to taking action forward (including buy-in from the Council's leadership and executive bodies), and the support of action researchers. For local authorities with fewer resources, and even more competing demands, it may be more difficult to create the same level of accountability, cooperation, oversight and influence. Nonetheless, the hope is for Food for the Future to eventually become more independent from NYC (although still with NYC's involvement), and perhaps associated more strongly with the Sustainable Food Places network [135]. This shift towards more distributed leadership will be a key test for the initiative—not least in how decisions will be collectively agreed and taken, as discussed above.

Wider lessons for designing, implementing and embedding transformation-focused evaluation

The process thus far of designing, and starting to implement and embed, a TFELS in Food for the Future suggests five important lessons for what is needed to make this process possible, learning from what has worked well in addition to

shortcomings. The first is the need to broaden appreciation of evaluation beyond metrics and impact. Evaluation is commonly understood in relatively narrow terms, being associated particularly with quantitative metrics and indicators, and evaluating projects' impact. This has been the case within NYC, reflective of traditionally risk-averse decision-making in the public sector, but is also a more widespread phenomenon, and a legacy of conventional positivist modes of evaluation [14]. In Food for the Future, we have had to continually emphasize that the scope of evaluation goes beyond only metrics and impact. For instance, it encompasses evaluation of processes, enabling conditions, and the planning of interventions as well as their impact, and considers qualitative as well as quantitative indicators. We have also tried to broaden appreciation of evaluation as a whole continuous way of thinking and acting, rather than merely a discrete technical exercise.

This shifted understanding of evaluation is important for designing and embedding TFE because: it helps to set more realistic expectations of what evaluation can achieve in complex systems (rarely is it possible in such contexts to conclusively, causally link system interventions to observed changes in quantitative indicators); it highlights the more diverse kinds of feedback and evidence needed for system change initiatives, drawing on qualitative as well as quantitative sources (e.g., impact stories and horizon-scanning) and interrogating the strategic and planning stages of an initiative as well as its impacts, in order to maximize the initiative's potential and gain a richer picture of its effects; and it helps people to see evaluation as a developmental culture of working that enables feedback and adaptation at a speed appropriate to the dynamic conditions of complex systems. To facilitate this shift, we would recommend reframing 'rigour' or 'robustness' of evaluation findings as requiring a more holistic, diverse methodological approach that complements and enriches insights from quantitative data, rather than treating quantification itself as the 'gold standard'.

The second lesson is that we found it helpful to draw attention to relatively developmental evaluation practice already being implemented by Food for the Future actors, even though they were not recognizing it as such and applied it intuitively, without much conscious effort to evaluate in a particular way. For instance, SJB noticed that the Public Health officers of the Coordination Group were already adept at working in an agile way, responding rapidly to stakeholder feedback and frequently adapting or pivoting their approach and communication materials, which in their case consisted primarily of a continually updated slide deck. It was also noted that the well-connected members of the Core and Partnership Groups were already enabling rich horizon-scanning discussions in their meetings. Drawing attention to these aspects was important because they were not otherwise being seen as examples of the kind of evaluation approach the initiative needed to cultivate; the evaluation was instead still being treated as a separate, isolated exercise. Showing participants that useful evaluative practice already existed in their culture of working, was considered to make TFE seem more tangible, familiar and feasible, and itself part of an empowering positive deviance or appreciative inquiry approach that builds on potential rather than picking apart problems, and characterizes Developmental Evaluation [88].

The third lesson arising from this work was the need to iterate towards a minimum viable product of the TFELS design rather than aim for perfection, and keep the design as simple as possible but also focused and purpose-led. The design went through eight main iterations (S4–S11 Figs) before the version presented in this paper, which is still being continually updated and refined. After all, the TFELS design will never be an entirely finished product, given the ever-changing nature of the North Yorkshire food system and the initiative's goals. During early iterations (S4 and S5 Figs) it became clear that fleshing out the design in detail was not going to be useful until its core elements and purpose were settled, resonating, and gaining some familiarity with the initiative's stakeholders. We therefore focused on refining the main strands of the initiative's evaluation questions as a starting point (S6 Fig), before bringing in other dimensions of the TFELS (e.g., feedback mechanisms) (S7–S11 Figs). Thus, rather than creating a perfectly complete iteration each time, the most effective iterations were 'minimum viable products' [136] with enough information to feel tangible and be discussed, critiqued, and then further iterated if necessary, but simple enough to be quickly understood.

We also found it helpful to think of the TFELS design in terms of 'memes' that would feel intuitive or stick in people's minds, as well as what accurately described the initiative's needs. For instance, it was considered important for actors to be able to describe the evaluation questions simply as the four main strands of enablers, actions, impact, and process

(Fig 4), and a visually engaging representation of the TFELS was attempted for each iteration, regardless of how much detail had been fleshed out (S4–S11 Figs). This made it easier to start visually seeding the TFELS with wider stakeholders, e.g., in PowerPoint presentations. A key skill required here was sensing (and if necessary, sense-checking via dialogue) when something 'landed well' (or not) with people, which might be expressed implicitly (verbally and non-verbally) as well as explicitly. In general, we assumed that an overcomplicated design would discourage buy-in and use, whilst also recognizing the need for a holistic TFELS (Fig 4 remains a useful shorthand illustration of the crux of the TFELS, with Fig 3 providing greater detail, and other versions providing intermediate detail which are routinely used in the initiative's communications—see S1 and S2 Figs). Overall, this approach bore similarities to the 'double diamond' design approach of iterative divergent activity (investigating, developing, testing) and convergent activity (defining, refining, implementing) [137], albeit with a more continuous chain of 'diamonds'. SJB played a role of iteratively reflecting back to Food for the Future actors how he observed them to be evaluating, as well as updates following the last round of feedback, and growing clarity about what TFE would need to look like for the initiative based on collective sense-making and SJB's individual observations. If the design process ever felt in danger of becoming bogged down or waylaid by debating details, we found it helpful to continually draw attention back to the underlying purpose, values, principles, goals, and guiding questions of the process and the TFELS, and particularly the overarching aspect of the TFELS design and whether these remained accurate or appropriate—trusting that the details would emerge in due course when the TFELS' more substantive elements had become clearer.

