Discover

Measuring employees' perceptions of sustainability transitions at work: a novel survey with findings from Finland

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Abstract

Sustainability transitions have effects on working life, but there are no standardized measurement instruments for understanding employees' views on their effects. This article presents a novel survey targeted at employees to gather information on employees' perceptions of sustainability in their work. A survey was designed to gather information on all workers, regardless of the economic sector in which they work in, to broadly capture transition-relevant changes in working life. These include measuring the actions of both work organizations and employees to work in a more sustainable way. This paper presents the survey with findings from a nationally representative data collection taken in Finland. The topics include questions from work organizations' sustainability actions to employees' own sustainable actions. The results show the differences in organizations and individuals' actions in working life. Large work organizations are most active, and there are differences between sectors. Individuals' sustainable actions are more common among women and climate worried employees. The method provides evidence of employees' views and actions in sustainability transitions and improves our holistic understanding of transitions in all sectors of the economy. In addition, the results provoke new questions for both policy and research on how to acknowledge differences between social groups in transitions and support them in delivering a just sustainability transition.

Keywords Sustainability transitions · Survey · Work · Measuring · Employees · Organization

1 Introduction

Sustainability transitions—qualitative socio-technical shifts to more sustainable production and consumption patterns— are reshaping work in all sectors of the economy. Changing work is an essential component of all socio-technical transitions due to their systemic and multi-actor characteristics [1], since workers are found from all sectors of the economy and systems of production, where shifts toward sustainability are required. At work, the coevolutionary shifts are implemented by employees' and work organizations' actions to adapt to more sustainable ways to operate, and they have consequences on the employees by changing work practices and by moving jobs from one sector to another [2]. At working life, sustainability transitions refer to social and technical changes that affect the accustomed ways how work

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is done in a more environmentally sustainable way. Understanding this co-evolutionary dynamic between work and societal shifts is essential for ensuring a successful and just sustainability transition.

Currently, there is little information on the general situation of sustainability transitions (STs) in work, since our understanding on STs and work organizations' and employees' actions is mostly based on sector-specific case studies [e.g. 3, 4] and modelling and scenario work [5, 6]. Although an increasing scholarship calls to develop measurements for transition research [7, 8], a research gap exists on how to measure the changes that take place at the intersection of STs and work, although there is an urgent need for data collection tools with broad applicability across the economy [9]. This article presents a new survey method to investigate employees' views on STs to gather information on how employees themselves and their work organizations are already changing toward sustainability. The new method contributes to the needs of both policymakers and researchers to develop knowledge production systems in solving sustainability crisis [10, 11]. Moreover, data-based policymaking has become a crucial element of governance processes [12], and as governments globally have committed to implement transformative actions for sustainable development [13], measures for transitions are needed to keep on track of sustainable change of societal systems.

Pressures for reshaping work more environmentally sustainable result both from policy guidelines and citizen interests. The EU Green Deal will restructure the European economy for a low-carbon trajectory, which will have employment impacts [14] and needs for skills renewal of the working population [15, 16]. The International Labour Organization is further promoting decent green job creation through its guidelines [17], and the UN Agenda 2030 calls for climate action in different levels of the society [13]. Although there are policies targeted to green job creation particularly in the environmental sector [18], transitions are expected to impact all jobs in every sector with varying degrees [15, 19–22]. EU citizens reason that climate change is a major global threat, and their requirements towards governments and companies to solve climate emergency are rising [23, 24], which increases the pressure of non-state actors, such as work organizations, to take climate action [25, 26]. Various communities [27], including work organizations and occupational groups, play a role in developing sustainable alternatives at work, such as new skills and practices [2, 3, 28]. Literature on employees' opportunities to initiate sustainable change exists [29], but there are hindrances for individual action to break down the institutionalized reproduction at work [30, 31]. Currently, we do not know if organizational changes in STs are commonplace or to what extent the changes engage with employees. This kind of information provided by the shop-floor level can inform policymakers about the local conditions in working life where STs are expected to bring about change. Survey data collection will inform of the occurrences of various initiatives of the employees and work organizations, which provide an indication of their contributions to the STs. To understand the current development of working life in STs and to fill the research gaps, this article presents a novel survey addressed to employees and a data collection process on topic. The aim of this article is twofold. First, it summarizes previous literature on employees' and work organizations' actions which advance STs. Second, it presents a survey for collecting information on employees' perceptions on STs at work. The data collected from the employed population generates evidence on whether sustainable shifts are taking place at work, and whether changes are occurring on a broad front. The survey consists of 10 thematic modules for measuring key themes in the interface of work and STs, along with socio-demographic variables.

