

Connecting local food system actors for climate-friendly public catering in Germany: Lessons learned from a transformative and transdisciplinary research project

Annika Fricke,^a *Franziska Bürker,^b Pia Laborgne,^c Sarah Meyer-Soylu,^d
and Eva Wendeborg^e
Karlsruhe Institute of Technology

Submitted September 25, 2025 / Revised February 26 and April 30, 2026 / Accepted April 30, 2026 /
Published online August 27, 2026

Citation: Fricke, A., Bürker, F., Laborgne, P., Meyer-Soylu, S., & Wendeborg, E. (2026). Connecting local food system actors for climate-friendly public catering in Germany: Lessons learned from a transformative and transdisciplinary research project. *Journal of Agriculture, Food Systems, and Community Development*. Advance online publication. <https://doi.org/10.5304/jafscd.2026.154.011>

Copyright © 2026 by the Authors. Published by the Lyson Center for Civic Agriculture and Food Systems. Open access under CC BY license.

Abstract

Climate-friendly nutrition is a pivotal subject for the future. The Climate-friendly Cafeterias (CliCa) project was initiated as a one-year transformative and transdisciplinary initiative to support the Karlsruhe (Germany) Climate Protection Concept 2030. Linked to this, the transformation goal of CliCa was to implement climate-friendly and sustainable measures (referred to as ‘levers’) in local

cafeterias. These measures included increasing the share of organic, regional, seasonal, vegetarian, and vegan food, along with reducing food waste. The research goal (research question) was to identify the barriers for implementing levers. This was accompanied by the educational goal aimed to raise awareness among cafeteria staff and guests. The article presents the transdisciplinary design, addresses the research question, and evaluates the transformational goal by presenting outcomes (changes within the project duration) and impacts (changes after the project duration). Within the

^a * *Corresponding author:* Annika Fricke, Institute for Technology Assessment and Systems Analysis (ITAS) at Karlsruhe Institute of Technology (KIT); Karlstraße, 11; 76133 Karlsruhe, Germany; +49721 608 24707;

Annika.fricke@kit.edu;

 <https://orcid.org/0000-0001-6467-4731>

^b Franziska Bürker, Institute for Technology Assessment and Systems Analysis (ITAS) at Karlsruhe Institute of Technology (KIT); franziska.buerker@kit.edu;

 <https://orcid.org/0009-0009-4086-6734>

^c Pia Laborgne, Institute for Technology Assessment and Systems Analysis (ITAS) at Karlsruhe Institute of Technology (KIT); pia.laborgne@kit.edu;

 <https://orcid.org/0000-0001-9554-2918>

^d Sarah Meyer-Soylu, Institute for Technology Assessment and Systems Analysis (ITAS) at Karlsruhe Institute of Technology (KIT).

Sarah Meyer-Soylu is now at KleVer-Klimaschutz und Energieagentur Landkreis Verden; Meyersarah@web.de

^e Eva Wendeborg, Institute for Technology Assessment and Systems Analysis (ITAS) at Karlsruhe Institute of Technology (KIT); eva.wendeborg@kit.edu;

 <https://orcid.org/0009-0009-9936-603X>

See disclosures and other information on next page.

CliCa project, a heterogeneous network consisting of up to 40 actors was established, with a core group of 11 institutions engaging in regular participation. Two open questionnaires ($N = 10$ and $N = 9$) were conducted during the project's duration, and eight follow-up interviews were conducted two years after the project's conclusion. The data analysis revealed 10 key barriers to implementation and several measurable changes related to the identified levers. The most frequently cited barrier was 'Guest acceptance,' followed by 'Missing/unclear framework conditions,' 'Lack of money,' and 'Higher price.' The majority of barriers were mentioned in relation to the lever 'Increasing the use of organically produced food.' The findings of this study indicate that individual levers and barriers are interrelated and should be addressed in combination. With respect to the transformation goal, we conclude that establishing a stakeholder network with a focus on peer-to-peer counseling is particularly effective when participants encounter similar challenges and operate under comparable systemic conditions, such as infrastructure, acceptance by cafeteria guests, and economic frameworks.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Ethics Approval

A privacy policy is available and has been signed by all participants. No prospective studies on humans. No Clinical trials. No Clinical Case reports. No Clinical Case reports. No Human embryos and human stem cells. No children, adolescents, and vulnerable or incapacitated study participants were included. No on indigenous communities.

AI Statement

DeepL Write was used as a tool to help translate the manuscript into academic English during the revision process.

Contributions of Authors

A.F. led the project CliCa, wrote the first draft of the manuscript, led the writing and review process, finalized the manuscript and communicated it to the journal. A.F., P.L., S.M.S. and E.W. co-performed the project CliCa and the data analysis. F.B., P.L., S.M.S. contributed to the first draft and the review process. S.M.S. co-acquired and co-led the KARLA project and CliCa.

Keywords

climate-friendly nutrition, foodservice, public catering, institutional food, sustainable food systems, transdisciplinary, transformative research

Introduction

The notion of environmentally sustainable nutrition, and sustainable nutrition more broadly, is pertinent to the future. The food system, including cultivation to production, processing, transportation, and refrigeration, accounts for around 25% of all greenhouse gas emissions (Poore & Nemecek, 2018). In recent years, the public catering sector—encompassing all food consumed in public spaces such as schools, kindergartens, hospitals, and workplace and university cafeterias—has attracted the attention of policymakers and scientists who are seeking to address the climate and environmental challenges facing our food. The out-of-home catering sector is a major contributor to climate change, especially with regard to its carbon footprint and food waste (Speck et al., 2022), and is considered to be a catalyst for transforming food production due to the substantial number of meals served to the public on a daily basis. According to the German Ministry for the Environment (BMU, 2018), 28% of the emissions caused by food preparation in Germany originate from large and public kitchens. As stated by the Federal Association of the German Food Industry (BVE, 2020), public catering¹ was responsible for 12.4 billion meals in 2019. In the context of out-of-home catering, Speck et al. (2021) identify a pivotal negotiating point for the food transition as significant impacts can be achieved by implementing changes in public catering, particularly in the domain of food procurement, given the substantial volume involved. Beyond the realm of sustainability, public catering institutions assume a central role in promoting healthful dietary practices. According to the EAT-Lancet Commission, food production is the most significant driver of global environmental change, and unhealthy diets are considered an even greater threat to human health and longevity than the combined effects of unsafe sex, alcohol, drugs, and

¹ The authors decided to use the term 'public catering,' since most of the literature they drew on was European. In the U.S., however, the terms 'institutional food' and 'foodservice' are more commonly used.

tobacco (Swinburn et al., 2019). The resolution of these two issues can be achieved by promoting sustainable and healthy nutrition through public catering. The report *Policies for More Sustainable Food* (Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection [WBAE], 2020) identifies four key objectives for sustainable nutrition: a healthy diet corresponding with minimum social standards along the value chain prioritizing animal welfare, and aligning with Germany's sustainability goals (SDGs). The challenge is twofold: to reduce greenhouse gas emissions from food production, and to implement measures that will enable the achievement of the four key objectives. The key question is how to bring about a fundamental transformation of the food sector.

Need for Transdisciplinary and Transformative Research

To surmount this challenge and answer this key question, it is imperative to address both global and local levels. Transformative and transdisciplinary research projects can generate robust social knowledge (Lang et al., 2012), which Gibbons (1999) defines as knowledge arising from society and therefore more likely to be accepted. Transdisciplinary research involves nonscientific actors in the research process, who participate substantially in the research endeavor (Bergmann, 2010). Transdisciplinary research focuses on the collaborative development of action and solution strategies pertinent to practical applications that address real-world problems (Bergmann, 2010). Transformative research endeavors are driven by the overarching objective of effecting a great transformation (German Advisory Council on Global Change [WBGU], 2011) and providing robust knowledge at the local level. This knowledge is often applied in real-world laboratories that operate at the interface between society and science (Parodi & Seebacher, 2024).