In keeping with the iterative, developmental design process, a fourth lesson was that the design team needed a 'bricolage' approach that drew on knowledge of a wide variety of tools, frameworks and methods (Table 1), and remained responsive to emerging needs of the evaluation users. This enabled us to make better decisions about what would suit a particular context, as further elaborated by the Blue Marble Evaluation Bricolage Methods Principle [78], given conditions of limited time (e.g. SJB's PhD timescale, or the speed at which Food for the Future moved into action) and expertise, uncertainty (e.g., of which groups would end up coordinating the initiative), and the fact that no single tool, framework or method was entirely satisfactory for the initiative's purposes. A more efficient use of time was to apply and adapt contextually appropriate existing tools rather than reinvent the wheel. As such, the TFELS drew inspiration from multiple sources, including many focused on transformation (Table 1). Some of these were not incorporated from the outset but rather as new needs and gaps became apparent along the way. Examples included the need for a clearer story of change and application of contribution analysis, Principles-focused Evaluation, and an understanding of the limitations of (especially quantitative) indicators (Table 1). More broadly, the coordination and direction of the TFELS design itself were shifted in response to emerging events and realizations, like the formation of the Core Group, and the need to link the initiative's evaluation more closely to its governance (see 'Evaluation questions' above). Ultimately this bricolaged, responsive approach was important for keeping the TFELS utilization-focused and useful for its end users, even in changeable circumstances, as well as providing opportunities to weave in key concepts and frameworks related to transformation. Utilization-Focused Evaluation was itself one of the foundations of the TFELS (Table 2). This approach has been challenging for TFELS actors to become used to, presumably because of an ingrained tradition of applying standardized methods because they are familiar, 'the done thing', and have precedent, rather than continually question their fit to the situation at hand and creatively adapt, develop and apply new approaches.

A fifth important lesson was to make the process as experiential as possible, whereby participants learn by doing and directly experience applying the TFELS. This enables the TFELS to become more familiarized, for more salient feedback on the TFELS to be generated, and in general to support a more adaptive, experimental way of working. This follows the well-researched phenomenon of practice usually facilitating more powerful forms of learning than more abstract knowledge-gathering [138]. Examples include the application of ripple effects mapping and action evaluation (Figs 3 and 4) at the launch event, or subtler things like adopting a more emergent agenda or routinely sharing good news in ELWG workshops. Another aspect of this experiential approach was basing the TFELS on what was already being applied and

experienced by Food for the Future actors, as described above. Overall, these five lessons suggest that design work should be treated not only as a preliminary exercise, but as an ongoing journey and one that is also key for embedding TFE. Like any form of culture change, embedding TFE requires the building of trust, common purpose, and shared language, which take considerable time and effort to grow. Designing the TFELS has been a vital, often experiential component of bringing people on a shared journey and reinforcing a new culture of working, aided by making explicit the useful practices already being applied.

Conclusions

Our study shows that the design of a transformation-focused evaluation and learning system for Food for the Future needs to integrate core evaluation questions, other goals and guides, and different forms of feedback, sense-making and learning within an ecosystem of actors striving to support food system transformation. It would need to establish reinforcing dynamics between its components to drive the intended outcomes of rapid adaptation to food system change, more effective transformative action, a transformed understanding of evaluation and a critical, reflexive approach that avoids greenwashing and cherry-picking, deeper forms of learning and its dissemination, the maintenance of transformational intent and hope, and a system that maintains its integrity over time by continuously drawing in new actors. The process of effectively designing, implementing and embedding TFE is likely to require: a holistic appreciation of evaluation beyond only metrics and impact; an approach that is iterative, bricolaged, responsive and experiential, combines the actual with the aspirational, and works from existing strengths; and ultimately treating design work as an ongoing and vital part of embedding TFE within a wider culture of working and organizing. We are all apprentices at the end of the world as we know it [139]; in other words, we are entering an unprecedented era of change and uncertainty where old paradigms are no longer fit for purpose, and which all of us are learning to navigate [140,141]. This underscores the vital importance of learning how to embed more developmental and transformation-focused evaluation approaches fit for our dynamic world.