Section two presents previous research on topic and positions employees in ST research. Section three presents how the survey was planned, and the research data collected, including the discussion of the limitations of the research method. Section four presents the results of the survey, which highlight the differences in employees' perceptions regarding their gender, sector of work, and other background variables. Section five discusses the findings in more detail with an emphasis on the societal relevance of the data. Section six concludes the article.

2 Employees and work organizations' actions in sustainability transitions

This section presents previous research on the connections between environmental sustainability and employees. With a focus on previous survey research, we bring about how work organizations and employees reshape their ways of working to realize transition toward sustainable production modes. After the review, we discuss recent calls to develop methods and measuring in the field of ST research.

2.1 Employees in sustainability transitions

The centrality of working life in solving sustainability challenges is increasingly recognized [32–34]. However, most empirical research in the field of ST research has focused on job destruction and job creation driven by the STs [e.g. 35].

Scholars such as Casano [19], Moilanen & Alasoini [2] and Süßbauer et al. [36] highlight that the connection between the STs and employees' is more diverse, and STs also take place and create change among work communities at the grassroots level. For instance, Moilanen and Alasoini [2] present that in addition to job destruction and creation, employees' skills, practices, and knowledge contribute to sustainability of their work organizations, occupational communities, and their own work. Sustainability initiatives at work organization require employees to change their accustomed ways to work [36], which may increase skills' requirements [19]. Employees should not be examined only as objects of climate policies, but also as grassroots actors equipped with agency to influence their work, the work organization or collaborating stakeholders, and push them toward more sustainable directions. However, employees' opportunities to initiate change has constraints, since their colleagues may be unwilling to adopt new sustainable ways to work [2], or initiation on sustainability can be perceived as a threat for their career [31]. Therefore, views of the working population provide information on their willingness to change toward sustainability and the potential change resistance.

In addition to ST research, employees' contributions to environmentally sustainable work have been investigated especially in the field of pro-environmental behaviour [see e.g., 29, 37], which refers to individual and discretionary activities conducted by employees at work [38]. Multiple indicators for measuring pro-environmental behaviour at work have been developed, but they include obvious weaknesses: most data collection has taken place in office environments with small samples, and research has mostly limited to developing and comparing quantitative indicators of different behaviours, such as recycling and reusing [38]. Research on organizational efforts, such as environmental training or the influence of organizational norms and values of the workplace, have received less attention [however, see 37, 39]. STs refer to systemic and qualitative shifts toward sustainable production patterns, and thus, focus of measuring should cover both individual and organizational factors.

Literatures in environmental management, industrial relations, and corporate social responsibility (CSR) have investigated how employees may contribute to organizations' sustainability, although these fields have not developed measurements applicable to the wage earner population. However, there are means by which employees can contribute to organizational climate change mitigation and adaptation efforts, and this emphasizes the relevance of measuring employees' views and experiences. For instance, Reed [40] and Boiral [41] assert that employees' involvement in organizations' environmental affairs strengthens its overall environmental management, and employees' awareness of climate change is connected to organization's climate actions [42]. Employees' actions are associated with higher emission reductions in organizations [43] and they have a role in contributing to CSR [44]. In addition, employees need information on how to adapt to climate change at work [45, 46] and their knowledge can contribute to organizational adaptation plans [47]. Since the shifts toward sustainable production and consumption are expected to influence employees, and previous literature provides ample evidence between organization's sustainability and opportunities of employee involvement to contribute to it, it is relevant for both policy and society to develop indicators for making such measures. The use of this information will support employees and work organizations in STs and make their actions visible.

2.2 Quantifying employees' opinions in sustainability transitions research

The field of sustainability transitions research has focused on qualitative and case study-oriented research, but the need to develop new methodologies has been acknowledged [1]. Data collection from the employees has played a central role in improving working conditions and employment policies [48, 49]. Employees' views and use of their knowledge could benefit organizational development on the environment and climate as well and inform better environmental policymaking. In the context of STs, employees' perceptions produce information on the organizational practices and actions from a lay perspective [50], which are currently little represented in the field. Their views help to produce a more varied understanding of sustainability in organizations [51], since organizations' management can overestimate actions [46]. Krlev & Terstriep [7] and Williams & Robinson [8] have already investigated the possibilities and preconditions of measuring STs.

Williams & Robinson [8] raise actors and practices as one of the five elements in measuring STs, which can be observed by investigating actors' perceptions of changes in the rules of an organization, or perceptions in their own change initiation. Work can be conceptualized as a game, where accustomed and socially shared norms and practices prevent shifts toward sustainability [2, 52]. However, the rules can be challenged by the sustainable alternatives of the organizations or employees, which emerge through introductions of new practices, technologies, and policies at the organization, for instance. Analysis of employees' perceptions on work and changes in work practices provide evidence whether STs already emerge at work. Rohracher et al. [53] view that transformative actions fail in delivering full impact without monitoring measures, which inform on the changes the actions are supposed to accomplish. Following this,

measuring working life and changes in there brought by STs will only become systematically understood when they become measured.