As part of the Karlsruhe Real-World Labora-

tory for Sustainable Climate Protection (KARLA), the Climate-friendly Cafeterias² (CliCa) project was designed in a transformative, transdisciplinary manner. The project supports the Karlsruhe Climate Protection Concept (City of Karlsruhe, n.d.), measure E1.8: 'Climate-friendly Lunchtime Catering in Municipal Canteens and Cafeterias' by generating robust social knowledge and promoting transformation at the local level in cafeterias. To address the complexity of real-world-problems, the project team³ defined the research goals, transformation goals, and educational goals (Beecroft & Parodi, 2016; Schäpke et al., 2017; Singer-Brodowski et al., 2018) simultaneously. The transformation goal was to implement climate-friendly and sustainable measures (so-called 'levers') in local cafeterias by increasing the proportion of organic, regional, seasonal, vegetarian, and vegan food items on menus or screens and reducing food waste in public catering facilities in Karlsruhe. The research goal was to identify barriers to implementing climate-friendly measures. The research question addressed in this article accordingly is: What are the barriers to implementing climate-friendly measures in cafeterias? The educational goal was to raise awareness among local actors, cafeteria staff, and cafeteria guests about these issues. In this article, we³ outline the transdisciplinary process, in which a network of actors was formed through various networking events, such as cafeteria visits, and FutureBowls (networking events combining theoretical input, networking, and exchange). Next, we present the results of the identified barriers and the projects' impact on transforming local cafeterias.

Applied Methods and Data Analysis

To answer the research question and evaluate the transformation goal, the project team applied the methods listed in Table 1. The educational goal was not further operationalized or measured but is addressed in the Discussion section.

² The term 'cafeteria' is used in this study because it is being published in a U.S.-based journal. However, in British English and European contexts, the term 'canteen' (German: Kantine) is more common. Canteens/cafeterias are catering facilities in companies, government agencies, schools, or hospitals that primarily serve hot meals to employees, students, or patients in hospitals.

³ In this article, 'project team' refers to the persons who worked directly in CliCa and carried out the transdisciplinary process. 'We' refers to the article's authors. This distinction was made because the authors and the project team members overlap in terms of personnel but are not identical.

Design of the Transdisciplinary Process

Jahn et al. (2012) developed a popular model of an ideal typical transdisciplinary research process.

However, the authors used the framework of Ferretti et al. (2016) to present the transdisciplinary process, breaking it down into five consecutive

steps: Step 1: Joint identification of research needs; Step 2: Agreement on expectations and goals; Step 3: Establishment of continuous communication during the research process; Step 4: Formulation and transfer of research results; and Step 5: Reflection on the research process. Steps 1 to 3 are pre-

Table 1. Overview of Methods Applied, Objectives, Respondents, and Analysis

Method applied	Objective	Respondents		More information and analysis
Open-ended Questionnaire 1	(1) Get inquiries regarding barriers to implement climate-friendly measures (i.e., the "levers") (2) Obtain inquiries regarding the actors' prior experience with individual levers	Approximately 20 actors participated in the FutureBowls on a regular basis, representing a total of 17 institutions, with 11 institutions being represented in more than two FutureBowls Multiple actors were designated to represent a single institution	Completed by 10 institutions	Free text responses were inductively coded in Word (Microsoft Office Professionals Plus 2019) and subsequently clustered according to keywords. Quantitative data underwent analysis and clustering in Excel. Administered in paper format at the second FutureBowl.
Open-ended Questionnaire 2	Gauge potential outcomes related to the transformation goals	A total of 5 institutions were represented in both questionnaires	Completed by 9 institutions	Administered in paper format at the third FutureBowl.
Research Diary	Document experiences and insights regarding CliCa's goals	--		Notes were discussed within the research team and used for the discussion. Important details of bilateral conversations were noted.
Interviews	Get information about transformation goals and long-term impacts	Selected actors with whom close contact was maintained and among whom changes were implemented in the institutions		Interviews (ranging 11–35 minutes long) were meticulously recorded, transcribed, and clustered according to the identified levers using the MAXQDA 24 software. One actor declined to participate in interviews but consented to respond to interview questions in writing; inquiries addressed in written form were incorporated into the clustering process. Starting with an opening question, what they still remember from the project, the interviewed actors were asked how CliCa supported them during the project's duration, whether the changes that occurred during the project period are still in place, whether further changes have been made, whether there is still contact with other actors from the network (for details, see Tables A3, A4, and A5 in the Appendix). Two years following the conclusion of CliCa, eight structured interviews were conducted via Zoom. Interviewed actors were asked to describe the changes initiated by CliCa and then implemented in the institutions; explicitly mentioned barriers were also coded.

sented in the following section. Steps 4 and 5 are included in the Discussion section. Throughout the project, the project team members assumed various roles, including those related to organization, moderation, and neutral mediation. On occasion, the project team members also acted as mediators, researchers, and speakers at the FutureBowls.

Step 1: Joint Identification of Research Needs

The primary objective of the Karlsruhe Real-World Laboratory for Sustainable Climate Protection (KARLA), where CliCa was located, was to pilot some of the urban climate protection measures from the Karlsruhe Climate Protection Concept 2030 (adopted in 2020) on a small scale, using a participatory approach, and integrating other social and environmental dimensions in addition to reducing CO₂ emissions. CliCa was selected as a transformation experiment⁴ within KARLA through a participatory co-design process involving a series of coordination meetings, workshops, and a survey targeting at Karlsruhe citizens, climate protection experts from the Karlsruhe Institute of Technology (KIT), the municipal administration, and prospective project partners. KARLA was integrated into the infrastructure of the real-world laboratory District Future—Labor City, which operates in a transdisciplinary manner, fostering

mutual learning and facilitating encounters at eye level (see also Ober et al., 2024) and leveraging its existing transdisciplinary infrastructure, expertise, and networks. For a more comprehensive understanding of the concepts of transformative and transdisciplinary research, refer to Fricke et al. (2023).

Step 2: Agreement on Expectations and Objectives

During the project's preparatory phase, the project team identified six levers (see Table 2) for a climate-friendly cafeteria. The selection was based on the ability of each lever to substantially influence a cafeteria's carbon footprint; degree of influence by operators or staff; and feasibility of implementation within the project timeframe. CliCa focused on practices that could be changed within a manageable timeframe, such as the selection of food and ingredients, rather than targeting changes to the kitchen or building infrastructure, which would require a more substantial investment. Five levers were mentioned as measures in the Karlsruhe Climate Protection Concept 2030 (E.1.8.); another lever (L06) addressing the guidelines of the DGE (The German Nutrition Society [DGE], 2021), which focus on the intersection of climate protection, sustainability, and health, was added during the course of the project.

Table 2. Synopsis of the Levers Addressed, and the Support Provided by the Climate-Friendly Cafeterias (CliCa) Project

No.	Lever (L)	Support provided by CliCa
01	Avoid food waste	• Connecting with the Foodsharing initiative • Providing a concept for passing on leftover food to parents (daycare center)
02	CO ₂ emissions accounting and communication	• CO₂ emission balancing of dishes using the tool Eaternity • Visualization of CO_{2eq} savings in the form of table displays
03	Local and seasonal food products	Providing a regional supplier list
04	Vegan and vegetarian meals/products	Providing information through a digital info hour
05	Take-away culture and reusable systems	Advice on different reusable systems
06	Organic and DGE certification	Organizing expert input at the FutureBowl from the State Center for Nutrition BaWü and the organic inspection entity in Karlsruhe

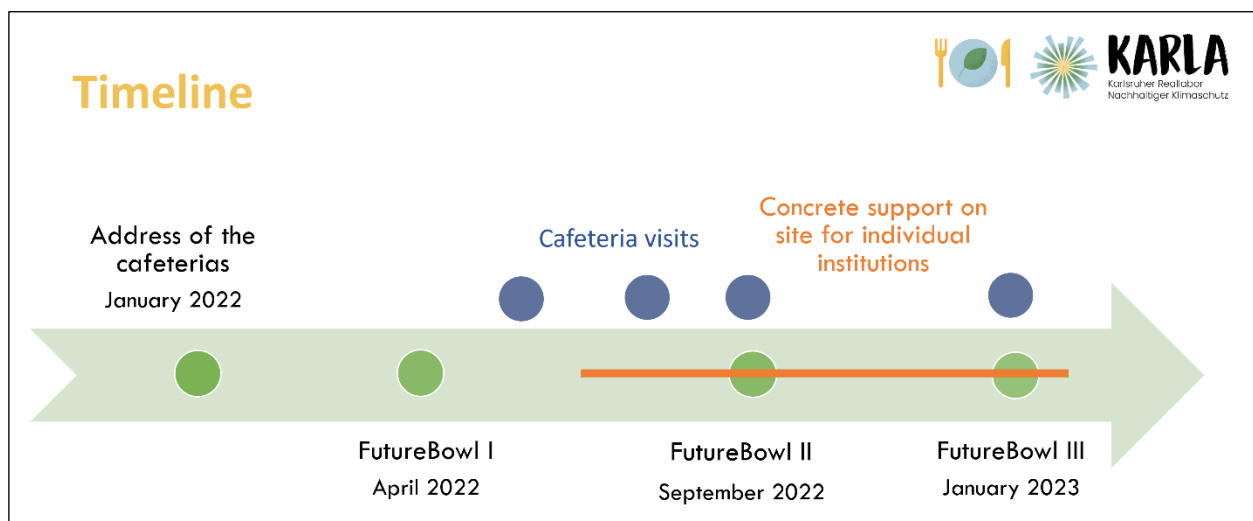
⁴ The term 'transformation experiment' in KARLA refers to trying something out (an alternative, new processes, or new approaches) in a limited period of time. The aim of the experiment is to bring about at least temporary change and to examine the experiment in terms of its sustainability and mechanisms of action.