Supporting information

S1 Table. Members of Food for the Future in North Yorkshire's Evaluation and Learning Working Group.
(DOCX)

S2 Table. The Evaluation and Learning Working Group's principles for the TFELS design process.
(DOCX)

S3 Table. Intended outcomes of the transformation-focused evaluation and learning system (TFELS) for Food for the Future in North Yorkshire, if it were functioning successfully.
(DOCX)

S1 Fig. Concise illustration of selected dimensions of the Food for the Future in North Yorkshire transformation-focused evaluation and learning system (TFELS). Such succinct versions of the TFELS illustration focused on dimensions 2, 3 and 4 are used for communication within and beyond Food for the Future. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).
(TIF)

S2 Fig. Even more concise illustration of selected dimensions of the Food for the Future in North Yorkshire transformation-focused evaluation and learning system (TFELS). Such succinct versions of the TFELS illustration focused on dimensions 2, 3 and 4 are used for communication within and beyond Food for the Future. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).
(TIF)

S3 Fig. The story of change of Food for the Future in North Yorkshire in the form of a concept map showing mutual support and reinforcement between its action domains. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).
(TIF)

S4 Fig. First main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from September 2023. The TFELS design went through around eight main iterations before the version presented in this paper. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural). See the mural for details.
(TIF)

S5 Fig. Second main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from October 2023. The TFELS design went through around eight main iterations before the version presented in this paper. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural). See the mural for details. Includes the 'food system flower' diagram of Parsons et al. [41].
(TIF)

S6 Fig. Third main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from November 2023. The TFELS design went through around eight main iterations before the version presented in this paper. Figure created by Sam J. Buckton in PowerPoint.
(TIF)

S7 Fig. Fourth main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from June 2024. The TFELS design went through around eight main iterations before the version presented in this paper. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).
(TIF)

S8 Fig. Fifth main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from June 2024. The TFELS design went through around eight main iterations before the version presented in this paper. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).
(TIF)

S9 Fig. Sixth main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from February 2025. The TFELS design went through around eight main iterations before the version presented in this paper. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural).
(TIF)

S10 Fig. Seventh main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from February 2025. The TFELS design went through around eight main iterations before the version presented in this paper. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural). See the mural for details.
(TIF)

S11 Fig. Eighth main iteration of the transformation-focused evaluation and learning system (TFELS) design for Food for the Future in North Yorkshire, from July 2025. The TFELS design went through around eight main iterations

before the version presented in this paper. Figure created by Sam J. Buckton in Mural (https://www.mural.co/; Tactivos, Inc. dba Mural). See the mural for details.
(TIF)

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References

1. Lawrence M, Homer-Dixon T, Janzwood S, Rockström J, Renn O, Donges JF. Global polycrisis: the causal mechanisms of crisis entanglement. Glob Sustain. 2024;7:e6. https://doi.org/10.1017/sus.2024.1
2. Forchtner B. Climate change and the far right. WIREs Clim Change. 2019;10(5). https://doi.org/10.1002/wcc.604
3. Crews C. The Far Right Culture War on ESG. Religions. 2023;14(10):1257. https://doi.org/10.3390/rel14101257
4. Gertrudix M, Carbonell-Alcocer A, Arcos R, Arribas CM, Codesido-Linares V, Benítez-Aranda N. Disinformation as an obstructionist strategy in climate change mitigation: a review of the scientific literature for a systemic understanding of the phenomenon. Open Res Eur. 2024;4:169. https://doi.org/10.12688/openreseurope.18180.2 PMID: 39399659
5. Patton MQ. Evaluation criteria for evaluating transformation: implications for the coronavirus pandemic and the global climate emergency. Am J Eval. 2021;42:53–89. https://doi.org/10.1177/1098214020933689
6. Díaz S, Settele J, Brondízio ES, Ngo HT, Agard J, Arneth A, et al. Pervasive human-driven decline of life on Earth points to the need for transformative change. Science. 2019;366(6471):eaax3100. https://doi.org/10.1126/science.aax3100 PMID: 31831642