To position our survey methodology with ST theory, employees and work organizations are seen as actors of the regime level, who contribute to the stability of industries in their daily operations [2, 52]. The accustomed institutions at work, such as norms, values, and cultures of work, both enable and constrain how work is done, contributing to unsustainability of industrial regimes [54, 55]. STs take place through social and technological innovations, which evolve in relational and systemic interactions between actors [55]. Following this, measuring of employees' understandings of their work organizations' actions and their own sustainable actions maps out the already ongoing initiation toward sustainability in regimes. Although literature on actors in STs exists [56, 57], less attention has been paid to the analysis of regime actors, i.e., general citizens, who are envisioned to adapt to the changing environment by adopting innovations and changing their behaviour [58, 59]. Thus, measuring of employees' perceptions and experiences of their work and the organization provide a viewpoint for operationalizing transition processes that impact actors, also a research gaps posed by Huttunen et al. [59].

3 Data and method

3.1 Development of survey and sampling of survey data

We designed a survey to fill the knowledge needs identified in the previous sections. The guiding principles in building the questionnaire were to design questions on sustainability at work which would be suitable for employees working in any economic sector or occupation. Previous survey measurements on work and sustainability were utilized as the starting point for our efforts [see e.g. 38, 60–62]. For instance, the review conducted by of Francoeur et al. [38] was used to acknowledge the variety in employees' actions, but we focused on such pro-environmental topics, such as initiation and ideas, that can emerge in every occupation. The findings of García Mira and Dumitru [61] and Yuriev et al. [37] were used to understand organizational actions that would indicate of a shift toward sustainable modes of operation. Existing previous validated survey instruments were used when applicable, mainly to measure climate change attitude with questions used in the European Social Survey.

The first author was responsible for the original drafting of the survey, and it was further developed in a multidisciplinary research group as an iterative process between 2021 and 2022. The survey was pre-tested two times by both quantitative and qualitative means to increase the validity and reliability of the survey before the final data collection took place [63]. The first test took place in a Finnish work organization in October 2021. The number of responses was 51. The pilot survey enabled the respondents to provide feedback on every page of the survey on how they experienced answering the survey. The feedback was utilized for the development of the final survey. This quantitative testing also included conducting explanatory factor analysis on the factor loadings and dimensions of the measures. As a result of the testing, questions and measurement scales were refined. The second test took place in January 2022. The first author conducted fourteen qualitative interviews with employees working in different fields of the economy. The informants provided valuable feedback for making final revisions to the survey.

3.2 Sampling and data collection

The survey questionnaire was put to a full-scale test in a data collection with Finnish employees. The target population of the final research survey was wage earners working in Finland and the unit of analysis was an individual employee. In collaboration with government organization Statistics Finland, it was possible to take representative sample of wage earners working in Finland. Although the coverage of their employment register is good, there is a delay to sampling, during which the working status of individuals can change. The sample was formed from the most recent register data available, spring 2019, and the sample size of the survey was 5000 wage earners. It was expected that in 2022, 84–88% of the respondents still have a wage earner status despite the delay in register data. Sampling criteria of the target group was set to cover employees between 18 and 67 years. Because of the delay in register data, employees aged 18 or 19 couldn't be reached to the sample. The sampling was made representative by weighing in the sampling the geographical area of living, age, and sex. This followed a similar sampling criterion with other representative wage earner surveys conducted by Statistics Finland. We were also interested to find out whether the novel topic gains similar interest among wage earners and if the data and its results could be compared

with other similar wage earner data. The research ethical committee of the Finnish Institute of Occupational Health provided consent for data collection in March 2022.

The data collection took place between 11.3.2022-23.6.2022. The data was collected through a web-based survey. Username and password for accessing the web-based survey were distributed for respondents via post mail, attached with an information leaflet of the research project and its objectives. The leaflet informed that consent to participate in the study is voluntary. In addition, it included information on the confidential data usage, anonymity, and data protection. After the first contact with the population, the respondents were reminded of the data collection three times in spring 2022 with an information leaflet send via post mail. The second to last post mail also included the survey form in paper and a response envelope. Two text messages or emails were sent to those respondents whose phone number or email address was found from the register to increase respondent activity. The final response rate of the survey was 38.3%. The target response rate was from 35 to 40%, which was considered high enough for desired statistical generalizations based on the data. Gift card lottery was used as an incentive for the respondents. The final data consisted of those respondents who filled at least one third of the survey and the number of respondents was 1917. Table 1 presents the general profile of the sample.