Step 3: Involvement of Actors and Establishment of Continuous Communication

One of CliCa's main tasks was to establish a network of relevant actors, and identify and document local examples of best practices. These examples include local cafeterias that act as pioneers of change (WBGU, 2011), setting a good example, and having the potential to serve as role models and transfer practical knowledge. After conducting a comprehensive investigation of the relevant local actors, a variety of individuals and organizations were contacted via email: municipal institutions, including kindergartens and schools; prominent corporate dining facilities; social institutions; and active individuals. The initial contact aimed to raise awareness of the project, encourage networking among interested parties, identify examples of local best practices, and provide interested actors with closer support in implementing sustainability measures in their cafeterias. The project team participated in various local action days on sustainable nutrition and held preliminary talks with interested actors. Approximately 40 interested institutions were added to an email distribution list, which was subsequently used for further communication. Notably, an individual from the city administration substantially facilitated the inclusion of municipal actors. The project website⁵ provided detailed

information on the individual levers. Throughout the project, various examples of best practices were disseminated, including cafeteria profiles, news articles, and materials designed to communicate the carbon footprints of different meals effectively. Additionally, related articles were published in the local newspaper, and a podcast episode was released. Individual consultations were conducted for four institutions. These included administering a survey to cafeteria guests in one cafeteria (not included in this article), conducting a survey on vegetarian offerings and demand in another, cooperating and consulting with the Foodsharing initiative for food pickups (particularly with regard to legal aspects), balancing the CO₂ emissions of several dishes, and providing counsel to another cafeteria on options for reusable items. The actors who participated in the transdisciplinary formats (e.g., FutureBowls and cafeteria visits; see Figures 1 and 2) included cafeteria operators, cooks, and kitchen or operations managers from seven municipal institutions, three scientific institutions, three social organizations, two associations, one major supplier, and municipal administrators from four different offices. These participants answered the questionnaires (see also the Method section). Consequently, the participants in this study represented a diverse range of backgrounds and experiences,

Figure 1. Timeline of the CliCa Project, January 2022–January 2023, Illustrating the Various Formats Applied (Including FutureBowls and Cafeteria Visits)



⁵ KARLA website: <https://www.reallabor-karla.de/klimafreundlicheKantinen.php>

including cafeteria managers and individuals involved in municipal cafeteria operations.

Results

We first outline the barriers identified by participants in the FutureBowls. Then we present CliCa's outcomes (implementations during the project's duration) and impacts (implementations after the project ended) to evaluate the transformation goal. This evaluation is informed by the responses of the actors to the second questionnaire and the findings from the follow-up interviews.

Barriers to Implementing the Measures

Ten distinct barriers to implementing measures of the levers were identified based on the questionnaires administered at the second FutureBowl (see Tables 3 and 4).

Barriers identified in total

The actors identified the substantial barrier 'Lack of acceptance' [B5], which is referenced 14 times and is particularly evident in the context of 'Increasing the range of vegetarian/vegan food' (7 codes). Additional substantial barriers that have been identified are [B8] 'Lack of/unclear framework conditions' (10 codes in total), [B1] 'Lack of money' and [B4] 'Higher price.' The barriers less frequently mentioned are [B10] 'Lack of incentives' and [B3] 'Lack of premises.'

Barriers identified per lever

The barrier [B5] 'Lack of acceptance' was identified seven times within the lever 'Increase the range of vegetarian/vegan food.' The most barriers were mentioned in relation to the lever 'Increasing the use of organically produced food' (different: 7; barriers in total: 12). The second largest number of different barriers was pointed in the lever 'Establishment of take-away and reusable systems' (different barriers: 6; 9 in total). A total of 9 barriers were identified in the lever 'Increase the use of local/seasonal foods' and 'Increasing the range of vegetarian/vegan food on offer.'

Implementations in the Actors' Institutions

Due to the fluctuating number of participants at the FutureBowls, the actors who had represented their institution at the third FutureBowl ($N = 9$) were asked to respond to a questionnaire regarding their awareness of a lever identified by CliCa, their subsequent engagement with the topic, and whether this had led to any changes in their institutions (see Figure 3, multiple answers possible). The lever 'Local and seasonal products' (L03) was not queried, as some measures were associated with measures in other levers (L04 and L06). The responses to the questionnaires indicate that the majority of the actors who were informed about a lever had continued to work on it. In each of the five levers measured, at least three institutions have

Figure 2. Impressions of the Third FutureBowl that Took Place in a Cafeteria



Source: Karlsruhe Transformation Centre (KAT).

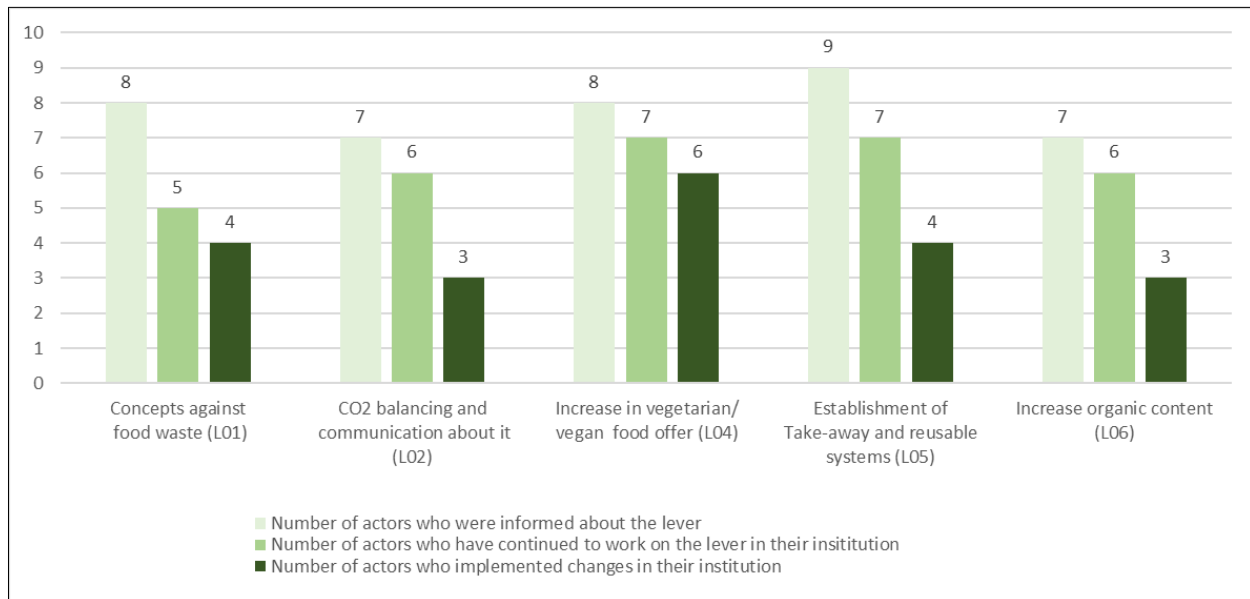
Table 3. Overview of the Barriers Identified, Accompanied by the Respective Code Number and Detailed Information Concerning Each Barrier

Code number	Barrier identified	Further description
[B1]	Lack of money for implementation	e.g., for organic certification
[B2]	Lack of suppliers or difficult market conditions	especially for local products
[B3]	Lack of premises	lack of space (especially storage space)
[B4]	Higher price that would affect consumers	
[B5]	Lack of acceptance among guests or employees	resulting in fear of guest migration, among other things
[B6]	Lack of time	e.g., to find new suppliers find out about certification options
[B7]	Lack of staff for the conversion and introduction of measures	e.g., communication options for CO ₂ accounting restricted as a result
[B8]	Lack of/unclear framework conditions	very broadly defined, e.g. tendering procedures hinder the increase in the use of regional food; regionality cannot be considered in tendering procedures; limits of public procurement law; limits of own kitchen system or own infrastructure or in the reduction of food waste
[B9]	Lack of information	including lack of experience
[B10]	Lack of incentives	including the influence of the environment ("the others don't do it either"), lack of role models or lack of peer group