7. UNEP. The Closing Window: Climate crisis calls for rapid transformation of societies (Emissions Gap Report 2022). Nairobi: United Nations Environment Programme; 2022. Available:https://www.unep.org/resources/emissions-gap-report-2022
8. Chancel L, Piketty T, Saez E, Zucman G. World Inequality Report 2022. World Inequality Lab; 2021. Available: https://wir2022.wid.world/
9. Buckton SJ, Fazey I, Sharpe B, Om ES, Doherty B, Ball P, et al. The Regenerative Lens: A conceptual framework for regenerative social-ecological systems. One Earth. 2023;6(7):824–42. https://doi.org/10.1016/j.oneear.2023.06.006
10. Fischer J, Farny S, Abson DJ, Zuin Zeidler V, von Salisch M, Schaltegger S. Mainstreaming regenerative dynamics for sustainability. Nat Sustain. 2024;7:964–72. https://doi.org/10.1038/s41893-024-01368-w
11. Feola G. Societal transformation in response to global environmental change: A review of emerging concepts. Ambio. 2015;44(5):376–90. https://doi.org/10.1007/s13280-014-0582-z PMID: 25431335
12. Junge K, Cullen J, Iacopini G. Using contribution analysis to evaluate large-scale, transformation change processes. Evaluation. 2020;26(2):227–45. https://doi.org/10.1177/1356389020912270
13. Ofir Z, Rugg D. American Journal of Evaluation Section on International Developments in Evaluation: Transforming Evaluation for Times of Global Transformation. Am J Eval. 2021;42:47–52. https://doi.org/10.1177/1098214020979070
14. Buckton SJ, Fazey I, Ball P, Ofir Z, Colvin J, Darby M, et al. Twelve principles for transformation-focused evaluation. PLOS Sustain Transform. 2025;4(4):e0000164. https://doi.org/10.1371/journal.pstr.0000164
15. ANZEA, Superu. Evaluation standards for Aotearoa New Zealand. Superu; 2015. Available: https://anzea.org.nz/assets/Key-ANZEA-Files/ANZEA-Superu-Evaluation-standards-final-020415.pdf
16. Schwandt TA, Gates EF. Evaluating and Valuing in Social Research. New York (NY): Guilford Press; 2021.
17. Chaplowe S, Hejnowicz A. Evaluating outside the box: Evaluation's transformational potential. Soc Innov J. 2021;5.
18. Colvin J, Gallagher L, Gupta T, Ofir Z, Zazueta A. Transformation-focused evaluation: An initiative of the Transforming Evaluation collective. Emerald Network Ltd and The David and Lucile Packard Foundation. 2024.
19. Li Vigni F. Complexity sciences: A scientific platform. Sci Technol Stud. 2021;34:30–55. https://doi.org/10.23987/sts.97027
20. Anderson P. Perspective: Complexity theory and organization science. Organ Sci. 1999;10:216–32. https://doi.org/10.1287/orsc.10.3.216
21. Kirschke S, Newig J. Addressing Complexity in Environmental Management and Governance. Sustainability. 2017;9(6):983. https://doi.org/10.3390/su9060983
22. Seiffert MEB, Loch C. Systemic thinking in environmental management: support for sustainable development. J Clean Prod. 2005;13:1197–202. https://doi.org/10.1016/j.jclepro.2004.07.004
23. Patton MQ. Incorporate Environmental Sustainability in Evaluations. In: Change.org [Internet]. 2024 [cited 9 May 2024]. Available: https://www.change.org/p/incorporate-environmental-sustainability-in-evaluations
24. Van den Berg RD, Svoboda D, Ocampo A, Uitto JI, Mulder SS, Agrawal R, et al. The Prague Declaration: Meaning and Testimonials. In: Van den Berg RD, Magro C, Adrien M-H, editors. Transformational Evaluation for the Global Crises of Our Times. Exeter: IDEAS; 2021. p. 397–434.
25. Gates EF, Vidueira P, Komakhidze M, Aldrich C, Shim C. A critical, integrative review on evaluating systems change and transformation, part one: 2011–2021. Evaluation. 2025. https://doi.org/10.1177/13563890251363232
26. Schwandt TA. Post-normal evaluation? Evaluation. 2019;25:317–29. https://doi.org/10.1177/1356389019855501
27. Cabaj M. Evaluating systems change results: An inquiry framework. Tamarack Institute; 2019. Available: https://www.tamarack-community.ca/hubfs/Resources/Publications/Paper%20Evaluating%20Systems%20Change%20Results%20Mark%20Cabaj.pdf?hsCtaTracking=2797ccdf-cfd3-4309-a6e0-c70b6a7ed5de%7Cfb84904f-568e-4e7f-b063-8040401998b4
28. Williams A, Dickman J, Smurthwaite R. Advancing evaluation and learning on transformational change: lessons from the climate investment funds' transformational change learning partnership. Am J Eval. 2021;42:90–109. https://doi.org/10.1177/1098214020970283
29. Field TA, Ghoston MR. Existential themes of the 2020s syndemic polycrisis. J Humanist Couns. 2024;63:68–77. https://doi.org/10.1002/johc.12232
30. Magatti M. Polycrisis as collapse of the "universal and homogeneous state.". Philos Soc Crit. 2025. https://doi.org/10.1177/01914537251316825
31. Penuelas J, Nogué S. Catastrophic climate change and the collapse of human societies. Natl Sci Rev. 2023;10(6):nwad082. https://doi.org/10.1093/nsr/nwad082 PMID: 37181096
32. Dimbleby H. National Food Strategy Independent Review: The Plan. 2021. Available: https://www.nationalfoodstrategy.org/
33. Defra. Government food strategy. In: GOV.UK [Internet]. 2022 [cited 4 Sep 2023]. Available: https://www.gov.uk/government/publications/government-food-strategy
34. Defra. A UK government food strategy for England, considering the wider UK food system. London: Department for Environment, Food & Rural Affairs; 2025. Available: https://www.gov.uk/government/publications/a-uk-government-food-strategy-for-england/a-uk-government-food-strategy-for-england-considering-the-wider-uk-food-system
35. Everson R, Crossland A, Buckton S, Thompson J, Morris B, Haslam P, et al. Food for the Future North Yorkshire: A Framework for Action. FixOurFood; 2025.
36. North Yorkshire Council. Council Plan 2025–2029. North Yorkshire Council; 2025. Available: https://www.northyorks.gov.uk/your-council/council-plan-constitution-and-strategies/council-plan