3.3 Survey

The survey consists of 10 thematic sets of questions: Workplace sustainability, employer's sustainable actions, work organization's sustainability actions, sustainability skills training, sustainable work environment, own sustainable actions, awareness of new occupational safety and health risks, preparedness to hot working conditions, climate change related worries and opportunities, and sustainable values, along with socio-demographic variables. Five topics measure employees' personal views, such as perception of workplaces' sustainability, and they have a Likert-scale. Other five topics measure employees' observations at their work, and they have a dichotomous scale. All questions included an option to answer, 'I don't know'. Table 2 provides a short summary of the themes with a sample question.

Each theme includes a number of questions about the theme. Dimensionality testing is a key phase in scale evaluation [63] so Exploratory Factor Analysis was applied to each of the thematic sets separately. As the measurement scales are more properly treated as ordered, polychoric correlations were calculated and used as the basis of factor analysis. The factoring method was maximum likelihood. Factor analyses were run starting with one factor, increasing the number of factors as needed. The goal was to select the most parsimonious model for each theme, i.e. one where each item has a substantial loading to one factor (> 0.3) and one factor only, with the smallest number of factors. All 10 themes except one were found to be satisfactory with one factor, so they represent a unidimensional concept. One theme consisted of two factors (climate change worries and opportunities at work). All items and details of the factor analysis are available in Appendix A. Survey form is available in Appendix B.

Table 1 Profile of the data population

Sex	%	Sector	%	Employee status		Age group	%	Level of education[a]	%
Female	53,6	Private sector	63,7	Wage earner	84,3	20–29	14,1	No education	0,4
Male	44,6	Public sector	29,8	Out of labour market temporarily[b]	10	30–39	20,4	EQF 2–4	45,1
Other[c]	1,8	NGOs, HEIs	6,5	Retired	4,1	40–49	23,1	EQF 5	4,4
				Entrepreneur, freelancer[d]	1,6	50–59	25,2	EQF 6	23,4
						60–69	17,2	EQF 7	23,4
								EQF 8	3,2

[a]Classification according to European Qualification Framework

[b]Including unemployed and laid off workers, students and employees on a parental leave

[c]Respondents who responded their gender being other and who declined to provide an answer

[d]Including farmers and those working on a family farm

Table 2 Description of the survey measurements

Measurement	Target of the measurement	Scale	Sample question	Number of questions	Range of polychoric factor loadings
Workplace sustainability	Estimates whether employee perceives own workplace sustainable	5 item Likert scale	My workplace is a frontrunner in climate friendly operations in its field	7	0.69–0.91
Employer's sustainable actions	Assesses employees' perceptions of their employer and whether the employer mode of operation is sustainable	5 item Likert scale	My employer is willing to use resources to mitigate climate change	3	0.92–0.95
Work organization's sustainability actions	Measures the frequency of climate actions at employees' work organizations	3 item dichotomous scale	Has your workplace: Collected information on employees' skills in environmental and climate affairs?	10	0.83–0.90
Sustainability skills training	Measures the training on sustainability concerns, such as energy saving at work	4 item dichotomous scale	Has your workplace drawn up instructions or arranged training that concern the following things in your work: Energy saving or energy efficiency	6	0.67–0.93
Sustainable work environment	Estimate how sustainability is considered in the working environments	4 item dichotomous scale	At my workplace, there are recycled furniture, equipment or machines	7	0.34–0.78
Own sustainable actions	Evaluate employees own sustainable actions at work	5 item Likert scale	I have already made suggestions at my workplace to promote climate change mitigation or ecological sustainability	8	0.64–0.85
Awareness of new occupational safety and health risks	Measure employees' awareness of occupational risks related to climate change and sustainability transitions	4 item dichotomous scale	Have you discussed of the following climate change related occupational risks at your workplace: Working in high temperature	9	0.58–0.86
Preparedness to hot working conditions	Investigate employees' abilities and knowledge to work in hot environment	4 item dichotomous scale	Is there a cool space organized in your workplace where you can take a break during a heat wave?	6	0.52–0.93
Climate change related worries and opportunities	Measure employees worries and opportunities related to climate change and sustainability transitions at work	5 item Likert scale	My work and my environmental values are conflicted	5	0.50–0.97
Sustainability values	Measure employees' sustainable values	5 item Likert scale	Climate actions are also the responsibility of workplaces	6	0.49–0.83

3.4 Reliability and validity of the research method

Content validity of the survey was assessed through different phases of the project. First, the researchers involved in the planning of the survey represented seven different academic fields. This multidisciplinary perspective involved in the iterative development process of the survey form strengthened the thorough understanding of the essential topics related to work, STs, and climate change. Both quantitative and qualitative test surveys contributed to improvements of the content validity of the final survey. At the last stage, specialists of survey data collection working in Statistics Finland also participated with the finishing touch.