Table 4. Overview of Barriers Mentioned per Lever

Lever	Barriers										Number of different barriers mentioned per lever	Number of barriers mentioned in total in a lever
	B1: Lack of money	B2: Lack of suppliers/ difficult market conditions	B3: Lack of premises	B4: Higher price	B5: Lack of acceptance	B6: Lack of time	B7: Lack of staff	B8: Lack of/ unclear framework conditions	B9: Lack of information	B10: Lack of incentives		
Reduction of food waste (L01)						2		1	1		3	4
CO ₂ balancing of dishes and communication about it (L02)						3	3		1		3	7
Increase the use of regional/seasonal foods (L03)		3		2	1			3			4	9
Increasing the range of vegetarian/vegan food on offer (L04)					7						1	7
Establishment of take-away and reusable systems (L05)	1				2	1		2	1	2	6	9
Implementation of organic certification by an approved organic inspection body (L06)	4	1	2					1		1	5	9
Increasing the use of organically produced food (L06)	2	1		3	1			3	1	1	7	12
Implementation of the DGE quality standard for catering (L06)		1			2		1				3	4
Number of mentions across all levers	8	7	2	8	14	8	6	10	5	4		
Number of mentions within one lever	1	2	3	4	5 to 7							

Figure 3. Implementations in the Actors' Institutions During the Term of the CliCa Project, Categorized by Lever (L)



implemented changes. Notably, six out of eight actors have implemented changes in the lever 'Increase of vegetarian/vegan food offer.'

Follow-up Interviews on Impacts after the Project's Ending and Barriers

In the interviews, we inquired about the impact of CliCa (defined as implementations after the project's ending) related to five of the levers (Table 5). All interviewees reported implementations in at least one lever. A total of four interviewees reported implementations across four levers. The following implementations were mentioned: an increase of vegetarian or vegan ingredients and food (mentioned for four institutions); the introduction of weighing weeks to minimize food waste; a greater processing of leftover food; organic certification for individual product groups; and the introduction of a new reusable system. It is important to acknowledge that the authors of this study cannot presume that all of the observed changes can be attributed exclusively to CliCa's influence. In the first questionnaire, respondents were asked to specify which levers they had previously worked on. One-third of the respondents (representing 10 institutions) had previously mentioned working on 'implementation of organic cer-

tification by an approved organic inspection body,' 'increasing the range of vegetarian/vegan food on offer,' and 'increasing the use of organically produced food.' Note that the interviews indicated that it is not possible to distinguish between implementations that occurred during the project period and after the project period.

Discussion

The results indicate that both the levers and identified barriers are interrelated and can be addressed in combination. This is discussed in the following subsections, taking into account Steps 4 and 5 of the transdisciplinary process according to Ferretti et al. (2016). In addition, we discuss references to the educational goal. Lastly, we present the study's limitations and potential for future research.

Step 4: Formulation and Transfer of Research Results

The barrier [B1] 'Lack of money' is mentioned a total of eight times, especially for the lever 'Implementation of organic certification by an approved organic inspection body.' However, the project team demonstrated in the third FutureBowl that the costs associated with being certified organic are often lower than commonly assumed. This barrier

Table 5. Overview of the Outcomes and Impacts Identified in the Interviews, Conducted Two Years after the Project's Conclusion, Grouped by Measures per Lever

The statements listed in one cell in the 'Outcomes and impact' section correspond to the statements made by one of the actors interviewed. The measures currently under planning are indicated in **blue**. Challenges mentioned are displayed on the right. For further information, refer to Tables A1 and A2 in the Appendix.

Measure (Lever)	Outcomes and impact	Challenges
Against food waste (L01)	Cooperating with Foodsharing Reusing leftover food (e.g., offering leftovers as salads the next day) - Cooperating with Foodsharing and the public order office so that leftovers from a school are passed on to the church community - Cooperating between schools and Foodsharing since 2024 Regularly checking portion sizes and leftovers Weighing and measuring food waste to identify areas for improvement	
CO ₂ emissions accounting and communication (L02)	Balancing CO ₂ emissions of individual dishes (supported by KIT) and communication about this in the weekly plan Working to raise awareness among guests through communication via screens on sustainability and organic products	- Staff missing - Too time-consuming
Local and seasonal food products (L03)	Increasing the proportion of fresh products (in muesli) and products from own production for nutritional reasons - Changing recipes and side dishes for individual dishes to integrate regional products - Reducing supply chains by sourcing more regional products	
Increase in the range of vegetarian/vegan food (L04)	Offering more vegetarian products or menus; significantly increasing sales of vegetarian food Promoting the vegetarian line even more - Changing the menu: first, name the vegetarian options - Reducing meat consumption by offering more stews and goulash - Increasing vegetarian and vegan dishes (instead of 1 out of 4 dishes, change to 2 out of 4 dishes; vegetarian share is 46%) - Offering vegetarian/vegan dishes first in the product portfolio Training (in-house) for chefs	Meat substitutes are in demand by guests, but are not considered healthy as they are highly processed
Establishment of take-away and reusable systems (L05)	Establishing reusable systems for take-away food - Less packaging waste thanks to dispensers (e.g. for honey, jam and Nutella) - Paying more attention to bulk packaging Requesting sustainable packaging in the tender Introducing reusable systems instead of disposable Introducing reusable boxes for a 5 euro deposit, in addition to disposable packaging Introducing reusable systems is here to stay Introducing reusable packaging for pizza In 2025: Replacing the last single-use packaging with reusable packaging Further reducing disposable packaging	Introduction of checkout/deposit system for reusable items difficult

continued

Table 5 continued

Increase the organic share and DGE certification (L06)	- Increasing organic products (e.g. switch to organic pasta) - Contacting the organic certification body	Increase in prices
	Making all side dishes in patient catering of organic quality (previously was only salad)	At the same time that prices were increased due to the higher proportion of organic products, VAT was increased to 19% Healthy food is often not accepted by children, resulting in a high level of food waste
	Using more organic products (some products converted, such as jam, eggs, vegan spread)	
	Cafeteria has been certified organic, and 20% of the monetary value of goods is organic (mandatory for federal cafeterias since 2025)	
	Increasing organic share from 2% to 11.3% (as of 2025)	
	Increasing the proportion of organic products	
	Utilizing training courses for dishes according to DGE guidelines	
	Remodeling (new shelves for organic products), mainly for beans and pasta	
	Striving to offer some products in organic (pasta, lentils)	
	Target: 50% organic	
Other changes and impacts	Networking as an important lever	
	- Lesson learned: No top-down approach. Important to talk to guests in order to gain understanding for changes - Creating awareness among chefs and employees	
	Exchanging with other cities/municipalities and within a city is important	
	- Communicating changes to guests is important - Delivery days reduced from 3 to 2 days through cooperation between distributors	
	Networking of different actors as particularly enriching	

therefore underscores the significance of stakeholder awareness in promoting climate-friendly transformations. A substantial amount of information and counsel is available, particularly from the state of Baden-Württemberg, which has set itself the ambitious goal of increasing the share of organic food to 40% in the state-run cafeterias by 2030 (State of Baden-Württemberg, 2024). However, the flow of information is limited. This example illustrates how the information flow plays a pivotal role in transformation processes. In particular, the state of Baden-Württemberg has the potential to assume a more prominent role by proactively promoting advisory programs and disseminating information. Furthermore, the barrier [B3] Lack of premises is specifically identified for this lever. The size of the individual cafeterias that participated in the questionnaire plays a particularly important role in this analysis. This could be due to the fact that organic foods must be stored separately from conventional foods, as outlined in Directive 2014/24/EU and the Regulation on Organic Food Service.

It is noteworthy that the barrier ‘Lack of money’ was mentioned only on two occasions in the context of the lever of increasing organic products. A paucity of financial resources is often identified as a primary impediment to adopting organic products in cafeteria kitchens (Braun et al., 2018; Filippini et al., 2018; Kretschmer & Dehm, 2021; Risku-Norja & Løes, 2017). This may be attributed to the fact that the kitchens surveyed are aware of the prevailing measures that can be adopted to mitigate the financial implications of higher purchase costs associated with organic products. For instance, utilizing seasonal organic products, reducing meat in dishes, increasing plant-based dishes and reducing food waste are common measures employed to compensate for higher purchase prices (Lassen et al., 2023).