37. The University of Sheffield. New map shows where millions of UK residents struggle to access food. In: The University of Sheffield [Internet]. 2021 [cited 19 Jun 2023]. Available: https://www.sheffield.ac.uk/news/new-map-shows-where-millions-uk-residents-struggle-access-food
38. Sharpe B, Hodgson A, Leicester G, Lyon A, Fazey I. Three horizons: a pathways practice for transformation. Ecol Soc. 2016;21:47. https://doi.org/10.5751/ES-08388-210247
39. Doherty B, Bryant M, Denby K, Fazey I, Bridle S, Hawkes C, et al. Transformations to regenerative food systems-An outline of the FixOurFood project. Nutr Bull. 2022;47(1):106–14. https://doi.org/10.1111/nbu.12536 PMID: 36045085
40. Buckton SJ, Fazey I, Doherty B, Bryant M, Banwart SA, Carmen E, et al. Transformative action towards regenerative food systems: A large-scale case study. PLOS Sustain Transform. 2024;3(11):e0000134. https://doi.org/10.1371/journal.pstr.0000134
41. Parsons K, Hawkes C, Wells R. Understanding the food system: Why it matters for food policy. Rethinking Food Policy: A Fresh Approach to Policy and Practice: Brief 2. London: Centre for Food Policy; 2019.
42. Bhunnoo R, Poppy GM. A national approach for transformation of the UK food system. Nat Food. 2020;1(1):6–8. https://doi.org/10.1038/s43016-019-0019-8
43. Duncan J, Carolan M, Wiskerke JSC. Routledge Handbook of Sustainable and Regenerative Food Systems. 1st ed. Abingdon-on-Thames: Routledge; 2020. https://doi.org/10.4324/9780429466823
44. Benyus JM. Biomimicry: Innovation Inspired by Nature. 2nd ed. Boston: Mariner Books; 2002.
45. Reed B. Shifting from "sustainability" to regeneration. Build Res Inf. 2007;35:674–80. https://doi.org/10.1080/09613210701475753
46. Wahl DC. Designing Regenerative Cultures. Bridport: Triarchy Press; 2016.
47. Camrass K. Regenerative futures. Foresight. 2020;22(4):401–15. https://doi.org/10.1108/fs-08-2019-0079
48. McGreevy SR, Rupprecht CDD, Niles D, Wiek A, Carolan M, Kallis G. Sustainable agrifood systems for a post-growth world. Nat Sustain. 2022;1–7. https://doi.org/10.1038/s41893-022-00933-5
49. Gibbons LV. Regenerative—The new sustainable?. Sustain Sci Pract Policy. 2020;12:5483. https://doi.org/10.3390/su12135483
50. Fazey I, Colvin J. Transformation: An introductory guide to fundamental change for researchers and change makers in a world of crises - A Report for the Transforming UK Food Systems SPF Programme. York & Stroud: University of York & Emerald Network Ltd; 2023 Jun. Available: https://ukfoodsystems.ukri.org/transformation-a-guide-to-fundamental-change-in-a-world-of-crisis/
51. O'Brien K, Sygna L. Responding to climate change: The three spheres of transformation. Transformation in a Changing Climate. Oslo: University of Oslo. 2013. p. 16–23.
52. Fazey I, Moug P, Allen S, Beckmann K, Blackwood D, Bonaventura M. Transformation in a changing climate: a research agenda. Clim Dev. 2018;10:197–217. https://doi.org/10.1080/17565529.2017.1301864
53. IPBES. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. In: Brondizio ES, Settele J, Díaz S, Ngo HT, editors. Bonn: IPBES secretariat. 2019.
54. Davelaar D. Transformation for sustainability: a deep leverage points approach. Sustain Sci. 2021;16:727–47. https://doi.org/10.1007/s11625-020-00872-0
55. Riedy C. Discourse coalitions for sustainability transformations: common ground and conflict beyond neoliberalism. Curr Opin Environ Sustain. 2020;45:100–12. https://doi.org/10.1016/j.cosust.2020.09.014
56. Magro C, Van den Berg RD. Of Portals and Paradigms: Evaluation, Systems Thinking and the Pandemic. In: Van den Berg RD, Magro C, Adrien M-H, editors. Transformational Evaluation for the Global Crises of Our Times. Exeter: IDEAS; 2021. pp. 371–394. Available: https://ideas-global.org/wp-content/uploads/2021/07/2021-IDEAS-book-Transformational-Evaluation.pdf
57. Schneider K. What is learning? Psychology. 2024;15:779–99. https://doi.org/10.4236/psych.2024.155047
58. Tamarack Institute. TOOL: Single, Double and Triple Loop Learning. Waterloo (ON): Tamarack Institute; 2017. Available: https://www.tamarackcommunity.ca/hubfs/Events/Multi-Day%20Events/Community%20Change%20Institute%20-%20CCI/2017%20CCI%20Vancouver/Resources/Tool%20-%20Single%20Double%20Triple%20Loop%20Learning.pdf
59. Flood RL, Romm NRA. Plurality revisited: Diversity management and triple loop learning. Syst Pract. 1996;9(6):587–603. https://doi.org/10.1007/bf02169215
60. Otieno D, Niewolny K, Archibald T, Schenk T, Nunoo N. Transformative learning to promote transformative evaluation of food system praxis. Front Sustain Food Syst. 2023;6. https://doi.org/10.3389/fsufs.2022.1068356
61. Meadows D. Leverage Points: Places to Intervene in a System. In: The Donella Meadows Project Academy for Systems Change [Internet]. 1999 [cited 22 Feb 2023]. Available: https://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/
62. Blackler A, Swann L, Chamorro-Koc M, Mohotti WA, Balasubramaniam T, Nayak R. Can We Define Design? Analyzing Twenty Years of Debate on a Large Email Discussion List. She Ji J Des Econ Innov. 2021;7(1):41–70. https://doi.org/10.1016/j.sheji.2020.11.004
63. Norman CD. Supporting systems transformation through design-driven evaluation. New Dir Eval. 2021;170:149–58. https://doi.org/10.1002/ev.20464
64. Easterday MW, Rees Lewis DG, Gerber EM. The logic of design research. Learn Res Pr. 2018;4:131–60. https://doi.org/10.1080/23735082.2017.1286367