Construct validity of the survey is more complex since sustainability challenges vary between occupations. Organizational and employees' actions are context dependent [64], and relevance of the questions may vary between respondents. In addition to irrelevance, employees may not be aware of all the climate actions in their work organizations, also noted by Piwowar-Sulej [65]. The sectoral differences and lack of knowledge were considered by providing an option to answer, 'Not relevant at my work', in the questions where context specificity of work was assessed to be an issue. Opportunity to respond 'I don't know' was provided with every questions. The concern over employees' lack of knowledge and the sectoral differences were evaluated smaller than the advantages of the new survey and data collection on a topical issue. The pre-tests of the survey and a relatively good response rate of the data collection signal that the survey content was relevant for many of the respondents.

Concerns of reliability of the survey data were also acknowledged before the data collection, and they are discussed thoroughly for instance by Perrin & McFarland [66]. One central reliability question of this survey is the novelty of the topic. For instance, respondents may lack of knowledge of the assessed action at the work organization and employees may therefore be unable to provide answers [46, 65]. In addition, for many employees their traditional relationship to their workplace may have been disrupted due to increased remote work during the Covid-19 pandemic, potentially decreasing their knowledge on affairs of their workplace. Moreover, although definitions for the terms used in the survey were provided, they may be understood differently by respondents which may weaken the reliability of the results.

4 Results

We demonstrate the utility of the survey with examples of how factor scores differ between different socio-demographic employee groups and their work organizations. Factor scores were analysed with five background variables: Respondent's worry of climate change, gender, education level, work organization size, and sector of work. The background variables used in the analysis are presented in Table 3. We have selected four key themes to highlight what we can learn with the survey, showing factor score means and 95% confidence intervals for the various groups.

Figure 1 presents the differences in employees' perceptions of sustainability of their workplace, which were measured with seven items describing manifestations of sustainability such as efficient resource use and sustainability communication at the workplace. Higher values indicate respondent's positive perception of their workplaces' sustainability. Differences can be found between sectors of work, size of work organization and gender groups, as illustrated in the Fig. 1. The negative perceptions of the health care sector employees stand out since they are not experiencing almost any of the measured issues in their workplace. Based on this can be estimated that STs are not yet taking place in all sectors of the economy, or at least they are not known by the employees. Employees, who work in fossil intensive sectors such as industry, construction, or energy, have most positive perceptions toward sustainability of their workplace. These sectors are most affected by STs due to their high greenhouse gas emissions and environmental impacts, and based on the findings, actions already seem to take place among employees in these sectors.

Employees of large organizations view their workplaces as sustainable most often. Large organizations have more resources to use for sustainable actions, such as clean technology or organizational communication on sustainability, which may explain their employees' positive attitudes. However, if sustainability of work was measured by greenhouse gas emissions, large organizations and fossil intensive sectors would probably be estimated the least sustainable. Thus, employees' perceptions do not necessarily correspond with other sustainability measures, such as greenhouse gas protocol. However, as illustrated in Fig. 1, the findings inform on where workplaces already seem sustainable and where employees are disagreeing with workplace sustainability. Regarding gender differences, the Finnish labour

Table 3 Background variables used in the analysis

Variables	%
Gender	
Women	54, 6
Men	45, 4
Education level	
No university education	49, 7
University education	50, 3
Climate concern	
Unworried/Don't know	21
Somewhat worried	52, 5
Worried	26, 5
Organization size	
0–9 persons	16, 5
10–49 persons	34, 6
50–249 persons	24, 2
250 persons or more	24, 7
Sector of the economy	
Fossil intensive	33
Health care	24, 5
Private services	23, 5
Education, research, and administration	18, 9

market is highly segmented between gender groups, and most workers in fossil intensive sectors are men and most in the health care sector are women. This labour market characteristic partially explains the gender differences.

Figure 2 presents the findings of sustainability actions in work organization, with higher values indicating more action. The measured climate actions varied from organization climate program to co-creation of climate friendly work practices at the workplace, all of which foster shifts toward sustainable production by involving the employees. Overall, the mean values are low. This indicates that organization's climate actions are scarce in Finland according to the employees. However, employees of large organizations make an exception since they have experienced sustainability actions most often. The greater activity of large work organizations may be explained due to their better resources to invest in organizations' internal development.

Least sustainability actions have been experienced by respondents who are not worried of climate change, or who work in small organizations or in the health care sector. Employees' nonconcern of climate change may be associated with little interest to take part in, or familiarize oneself with, the sustainability actions of the work organization, which may explain the low factor score. Small organizations and health care sector organizations may be too occupied with maintaining their core operations, and therefore do not have enough resources or capacity to implement the measured actions. Health care sector has been assessed to have a lot of climate change mitigation potential [67], but based on the findings, employees of the sector are not familiar with sustainability actions, the actions do not exist, or they do not involve them.