In discussions with individual actors, we identified the effects of the COVID-19 (coronavirus) pandemic as a barrier or inhibiting factor in the implementation of climate-friendly measures. The global recession, which officially ended in 2022,

has had a substantial impact on this regard, as it has led to a considerable degree of uncertainty and has exacerbated the financial challenges experienced by certain actors. The considerable increase in remote work among some corporations due to the pandemic has resulted in a notable challenge for many cafeterias, as this transition has led to a decline in the number of individuals using the cafeteria facilities. According to the Federal Association of the German Food Industry (BVE, 2024), while the communal catering sector has not yet returned to the level of 2019 (the year before the coronavirus pandemic), it is gradually recovering.

The interviewees' statements regarding seasonal and local products align with the findings from other research projects. The integration of regional products is subject to legal impediments, as stipulated by the Public Procurement Act. The European Union's policy prohibiting discrimination indicates that local suppliers should not be accorded preferential treatment. The predominant supply structures in the public catering sector represent a substantial impediment to incorporating local and seasonal products. The following factors, in particular, restrict the regional availability of local products: more difficult market access for smaller regional (organic) producers; inconsistent supply structures; and inadequate processing structures for the requirements of communal catering (Braun et al., 2018; Kretschmer & Dehm, 2021). The most frequently mentioned barrier is 'Lack of acceptance by guests,' particularly with regard to offering vegetarian and vegan dishes. Consequently, guest demand should be a pivotal consideration in transforming cafeterias to promote healthier and more sustainable diets. Providing plant-based dishes is ineffective if guests at the counter opt for meat dishes. The guest's choice may be related to a lack of information about the health benefits of a plant-based diet (Simon et al., 2023), to 'neophobia'—the fear of trying something new—or to willingness to pay and the perceived value of the catering services themselves (Lopez et al., 2020). Nonetheless, cafeteria kitchens possess considerable potential to influence the manner in which they plan their menus and offer plant-based dishes. The fundamental principle that guides this endeavor is to create an impression on

consumers through the quality and flavor of the products. Attractive and flavorful plant-based dishes have been identified as a 'critical enabler for change' (Graça et al., 2022) and are considered one of the key factors in the transformation to more sustainable public catering (Lopez et al., 2020). A multifaceted array of factors influences guests' acceptance of vegetarian dining options. These factors encompass aspects such as pricing, with vegetarian meals often being priced comparable to, if not more expensive than, meat alternatives. Other influential factors include the size of the portion, the perceived satiety after the meal, the gustatory experience, and the presentation of the dish. This encompasses elements such as the nomenclature of the dish and the availability of additional information regarding the provenance of ingredients or health-related benefits. We hypothesize that all the points mentioned, as well as encouraging guests, could influence the acceptance of guests with regard to a vegan or vegetarian food offer. Establishments could address these factors to improve demand for vegetarian and vegan food.

Public catering has been identified as playing a pivotal role in the transformation of the food system by its potential to reduce animal products and place greater emphasis on legumes, in accordance with the Planetary Health Diet. This approach also entails a substantial increase in the proportion of organic food and a further reduction in food waste. A further imperative for all actors, from catering facilities to consumers, is advancing a heightened appreciation for food, coupled with having a comprehensive understanding of the multifaceted factors influencing its production and subsequent pricing (Fischedick et al., 2021). It is evident that the institutions represented at the FutureBowls have already demonstrated a number of promising approaches.

To further advance sustainability in public catering, it is imperative to establish a broad alliance of actors. The absence of adequate structures in food procurement that align with the requirements of public catering necessitates engaging elements of the upstream value chain. In a similar vein, the downstream areas of food waste recycling can serve as a pivotal mechanism in achieving closed-loop recycling in the food sector (although the primary

focus in this context is on the prevention of food waste). Local authorities play a pivotal role in this regard, as they possess the capacity to establish political frameworks conducive to developing sales, bundling, and processing structures. Local authorities should also assume responsibility for fostering collaboration among actors along the value chain. Municipalities can establish long-term coordination structures that extend beyond the duration of individual projects and foster long-lasting contacts and networking. The government-funded organic model regions in the state of Baden-Württemberg, designed to strengthen regional organic value chains, offer instructive examples. These regions demonstrate that coordination fosters valuable networking opportunities. Having permanent positions is imperative to cultivating profound trust among stakeholders (Schramek et al., 2023). The necessity for so-called coordination centers has been a subject of discussion for a considerable period (Hoinle et al., 2025). Moreover, effective governance is imperative for their success. In 2024, the state of Baden-Württemberg issued an administrative regulation stipulating that food in public cafeterias operated by the state must be 40% organic and 75% sustainable by the end of 2030 (Ministry of Food, Rural Affairs and Consumer Protection, 2024). According to the provisions of this administrative regulation, sustainable food is defined as food with sustainable, transparent, and traceable supply chains. This is characterized by the use of short transport routes, the absence of genetic engineering in production processes, and the reliance on seasonal produce (Ministry of Food, Rural Affairs and Consumer Protection, 2024). The provisions involving transport routes and seasonality are an attempt to increase the regional share of food. Additionally, there are increasing levels of advisory services for cafeterias at both the national and state levels. This development may offer companies the opportunity to implement changes that could benefit them. The resources and events offered by the Baden-Württemberg State Center for Nutrition merit particular mention in this context.

Step 5: Reflection on the Research and Transdisciplinary Process

As is often the case with transdisciplinary and transformative research projects, the question of continuation has not yet been satisfactorily resolved. The transfer of successful activities, such as the networking events (FutureBowls), to individuals capable of continuing them has proven problematic and has not yet occurred, and maintaining stakeholder engagement in the post-project phase remains challenging. This was also an inherent problem in the project structure, as CliCa was only funded for one year. This issue is at least partially addressed by the further recruitment of additional projects; two current research projects⁶ and additional local initiatives build on the results of CliCa.

It is imperative to reiterate that the participating actors in CliCa encountered disparate framework conditions (in terms of personnel, kitchen equipment, and economic and financial resources). While the fundamental challenges remain comparable, the scope of action and the degrees of freedom available to the actors vary. A subset of operators possesses their own kitchen facilities and receive subsidies to maintain low food prices. In contrast, other operators are subject to stringent procurement guidelines and are permitted to implement fundamental changes only every few years by inviting new contract agreements.

The responses to the questionnaires and the written and verbal feedback from the participating actors demonstrate that CliCa was able to encourage changes in the individual companies despite its one-year duration. The participants expressed their gratitude for the opportunities to establish professional connections and share their experiential knowledge. We posit that the “positive atmosphere” noted in the questionnaire getting at the communication on a personal level is pivotal in facilitating the exchange of ideas among practice partners engaged in transdisciplinary research, ensuring equitable collaboration. This approach encourages participants to share their concerns and

⁶ Project “Transformation of the food system towards sustainability using the example of innovations for communal catering in the Upper Rhine region” (see https://www.itas.kit.edu/english/projects_lab024_icnern.php) and project “Co-Creation of Sustainable Food Supply Chains through Cooperative Business Models and Governance” (see <https://www.sustainablefood-sc.org/index.php>).

uncertainties, fostering a collaborative environment. This low-threshold exchange fosters a sense of solidarity among stakeholders in implementing climate protection initiatives, thereby addressing concerns and fostering collective action.

Addressing the educational goal

The educational goal was not operationalized and measured; however, there is evidence that CliCa has fostered a collaborative environment conducive to mutual learning, sharing of experiences, and implementing changes through the exchange of ideas, contributions, and materials. The participants stated on multiple occasions during the interviews that they learned a considerable amount both from the other participants and from the CliCa project. Example quotes include, “You have done a good job of imparting knowledge and sparking interest in a pleasant atmosphere”; “Thank you for the great work/It opened my eyes to a lot of things.” However, what we have learned from CliCa is that raising the knowledge of cafeteria employees and understanding the guest perspective require further attention. A paucity of training in the preparation of plant-based dishes for kitchen staff has been identified as a common issue in the literature (Lopez et al., 2020; Martin et al., 2022). Enhancing training and providing further education is therefore recommended (Martin et al., 2022; Risku-Norja & Løes, 2017; Schäfer & Haack, 2023). CliCa has created a video about enhancing vegetarian and vegan dishes; however, it does not delve into the subject of raising awareness among kitchen staff.