65. Hay L, Cash P, McKilligan S. The future of design cognition analysis. Des Sci. 2020;6:e20. https://doi.org/10.1017/dsj.2020.20
66. Sveinson K, Delia E, Melton N, Dalal K, Cunningham G. Rethinking Rigor: Using Positionality and Reflexivity to Enhance Sport Management Scholarship. J Sport Manage. 2025;39(2):79–89. https://doi.org/10.1123/jsm.2024-0155
67. Wall S. An Autoethnography on Learning About Autoethnography. Int J Qual Methods. 2006;5(2):146–60. https://doi.org/10.1177/160940690600500205
68. Beers PJ, van Mierlo B. Reflexivity and learning in system innovation processes. Soc Rural. 2017;57:415–36. https://doi.org/10.1111/soru.12179
69. Fazey I, Schäpke N, Caniglia G, Patterson J, Hultman J, van Mierlo B, et al. Ten essentials for action-oriented and second order energy transitions, transformations and climate change research. Energy Res Soc Sci. 2018;40:54–70. https://doi.org/10.1016/j.erss.2017.11.026
70. Fazey I, Schäpke N, Caniglia G, Hodgson A, Kendrick I, Lyon C. Transforming knowledge systems for life on Earth: visions of future systems and how to get there. Energy Res Soc Sci. 2020;70:101724. https://doi.org/10.1016/j.erss.2020.101724
71. Umpleby SA. Second-Order Cybernetics as a Fundamental Revolution in Science. Constr Found. 2016;11:455–65.
72. Patton MQ, Campbell-Patton CE. Utilization-Focused Evaluation. 5th ed. New York, NY: SAGE Publications, Inc.; 2022.
73. Vargas C, Whelan J, Brimblecombe J, Allender S. Co-creation, co-design, co-production for public health - a perspective on definition and distinctions. Public Health Res Pract. 2022;32(2):3222211. https://doi.org/10.17061/phrp3222211 PMID: 35702744
74. Murphy P. Design Research: Aesthetic Epistemology and Explanatory Knowledge. She Ji J Des Econ Innov. 2017;3(2):117–32. https://doi.org/10.1016/j.sheji.2017.09.002
75. Jones D, Plowright P, Bachman L, Poldma T. Introduction: Design Epistemology. In: Lloyd P, Bohemia E, editors. Future Focussed Thinking - DRS International Conference 20227. London: Design Research Society; 2016. p. 295–301.
76. Fetterman D, Kaftarian SJ, Wandersman A. Empowerment Evaluation: Knowledge and Tools for Self-Assessment, Evaluation Capacity Building, and Accountability. 2nd ed. SAGE Publications, Inc.; 2014.
77. Mickwitz P, Neij L, Johansson M, Benner M, Sandin S. A theory-based approach to evaluations intended to inform transitions toward sustainability. Evaluation. 2021;27(3):281–306. https://doi.org/10.1177/1356389021997855
78. Patton MQ. Blue Marble Evaluation: Premises and Principles. New York: Guilford Press; 2019.
79. Nobles J, Wheeler J, Dunleavy-Harris K, Holmes R, Inman-Ward A, Potts A, et al. Ripple effects mapping: capturing the wider impacts of systems change efforts in public health. BMC Med Res Methodol. 2022;22(1):72. https://doi.org/10.1186/s12874-022-01570-4 PMID: 35300619
80. Finlay L. Negotiating the swamp: the opportunity and challenge of reflexivity in research practice. Qual Res. 2002;2(2):209–30. https://doi.org/10.1177/146879410200200205
81. Chinn D. Reflection and reflexivity. Clin Psychol Forum. 2007;178:15–8. https://doi.org/10.53841/bpscpf.2007.1.178.13
82. Arkesteijn M, van Mierlo B, Leeuwis C. The need for reflexive evaluation approaches in development cooperation. Evaluation. 2015;21(1):99–115. https://doi.org/10.1177/1356389014564719
83. Jasper MA. Using reflective writing within research. J Res Nurs. 2005;10:247–60. https://doi.org/10.1177/174498710501000303
84. Etherington K. Becoming a reflexive researcher - using our selves in research. London: Jessica Kingsley; 2004.
85. Wittmayer JM, Schäpke N. Action, research and participation: roles of researchers in sustainability transitions. Sustain Sci. 2014;9:483–96. https://doi.org/10.1007/s11625-014-0258-4
86. Gómez-Benito C, Lozano C. Constructing food citizenship: theoretical premises and social practices. Ital Sociol Rev. 2015;4:135–135. https://doi.org/10.13136/ISR.V4I2.79
87. Patton MQ. What is essential in developmental evaluation? On integrity, fidelity, adultery, abstinence, impotence, long-term commitment, integrity, and sensitivity in implementing evaluation models. Am J Eval. 2016;37:250–65. https://doi.org/10.1177/1098214015626295
88. Patton MQ. Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use. New York: Guilford Press; 2010.
89. Page GG. Blog # 7: The Orders of Outcomes. In: SustainaMetrix [Internet]. 2020 [cited 23 Feb 2024]. Available: https://www.sustainametrix.com/20142018-blog/2014/12/22/blog-7-the-orders-of-outcomes-4gk9h
90. Patton MQ. Principles-Focused Evaluation: The GUIDE. New York, NY: Guilford Press; 2018.
91. Britt H. Discussion Note: Complexity-Aware Monitoring. USAID; 2013. Available: https://www.betterevaluation.org/sites/default/files/Complexity_Aware_Monitoring_2013-12-11_FINAL.pdf
92. Mair S, Jones A, Ward J, Christie I, Druckman A, Lyon F. A Critical Review of the Role of Indicators in Implementing the Sustainable Development Goals. In: Leal W, editor. Handbook of Sustainability Science. Cham: Springer International Publishing; 2018. p. 41–56.
93. Healthy Schools North Yorkshire. North Yorkshire & York Healthy Schools Award; North Yorkshire Healthy Early Years Award. In: Healthy Schools North Yorkshire [Internet]. 2023 [cited 30 Jan 2026]. Available: https://healthyschoolsnorthyorks.org/
94. Rethink Food. Get Your Students High School Ready. In: Rethink Food [Internet]. 2026 [cited 30 Jan 2026]. Available: https://www.rethinkfood.co.uk/high-school-ready/
95. Head BW, Alford J. Wicked problems: Implications for public policy and management. Adm Soc. 2015;47:711–39. https://doi.org/10.1177/0095399713481601