Figure 3 presents the differences in employees' sustainability skills trainings at the workplace, with higher values representing more training. As shown in the Fig. 3, training on the measured general sustainability skills is not commonplace at Finnish workplaces. There are some differences: men, and employees of fossil intensive sectors and large work organizations, reported of sustainability trainings more often than others. Some training on sustainability skills is already provided, but currently it is not equally received by the employees. STs are evaluated to mean reskilling or on-the-job learning for most employees, regardless of the sector [15, 19]. Low training scores indicate that re-skilling and upskilling is still rare, and more efforts are needed to drive STs in every workplace.

Figure 4 presents the factor scores of employees' own sustainable actions, with higher values indicating more action. Worry of climate change is associated with a positive factor score, indicating that worried employees are already acting in their work to do it more sustainably and having ideas on how to do it. This is unsurprising but provides an indicator of validity for the measurement. Differences due to organizational factors are also found, as employees in small organizations and in the sectors of education, research, and administration report of their own sustainable actions most often.
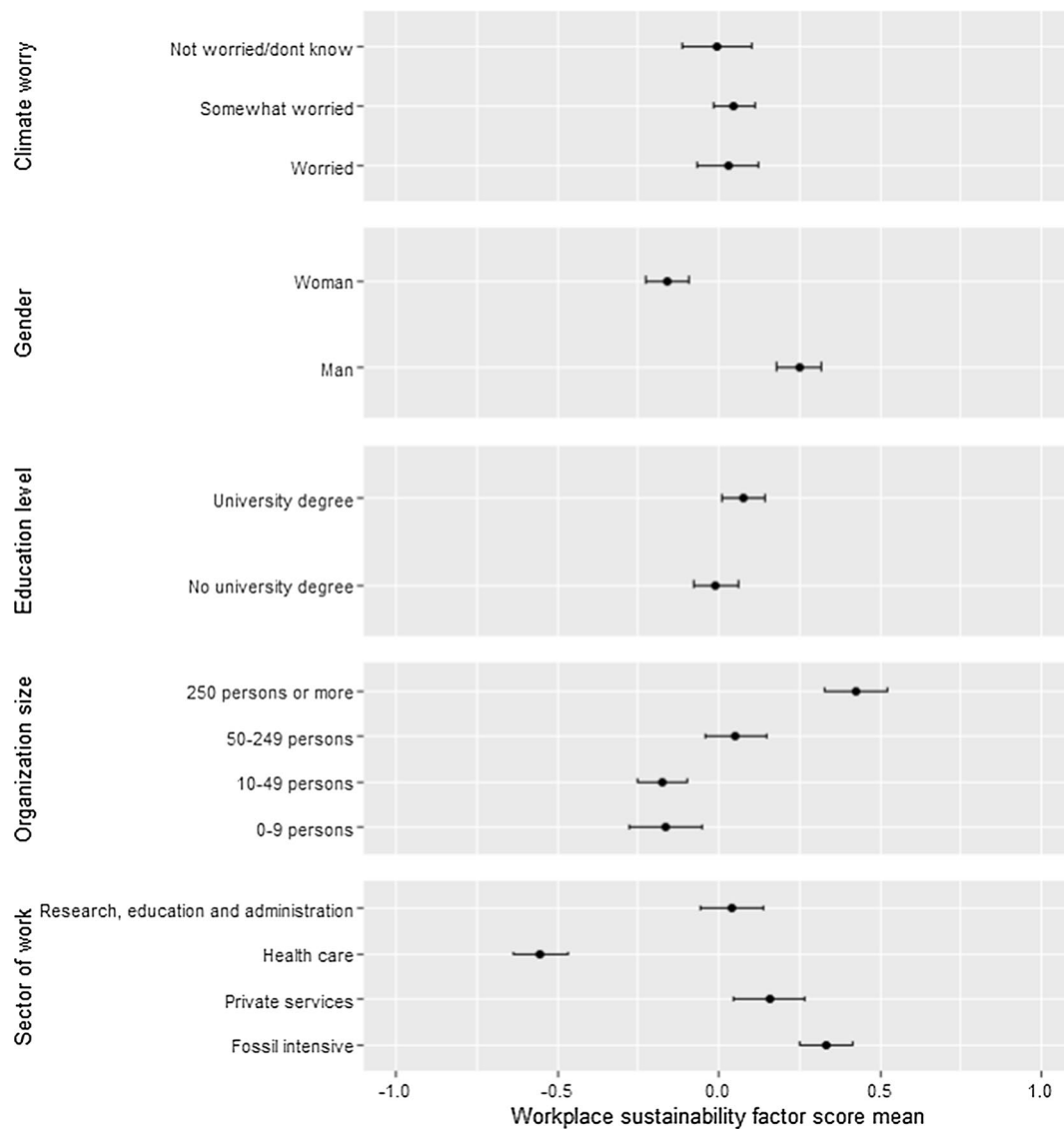
Fig. 1 Workplace sustainability factor score means

In smaller organizations, the initiatives of individual employees may play a greater role in STs, since small organizations may not have resources for larger scale sustainability actions, as shown in Fig. 2. Thus, organization size and sector of work seem to have an effect on employees' opportunities to act on sustainability.