Limitations and Future Research

One limitation of this study is the variation and small number of participating actors; only a total of five institutions were represented through actors in both FutureBowls, at which questionnaires were handed out. The present study’s participants are few in number (a small *N*), which is to be expected given the local transdisciplinary and transformative nature of the project and its relatively brief funding period. Consequently, the integration and analysis of the questionnaire results proved to be challenging. Furthermore, a more thorough examination of the perspectives of guests at cafeterias is warranted.

For instance, surveys could assist in ascertaining how guests perceive the communication of CO₂ emissions related to dishes. Surveying guests about a wider range of vegan or vegetarian options could also be beneficial in the discourse surrounding climate-friendly public catering. Many cafeteria operators are concerned that guests do not want these options, without having concrete indications to support this claim. Further research is needed concerning the barriers identified in implementing the levers. A sustainable diet encompasses a variety of other sustainability issues, including increasing the use of fair-trade food, obtaining feedback from visitors to promote participation and co-determination, raising awareness among employees in the company, and addressing fair wages along the value chain. However, these aspects were only marginally addressed in CliCa and could be included in a follow-up transformative project. Further research is necessary to explore the implications of the external costs approach (which factors the long-term costs of environmental and climate damage into food prices), as the integration of external costs into pricing strategies could have long-term implications for pricing and dietary behavior.

Conclusion

The following key messages are derived from our analysis. ‘Lack of money’ was one of the most frequently mentioned barriers, particularly with regard to organic certification. In Germany, there is a wealth of information on this topic, but there is not enough flow of information. The most frequently cited barrier was ‘Lack of acceptance,’ particularly with regard to vegetarian and vegan options. Therefore, it is imperative to take guest demand into consideration when transitioning cafeterias to healthier, more sustainable menus. Nonetheless, cafeteria kitchens hold significant potential to shape menu planning and promote plant-based options.

In addition to the barriers identified, the effects of the coronavirus pandemic were identified as a barrier or inhibiting factor in implementing climate-friendly measures. The interviewees’ perspectives on seasonal and local products align with the findings of other research, which indicate that the Public Procurement Act and EU non-discrimina-

tion policy impose legal restrictions on preferential treatment for local suppliers. The procurement challenges inherent to public catering demand engagement from the entire value chain. Local authorities should coordinate long-term networks, as evidenced by the organic model regions in the state Baden-Württemberg. Establishing permanent coordination roles is imperative for fostering trust among stakeholders. Effective governance is imperative for the success of such initiatives.

On a positive note, the participating actors in CliCa have shown that they can share pertinent practical knowledge with one another, empowering them to start implementing measures. The transformative results achieved are scalable and transferable to other cities. It makes sense to extend the scope of involvement from this transformation project to a diverse array of actors to catalyze transformative change. A network of different actors can lead to particularly fruitful outcomes if they are working on the same problems and if similar systemic conditions exist in terms of infrastructure, food, guests, and economic framework conditions. In such cases, transdisciplinary and transformative research projects that facilitate the networking of various actors and exchange of experiences are a viable option for fostering cooperation and trust among actors with diverse professional backgrounds.

References

- Beecroft, R., & Parodi, O. (2016). Reallabore als Orte der Nachhaltigkeitsforschung und Transformation [Real-world laboratories as sites of sustainability research and transformation]. *TATuP—Zeitschrift für Technikfolgenabschätzung in Theorie und Praxis*, 25(3), 4–8. <https://doi.org/10.14512/tatup.25.3.4>
- Bergmann, M., Jahn, T., Knobloch, T., Krohn, W., Pohl, C., & Schramm, E. (2010). *Methoden transdisziplinärer Forschung: Ein Überblick mit Anwendungsbeispielen* [Methods of transdisciplinary research: An overview with examples of application]. Campus Verlag.
- Braun, C. L., Rombach, M., Häring, A. M., & Bitsch, V. (2018). A local gap in sustainable food procurement: Organic vegetables in Berlin's school meals. *Sustainability*, 10(11), Article 4245. <https://doi.org/10.3390/su10114245>
- City of Karlsruhe. (n.d.). *Klimaschutzkonzept Karlsruhe 2030: Maßnahmenkatalog* [Catalog of Climate Protection Concept 2030]. Retrieved August 18, 2025, from <https://transparenz.karlsruhe.de/dataset/klimaschutzkonzept-karlsruhe-2030/resource/e4f00a58-ff0f-49c0-a749-89b39ece2e14>
- Federal Association of the German Food Industry [BVE]. (2020). *Jahresbericht 2019/20* [Annual report 2019/20]. <https://www.bve-online.de/download/bve-jahresbericht-ernaehrungsindustrie-2020>
- Federal Association of the German Food Industry [BVE]. (2024). *Jahresbericht 2024* [Annual report 2024]. <https://www.ernaehrungsindustrie.de/publikation/bve-jahresbericht-ernaehrungsindustrie-2024/>

We concur with the recommendation of the Ministry for the Environment (BMU, 2018) to promote climate-friendly catering as a cross-cutting issue in the government administration, as these entities are responsible for a significant number of cafeteria kitchens, including those in schools and daycare centers. Municipal administrations can function as catalysts in this regard, by facilitating the coordination of communication channels among various municipal offices and thereby fostering networks among different actors in municipal facilities. Climate-friendly nutrition—and more broadly, sustainable nutrition—is a subject that is pertinent to the future. Consequently, the implementation of a climate-friendly cafeteria will be influenced not only by the intrinsic motivation of individual players in out-of-home catering, but also by mounting pressure from the federal government, state, and local authorities. 

Acknowledgments

E. J. Joedicke, S. Rehberg, L. Weder, E. Marburger, J. Pfau, and L. Basler provided valuable help in conducting the transformation experiment in KARLA. We would like to thank the city of Karlsruhe for supporting us in connecting the actors. We would also like to thank the entire team of KARLA.

- Ferretti, J., Daedlow, K., Kopfmüller, J., Winkelmann, M., Podhora, A., Walz, R., Bertling, J., & Helming, K. (2016). Reflexionsrahmen für Forschen in gesellschaftlicher Verantwortung. BMBF-Projekt "LeNa—Nachhaltigkeitsmanagement in außeruniversitären Forschungsorganisationen." https://www.nachhaltig-forschen.de/assets/lena_nachhaltig-forschen/Dokumente/Reflexionsrahmen_FINAL.pdf
- Filippini, R., De Noni, I., Corsi, S., Spigarolo, R., & Bocchi, S. (2018). Sustainable school food procurement: What factors do affect the introduction and the increase of organic food? *Food Policy*, 76, 109–119. <https://doi.org/10.1016/j.foodpol.2018.03.011>
- Fischedick, M., Haacke, H., Arnold, K., Götz, T., Hennes, L., Kaselofsky, J., Koska, T., Leipprand, A., Samadi, S., Schüwer, D., Speck, M., Suerkemper, F., Thomas, S., Venjakob, J., von Geibler, J., & Wits, H. (2021). *Die Suche nach den wichtigsten Hebeln der großen Transformation* [The search for the key levers of the great transformation] (Zukunftsimpuls, No. 18). Wuppertal Institute for Climate, Environment and Energy. <https://hdl.handle.net/10419/235563>
- Fricke, A., Parodi, O., Trenks, H., & Saha, S. (2023). Transdisziplinär forschen [Transdisciplinary research]. In E. Nöthen & V. Schreiber (Eds.), *Transformative Geographische Bildung* (pp. 261–267). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-66482-7_36
- German Advisory Council on Global Change [WBGU]. (2011). *World in transition: A social contract for sustainability—Summary for policy-makers*. https://www.wbgu.de/fileadmin/user_upload/wbgu/publikationen/hauptgutachten/hg2011/pdf/wbgu_jg2011_kurz_en.pdf
- Gibbons, M. (1999). Science's new social contract with society. *Nature*, 402(Suppl. 6761), C81–C84. <https://doi.org/10.1038/35011576>
- Graça, J., Roque, L., Guedes, D., Campos, L., Truninger, M., Godinho, C., & Vinnari, M. (2022). Enabling sustainable food transitions in schools: A systemic approach. *British Food Journal*, 124(13), 322–339. <https://doi.org/10.1108/BFJ-11-2021-1188>
- Hoinle, B., Greiner, A., Bauer, C., & Bürker, F. (2025). *Strategien für mehr bioregionale Produkte in der Gemeinschaftsverpflegung* [Strategies for increasing bioregional products in institutional catering]. <https://doi.org/10.5281/ZENODO.15516021>
- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics*, 79, 1–10. <https://doi.org/10.1016/j.ecolecon.2012.04.017>
- Kretschmer, S., & Dehm, S. (2021). Sustainability transitions in university food service—A Living Lab approach of locavore meal planning and procurement. *Sustainability*, 13(13), Article 7305. <https://doi.org/10.3390/su13137305>
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(Suppl. 1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>
- Lassen, A. D., Thorsen, A. V., & Trolle, E. (2023). Current practices and opportunities for more sustainable public food procurement: A qualitative study among Danish municipalities and regions. *Foods*, 12(10), Article 1975. <https://doi.org/10.3390/foods12101975>
- Lopez, V., Teufel, J., & Gensch, C.-O. (2020). How a transformation towards sustainable community catering can succeed. *Sustainability*, 12(1), Article 101. <https://doi.org/10.3390/su12010101>
- Martin, G., Pujos, L., & Magrini, M.-B. (2022). Micro-level sustainability transition pathways of institutional food services in France. *Frontiers in Sustainable Food Systems*, 6, Article 943020. <https://doi.org/10.3389/fsufs.2022.943020>
- Ministry for the Environment [BMU]. (2018). *Große Küche auf kleiner Flamme (KüFla). Großküchen leisten ihren Beitrag zum Klimaschutz* [Large-scale kitchens on a low flame. Large-scale kitchens contribute to climate protection]. https://www.klimaschutz.de/sites/default/files/03KF0008A-B_PKD_KueFla_18102018_CPS_bf.pdf
- Ministry of Food, Rural Affairs and Consumer Protection. (2024). *Verwaltungsvorschrift des Ministeriums Ländlicher Raum und des Finanzministeriums zum Betrieb und zum Verpflegungsangebot in Kantinen und sonstigen Verpflegungseinrichtungen des Landes Baden-Württemberg (VwV Kantine)* [Administrative regulation of the Ministry of Rural Affairs and the Ministry of Finance regarding the operation and food service offerings in canteens and other catering facilities of the State of Baden-Württemberg]. <https://www.landesrecht-bw.de/bsbw/document/VVBW-VVBW000040907>