96. Slothuus L. Political fatalism and the (im)possibility of social transformation. Contemp Polit Theory. 2025;24(1):41–59. https://doi.org/10.1057/s41296-024-00685-1
97. Ackoff RL. Redesigning the future: Systems approach to societal problems. Nashville (TN): John Wiley & Sons; 1974.
98. North Yorkshire Council. Let's Talk Food - 2024. In: North Yorkshire Council [Internet]. 2025 [cited 16 Jan 2026]. Available: https://www.northyorks.gov.uk/lets-talk/lets-talk-food-2024
99. North Yorkshire Council. Our role, structure and objectives. In: North Yorkshire Council [Internet]. 2025 [cited 9 May 2025]. Available: https://www.northyorks.gov.uk/your-council/our-role-structure-and-objectives
100. Mintzberg H. The rise and fall of strategic planning. New York, NY: Free Press; 1994.
101. Mintzberg H. Managers Not MBAs. San Francisco (CA): Berrett-Koehler; 2005.
102. Vilas Belsare H. PESTLE analysis. IJAR. 2025;13(02):608–12. https://doi.org/10.21474/ijar01/20411
103. Aguilar FJ. Scanning the Business Environment. New York (NY): Macmillan; 1967.
104. Savage M, McPherson S, Williams A, Dickman J, Smurthwaite R, Sharma N. Signals Of Transformational Change: Insights from the evaluation of transformational change in the Climate Investment Funds. Climate Investment Funds and Itad; 2020. Available: https://www.itad.com/wp-content/uploads/2020/02/tc_signals_brief-1.pdf
105. Dudley N, Baker C, Ferwerda WH, Gutierrez V, Madgwick J. The 4 Returns Framework for Landscape Restoration. Commonland, Wetlands International Landscape Finance Lab and IUCN Commission on Ecosystem Management. 2021.
106. Davies R, Dart J. The "Most Significant Change" (MSC) Technique: A Guide to Its Use. 2005. Available: https://www.mande.co.uk/wp-content/uploads/2005/MSCGuide.pdf
107. Copestake J, Morsink M, Remnant F. Attributing Development Impact: The Qualitative Impact Protocol Case Book. Copestake J, editor. Rugby: Practical Action Publishing; 2019.
108. Cordero JP, Donkers K, Harrison I, Bridle SL, Frankowska A, Cain M, et al. AgriFoodPy: a package for modelling food systems. J Open Source Softw. 2024;9(97):6305. https://doi.org/10.21105/joss.06305
109. Cordero JP. Agrifood Calculator. In: Streamlit [Internet]. 2025 [cited 23 Apr 2025]. Available: https://agrifood-consultation.streamlit.app/
110. Stewart S. FixOurFood Commission. In: FixOurFood [Internet]. 2025 [cited 24 Jul 2024]. Available: https://fixourfood.org/commission/
111. Leicestershire County Council. Good Food Leicestershire. In: Leicestershire County Council [Internet]. 2026 [cited 19 Jan 2026]. Available: https://resources.leicestershire.gov.uk/health-and-wellbeing/good-food-leicestershire
112. Rockström J, Edenhofer O, Gaertner J, DeClerck F. Planet-proofing the global food system. Nat Food. 2020;1(1):3–5. https://doi.org/10.1038/s43016-019-0010-4
113. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. Lancet. 2019;393(10170):447–92. https://doi.org/10.1016/S0140-6736(18)31788-4 PMID: 30660336
114. Poppy GM, Baverstock J. Rethinking the food system for human health in the Anthropocene. Curr Biol. 2019;29(19):R972–7. https://doi.org/10.1016/j.cub.2019.07.050 PMID: 31593679
115. IPCC. Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. Shukla PR, Skea J, Buendia EC, Masson-Delmotte V, Pörtner H-O, Roberts DC, *et al*., editors. IPCC; 2019. Available: https://www.ipcc.ch/srccl/
116. FAO, IFAD, UNICEF, WFP, WHO. The state of food security and nutrition in the world 2023: urbanization, agrifood system transformation and healthy diets across the rural-urban continuum. Food & Agriculture Organization, editor. Rome, Italy: FAO, IFAD, UNICEF, WFP and WHO; 2023. Available: https://openknowledge.fao.org/handle/20.500.14283/cc3017en
117. Clapp J, Moseley WG, Burlingame B, Termine P. Viewpoint: The case for a six-dimensional food security framework. Food Policy. 2022;106:102164. https://doi.org/10.1016/j.foodpol.2021.102164
118. Acs S, Costa Leite J, Sanyé-Mengual E, Caivano A, Catarino R, Druon J-N, et al. Towards sustainable food systems: developing a monitoring framework for the EU. Front Sustain Food Syst. 2025;8:1502081. https://doi.org/10.3389/fsufs.2024.1502081
119. El Bilali H. Research on agro-food sustainability transitions: A systematic review of research themes and an analysis of research gaps. J Clean Prod. 2019;221:353–64. https://doi.org/10.1016/j.jclepro.2019.02.232
120. Fanzo J, Haddad L, Schneider KR, Béné C, Covic NM, Guarin A, et al. Viewpoint: Rigorous monitoring is necessary to guide food system transformation in the countdown to the 2030 global goals. Food Policy. 2021;104:102163. https://doi.org/10.1016/j.foodpol.2021.102163
121. Béné C, Frankenberger TR, Nelson S, Constas MA, Collins G, Langworthy M, et al. Food system resilience measurement: principles, framework and caveats. Food Secur. 2023;15(6):1437–58. https://doi.org/10.1007/s12571-023-01407-y
122. Hebinck A, Zurek M, Achterbosch T, Forkman B, Kuijsten A, Kuiper M, et al. A Sustainability Compass for policy navigation to sustainable food systems. Glob Food Sec. 2021;29:100546. https://doi.org/10.1016/j.gfs.2021.100546 PMID: 34178596
123. Climate Strategy, Monitoring, Impact, Learning, and Evaluation (SMILE) Community of Practice. Climate SMILE. In: Medium [Internet]. [cited 7 Apr 2025]. Available: https://medium.com/@climatesmile
124. Holling CS. Adaptive Environmental Assessment and Management. John Wiley & Sons; 1978.