Figure 4 also shows that women and employees with a university degree seem to be more engaged to do sustainable actions at work. These differences have also been noted in previous research [64, 68], although not with a data representing working population of a country. Even though the workplace perceptions of women were often more negative (Fig. 1) and sustainability actions at their work organizations were usually scarce (Fig. 2), they are more engaged in individual action. The findings may indicate that organizational actions do not foster individual actions, but on the contrary, individuals are more engaged in sustainability actions when organizations are inactive. However, it is important to note that previous research has found bias when individuals self-assess pro-environmental behaviours [69], and this may explain high factor scores in own actions.

As shown above, the views and experiences of the employed population differ according to their sector of work, organization size, gender, education level, and climate worry. The illustration of the findings of the survey data shows that the research method can provide information of different employees' perceptions of sustainability at
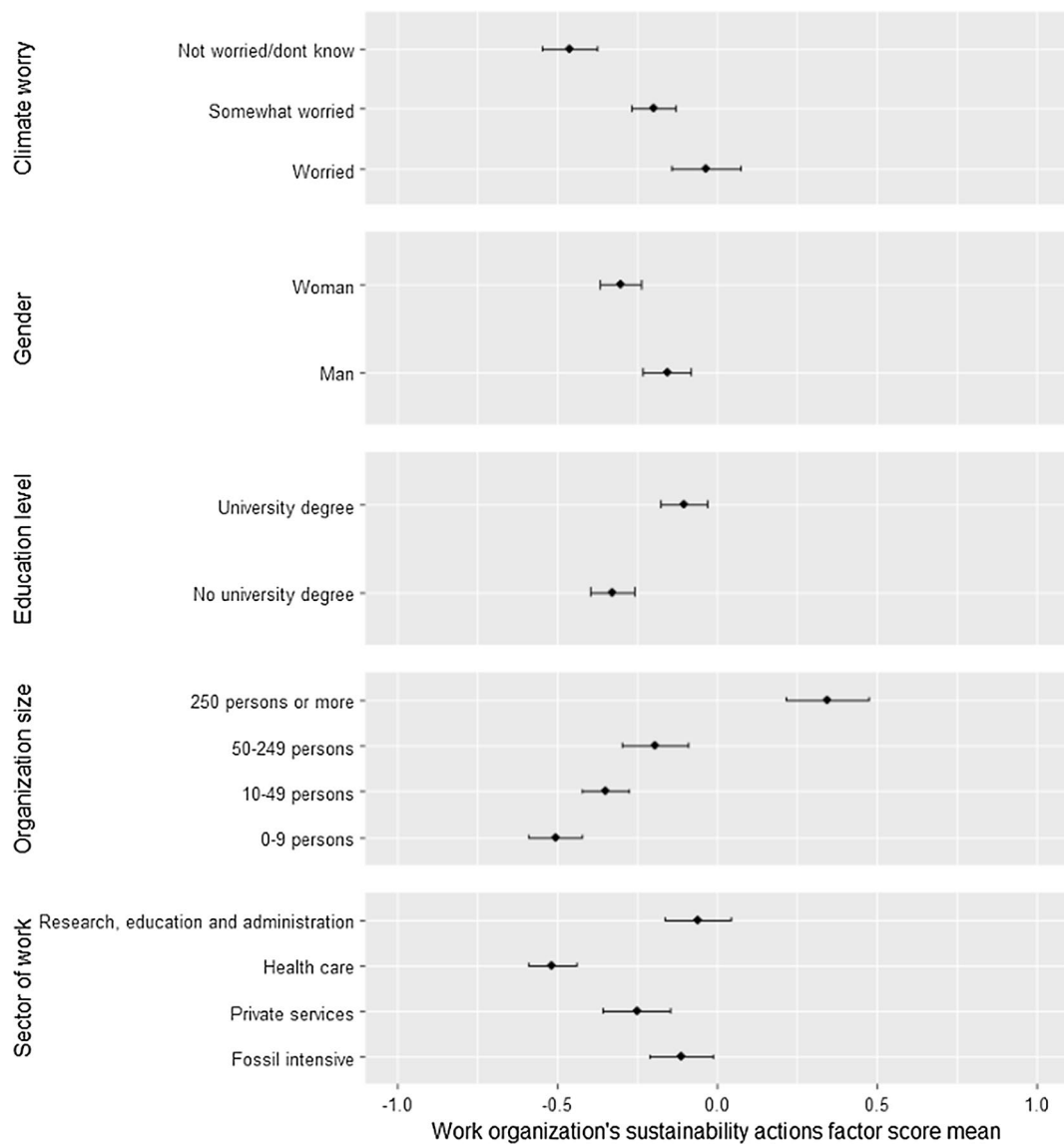
Fig. 2 Work organization's sustainability actions factor score means