- Ober, S., Szaguhn, M., & Fricke, A. (2024). Transdisziplinarität. In C. Peer, E. Semlitsch, S. A. Güntner, M. Haas, & A. Bernögger (Eds.), *Urbane Transformation durch soziale Innovation* (pp. 219–226). TU Wien Academic Press. https://doi.org/10.34727/2024/ISBN.978-3-85448-064-8_28
- Parodi, O., & Seebacher, A. (2024). Real-world labs and Living Labs. In Frédéric Darbell (Ed.), *Elgar encyclopedia of interdisciplinarity and transdisciplinarity* (pp. 421–425). Edward Elgar. <https://doi.org/10.4337/9781035317967.ch93>
- Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360(6392), 987–992. <https://doi.org/10.1126/science.aag0216>
- Risku-Norja, H., & Løes, A.-K. (2017). Organic food in food policy and in public catering: Lessons learned from Finland. *Organic Agriculture*, 7, 111–124. <https://doi.org/10.1007/s13165-016-0148-4>
- Schäfer, M., & Haack, M. (2023). Overcoming the efficiency paradigm—The challenges of introducing local organic beef in canteens. *Frontiers in Sustainable Food Systems*, 7, Article 1152185. <https://doi.org/10.3389/fsufs.2023.1152185>
- Schäpke, N., Stelzer, F., Bergmann, M., Singer-Brodowski, M., Wanner, M., Caniglia, G., & Lang, D. J. (2017). *Reallabore im Kontext transformativer Forschung. Ansatzpunkte zur Konzeption und Einbettung in den internationalen Forschungsstand* [Real-world laboratories in the context of transformative research: Starting points for conceptualization and integration into the international state of research] (IETSR Discussion Papers in Transdisciplinary Sustainability Research, 1/2017). Leuphana Universität Lüneburg, Institut für Ethik und Transdisziplinäre Nachhaltigkeitsforschung. https://epub.wupperinst.org/frontdoor/deliver/index/docId/6629/file/6629_Schaepke.pdf
- Schramek, J., Defant, F., Arendholz, E., Andert, S., Gerowitt, B., Nitsch H., & Wende V. (2023): *Zielerfüllungskontrolle und Evaluierung der Pflanzenschutzmittelreduktion und des Ökologischen Landbaus gemäß Biodiversitätsstärkungsgesetz Baden-Württemberg: Endbericht* [Monitoring of goal achievement and evaluation of pesticide reduction and organic farming under the Baden-Württemberg Biodiversity Strengthening Act: Final report]. Institut für Ländliche Strukturforchung (IfLS). https://mlr.baden-wuerttemberg.de/fileadmin/redaktion/m-mlr/intern/dateien/publikationen/Endbericht_BW-Biodiv_Finale-Fassung_2023-10-27_V2.pdf
- Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection [WBAE]. (2020). *Politik für eine nachhaltigere Ernährung. Eine integrierte Ernährungspolitik entwickeln und faire Ernährungsumgebungen gestalten. Gutachten* [Policy for a more sustainable diet: Developing an integrated food policy and shaping fair food environments. Expert report]. <https://www.bmleh.de/SharedDocs/Archiv/Downloads/wbae-gutachten-nachhaltige-ernaehrung.pdf>
- Simon, X., Copena, D., & Pérez-Neira, D. (2023). Assessment of the diet-environment-health-cost quadrilemma in public school canteens. An LCA case study in Galicia (Spain). *Environment, Development and Sustainability*, 25, 12543–12567. <https://doi.org/10.1007/s10668-022-02578-y>
- Singer-Brodowski, M., Beecroft, R., & Parodi, O. (2018). Learning in real-world laboratories: A systematic impulse for discussion. *GALA—Ecological Perspectives for Science and Society*, 27(Suppl. 1), 23–27. <https://doi.org/10.14512/gaia.27.S1.7>
- Speck, M., Wagner, L., Buchborn, F., Steinmeier, F., Friedrich, S., & Langen, N. (2022). *How public catering accelerates sustainability: A German case study*. *Sustainability Science*, 17, 2287–2299. <https://doi.org/10.1007/s11625-022-01183-2>
- Speck, M., Liedtke, C., Hennes, L., El Mourabit, X., & Wagner, L. (2021). *Zukunftsfähige Ernährungssysteme und Konsummuster gestalten: Aktuelle Erkenntnisse aus der Forschung zu nachhaltiger Ernährung am Wuppertal Institut* [Shaping future-proof food systems and consumption patterns: Current findings from research on sustainable nutrition at the Wuppertal Institute] (Working paper no. 19). Wuppertal Institut für Klima, Umwelt, Energie. <https://doi.org/10.48506/OPUS-7834>
- State of Baden-Württemberg. (2024). *Verwaltungsvorschrift des Ministeriums Ländlicher Raum und des Finanzministeriums zum Betrieb und zum Verpflegungsangebot in Kantinen und sonstigen Verpflegungseinrichtungen des Landes Baden-Württemberg (VwV Kantine)* [Administrative provision of the Ministry of Rural Affairs and the Ministry of Finance on the operation and catering offer in canteens and other food facilities of the state of Baden-Württemberg (VwV canteen)]. vom 9. Februar 2024 - Az.: MLR66-8374-308. <https://www.landesrecht-bw.de/bsbw/document/VVBW-VVBW000040907>.

Swinburn, B. A., Kraak, V. I., Allender, S., Atkins, V. J., Baker, P. I., Bogard, J. R., Brinsden, H., Calvillo, A., De Schutter, O., Devarajan, R., Ezzati, M., Friel, S., Goenka, S., Hammond, R. A., Hastings, G., Hawkes, C., Herrero, M., Hovmand, P. S., Howden, M., ... Dietz, W. H. (2019). The global syndemic of obesity, undernutrition, and climate change: *The Lancet* Commission report. *The Lancet*, 393, 791–846. [https://doi.org/10.1016/S0140-6736\(18\)32822-8](https://doi.org/10.1016/S0140-6736(18)32822-8)

The German Nutrition Society [DGE]. (2021). *Auf dem Weg zu mehr Nachhaltigkeit in der Betriebsverpflegung: Empfehlungen und Tipps für Dienstleisterinnen und Dienstleister* [Towards greater sustainability in workplace catering: Recommendations and tips for service providers]. aus dem Projekt Nachhaltig B|UND Gesund. <https://www.dge.de/fileadmin/dok/dge/projekte/LeitfadenNachhaltigkeit.pdf>

Appendix. Connecting Local Food System Actors for Climate-Friendly Public Catering

Table A1. Overview of Impacts that were Identified in the Interviews Conducted Two Years after the Project's Conclusion

The impact encompasses the changes that were implemented within the actors' organizations. The measures currently under planning are indicated in **blue**. Challenges mentioned are indicated in **red**; measures to be implemented in the future are indicated in **grey**.