125. Teece D, Pisano G, Shuen A. Dynamic capabilities and strategic management. Strateg Manag J. 1997;18(7):509–33. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z
126. Patton MQ, McKegg K, Wehipeihana N. Developmental evaluation exemplars: Principles in practice. New York: The Guildford Press; 2016.
127. Yap C. New geographical directions for food systems governance research. Prog Hum Geogr. 2023;47:66–84. https://doi.org/10.1177/03091325221133808
128. Yap C. Leaked Strategy vs Published Strategy: A Side by Side Analysis. In: Food Research Collaboration [Internet]. 15 Jun 2022 [cited 25 Aug 2022]. Available: https://foodresearch.org.uk/blogs/leaked-strategy-vs-published-strategy-a-side-by-side-analysis/
129. Jackson P, Yap C, Parsons K, Treuherz S, Roberts G. Values-based food systems: the role of local food partnerships in England. Agric Hum Values. 2024;42(3):1379–93. https://doi.org/10.1007/s10460-024-10670-4
130. Yap C, Treuherz S. Emerging processes of territorial food systems governance: lessons from a local food action plan in Sheffield, UK. Local Environ. 2025;30(8):1020–35. https://doi.org/10.1080/13549839.2025.2467865
131. Fazey I, Leicester G. Archetypes of system transition and transformation: Six lessons for stewarding change. Energy Res Soc Sci. 2022;91:102646. https://doi.org/10.1016/j.erss.2022.102646
132. Cusworth G, Lorimer J, Brice J, Garnett T. Green rebranding: Regenerative agriculture, future-pasts, and the naturalisation of livestock. Trans Inst Br Geogr. 2022;47(4):1009–27. https://doi.org/10.1111/tran.12555 PMID: 36618006
133. Craft R, Pitt H. More than meat? Livestock farmers' views on opportunities to produce for plant-based diets. Agric Hum Values. 2024;41(3):975–88. https://doi.org/10.1007/s10460-023-10533-4
134. Kenter JO, Martino S, Buckton SJ, Waddock S, Agarwal B, Anger-Kraavi A. Ten principles for transforming economics in a time of global crises. Nat Sustain. 2025;8:837–47. https://doi.org/10.1038/s41893-025-01562-4
135. Sustainable Food Places. Sustainable Food Places. 2025 [cited 8 May 2025]. Available: https://www.sustainablefoodplaces.org/
136. Ries E. The lean startup. New York (NY): Crown Publishing Group; 2011.
137. Design Council. The Double Diamond. In: Design Council [Internet]. 2024 [cited 6 Aug 2024]. Available: https://www.designcouncil.org.uk/
138. Kolb DA. Experiential learning: Experience as the source of learning and development. 2nd ed. Upper Saddle River (NJ): Pearson FT Press; 2014.
139. Social-Ecological Systems Institute. Keynote at Leverage Points 2019: Ioan Fazey. In: Ideas for Sustainability [Internet]. 2019 [cited 9 May 2025]. Available: https://ideas4sustainability.wordpress.com/2019/02/06/keynote-at-leverage-points-2019-ioan-fazey/
140. Stein Z. Education is the Metacrisis: Why it's time to see the planetary crises as a species-wide learning opportunity. UK: Perspectiva; 2022. Available: https://systems-souls-society.com/wp-content/uploads/2022/01/Education-is-the-metacrisis.pdf
141. Pollock R, Bell R. From Polycrisis to Metacrisis: A Short Introduction. Life Itself; 2025. Available: https://news.lifeitself.org/p/from-polycrisis-to-metacrisis-a-short?utm_campaign=post&utm_medium=web