Actor	Measures against food waste	CO ₂ emissions accounting and communication	Increase the organic share	Increase in the range of vegetarian and/or vegan food	Establishment of take-away and reusable systems	Other changes and impacts
A01 • Canteen in municipal office • Canteen guests: high physical strain, increasingly male	Cooperation with Foodsharing	No, because too time-consuming.	• Increase in organic products (e.g. switch to organic pasta) • Contacting the organic certification body • Remodeling (new shelves for organic products), mainly for beans and pasta	More vegetarian products or menus; significant increase in sales of vegetarian food	Take-away food established in reusable systems	• Increasing the proportion of fresh products (in muesli) and products from our own production for nutritional reasons • Networking as an important lever (Q1, see Table A2)
A02 • Patient catering and canteen in hospital		Working to raise awareness among guests through communication via screens on sustainability and organic products	All side dishes in organic quality (previously only salad) in patient catering	• Even more promotions for the vegetarian line • Training (in-house) for chefs		• Lesson learned: No top-down approach. Important to talk to guests in order to gain understanding for changes • Creating awareness among chefs and employees (Q2)
A03 • Small welfare organization • Canteen guests: Young people	Reuse leftover food (e.g. offer leftovers as salads the next day)		More organic products (some products converted, such as jam, eggs, vegan spread)	• Changing the menu: name the vegetarian options first • Reduce meat consumption by offering more stews and goulash	• Less packaging waste thanks to dispensers (e.g. for honey, jam and Nutella) • Pay more attention to bulk packaging	

Actor	Measures against food waste	CO ₂ emissions accounting and communication	Increase the organic share	Increase in the range of vegetarian and/or vegan food	Establishment of take-away and reusable systems	Other changes and impacts
A04 Coordination of municipal school catering	- Cooperation with Foodsharing and the public order office so that leftovers from a school are passed on to the church community - Cooperation between schools and food sharing since 2024				- Request sustainable packaging in the tender - Introduction of checkout/deposit system for reusable items difficult (Q3)	- Healthy food is often not accepted by children, resulting in a high level of food waste in some cases - Exchange with other cities/municipalities and inner-city exchange important (Q4)
A05 • Canteen of a company			Strive to offer some products as organic (pasta, lentils)		- Introduction of re-usable systems instead of disposable (Q5) - In 2025: Replace the last single-use packaging with reusable packaging	- Communication of changes to guests is important (Q6) - Delivery days reduced from 3 to 2 days through cooperation between dealers
A06 • Canteen of a federal authority with its own tenant • Mixed clientele, including senior citizens from the neighborhood			- Canteen has been certified organic, 20% of the monetary value of goods are organic (mandatory for federal canteens since 2025) - At the same time as prices were increased due to the higher proportion of organic products, VAT was increased to 19% (Q7)		Introduction of re-usable boxes for a 5 euro deposit, in addition to disposable packaging	

Actor	Measures against food waste	CO ₂ emissions accounting and communication	Increase the organic share	Increase in the range of vegetarian and/or vegan food	Establishment of take-away and reusable systems	Other changes and impacts
A07 • Large canteen, employee catering at large research company	• Regularly check portion sizes and leftovers	Staff missing (Q8)	• Increase in organic share from 2% to 11.3% (as of 2025)	• Increase in vegetarian and vegan dishes (instead of 1 out of 4 dishes to 2 out of 4 dishes, vegetarian share is 46%)) • Vegetarian/ vegan dishes are offered first in the product portfolio • Meat substitutes are in demand by guests, but are not considered healthy as they are highly processed	• Introduction of reusable systems is here to stay • Further reduce disposable packaging	• Change recipes and side dishes for individual dishes to integrate regional products • Reducing supply chains by sourcing more regional products
A08 Canteen of a municipal administrative unit	Weighing and measuring food waste to identify areas for improvement	Balancing of CO ₂ emissions of individual dishes (supported by KIT) and communication about this in the weekly plan	• Increasing the proportion of organic products • Target: 50% organic • Increase in prices (Q9)		• Introduction of reusable packaging for pizza	• Networking of different actors as particularly enriching (Q10) • Utilization of training courses for dishes according to DGE guidelines

Source: Authors' own compilation.

Table A2. Actors' Quotations from the Interviews to Illustrate the Findings of Table A1Challenges mentioned are indicated in **red**.

Code Number	Quotations from the interviews
Q1	<i>Because I can't do everything on my own. Sometimes you need an idea, sometimes you need an address. ... It's good to have people who are already a bit further along, where you can get help.</i>
Q2	<i>To restore awareness there, because only they can sell it well.</i>
Q3	<i>Some really great things were presented, but many things are simply very, very cost-intensive. ... The student basically has to pay a deposit for such reusable systems. Yes, and our housekeeping staff are not allowed to collect anything.</i>
Q4	<i>I always say that not everyone needs to reinvent the wheel, but can also learn from others, right?</i>
Q5	<i>... to communicate this to the customer. Because that's often our problem, I'll say in quotation marks, that you then also have customer acceptance. Why do we no longer have disposable items? Why do we no longer have coffee cups that you can take away?</i>
Q6	<i>And now, after three years in total, we've also had good feedback, simply that people are happy to use them.</i>
Q7	<i>... it has the same turnover and at higher prices. So there must have been fewer guests.</i>
Q8	<i>I simply don't have the manpower to balance the courts.</i>
Q9	<i>If it's double the price, that's fine. But if you're paying almost three times the price, that's just not possible. You can't get away with that.</i>
Q10	<i>So it was really extended from kindergartens to schools, to canteens, to company restaurants. ... So it was an exchange from both sides. And it was simply fruitful, because you were always one step ahead.</i>

Source: Authors' own compilation.

Table A3. Questionnaire on Drivers and Barriers

Please tick [check] the boxes in the first three columns (multiple answers possible).
Which of these levers ...
... have you worked with in the past?
... are you currently working with?
... do you want to work with in the future?
Please answer the following questions in brief:
Where do you see hurdles to implementation (such as lack of incentives, financial support, guidelines)?
A. What helped you to implement the lever?
B. Alternatively: What would you need to be able to address or implement the lever?

Table A4. Questionnaire on the Effects of the Project

Question 1. Lever: ...

- Were you informed about this lever by the 'Climate-friendly canteens'?
 - Did you then continue to work on the lever in your company/institution?
 - Has this led to a change in your business/institution?
 - When effects are visible, what do they look like in concrete terms? [Free text]
 - Why did addressing this issue have no effect? [Free text]
-

Question 2. Which two levers are most important for your business/institution in terms of climate protection?

Question 3. How did you find the canteen visits? [very helpful/helpful/neutral/not helpful/not at all helpful]

Question 4. How did you find the FutureBowls format? [very helpful/helpful/neutral/not helpful/not at all helpful]

Question 5. What did you think of the materials provided as part of the project? (Posters, displays on carbon footprinting, presentation on measures for vegetarian offerings) [very helpful/helpful/neutral/not helpful/not at all helpful]

Question 6. In your opinion, what should be retained for similar projects in the future? [Free text]

Question 7. If an offer/element of the climate-friendly canteens could be made permanent or retained within the framework of KARLA, which offer should this be in your opinion? [Free text]

Question 8. Is there anything else you would like to share with us? Was there anything you particularly liked or disliked? [Free text]

Table A5. Questions from the Semi-Standardized Interviews

Question 1. What do you remember, what has stayed with you? How did CliCa support you?

Question 2. Are the changes that arose during the project period still in place?

Question 3. Have you continued to pursue the topics you set out to address?

Question 4. Have you implemented further concrete changes on other topics after the project period?

Question 5. Do you continue to exchange ideas with others/maintain existing contacts?

Question 6. Is there still interest in nutrition topics and networking?