work. The survey data can fill the gap between the envisioned sustainable future of work and the practical steps that are already taking place at working life to hasten STs. However, most analysed measures provide low factor scores, which indicate that employees' perceptions of their workplace's sustainability are negative, and actions and trainings to make work more sustainable are still infrequent. This highlights the need to strengthen local actions and support local capacities to hasten STs at work.
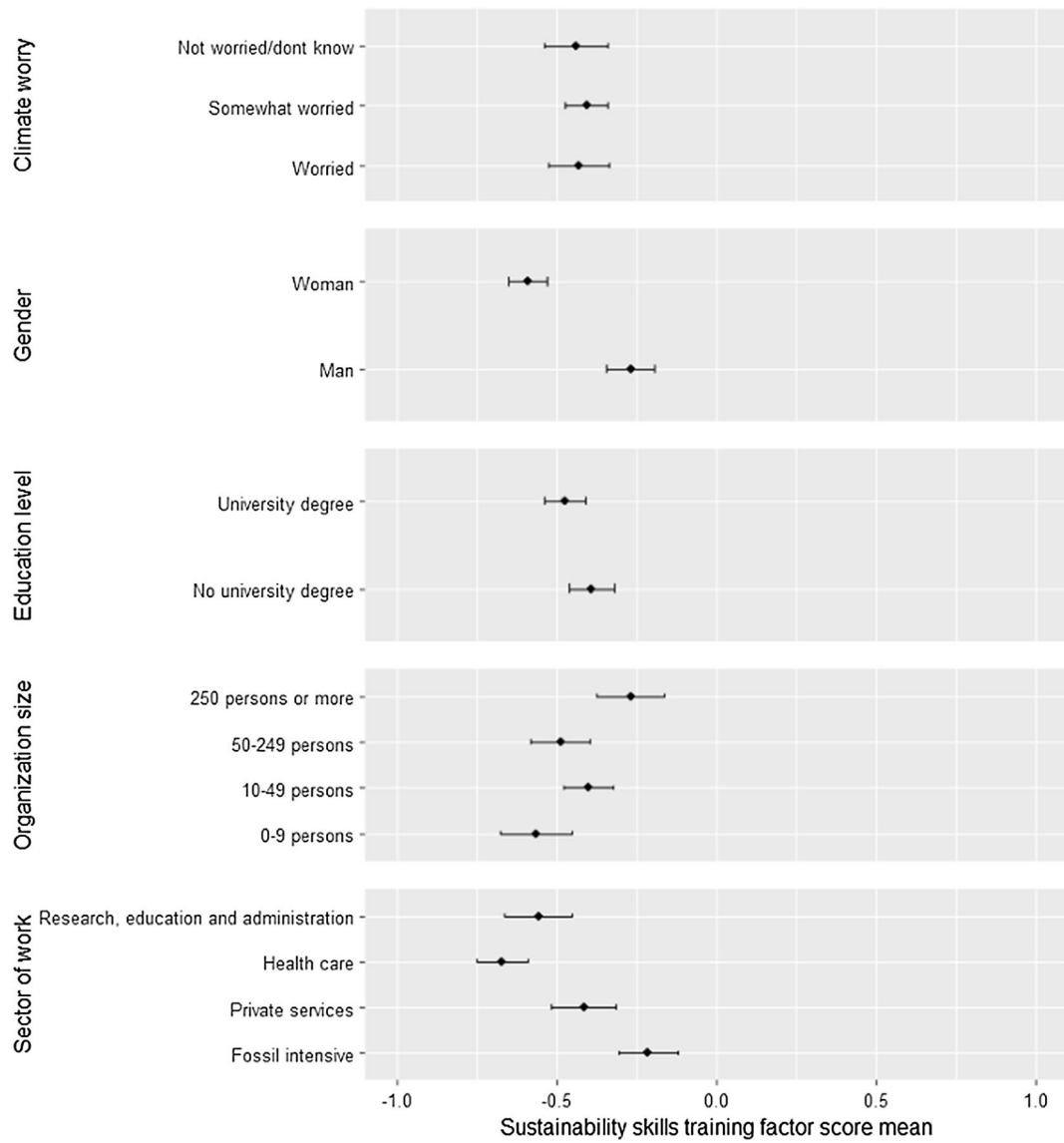
Fig. 3 Sustainability skills trainings factor score means
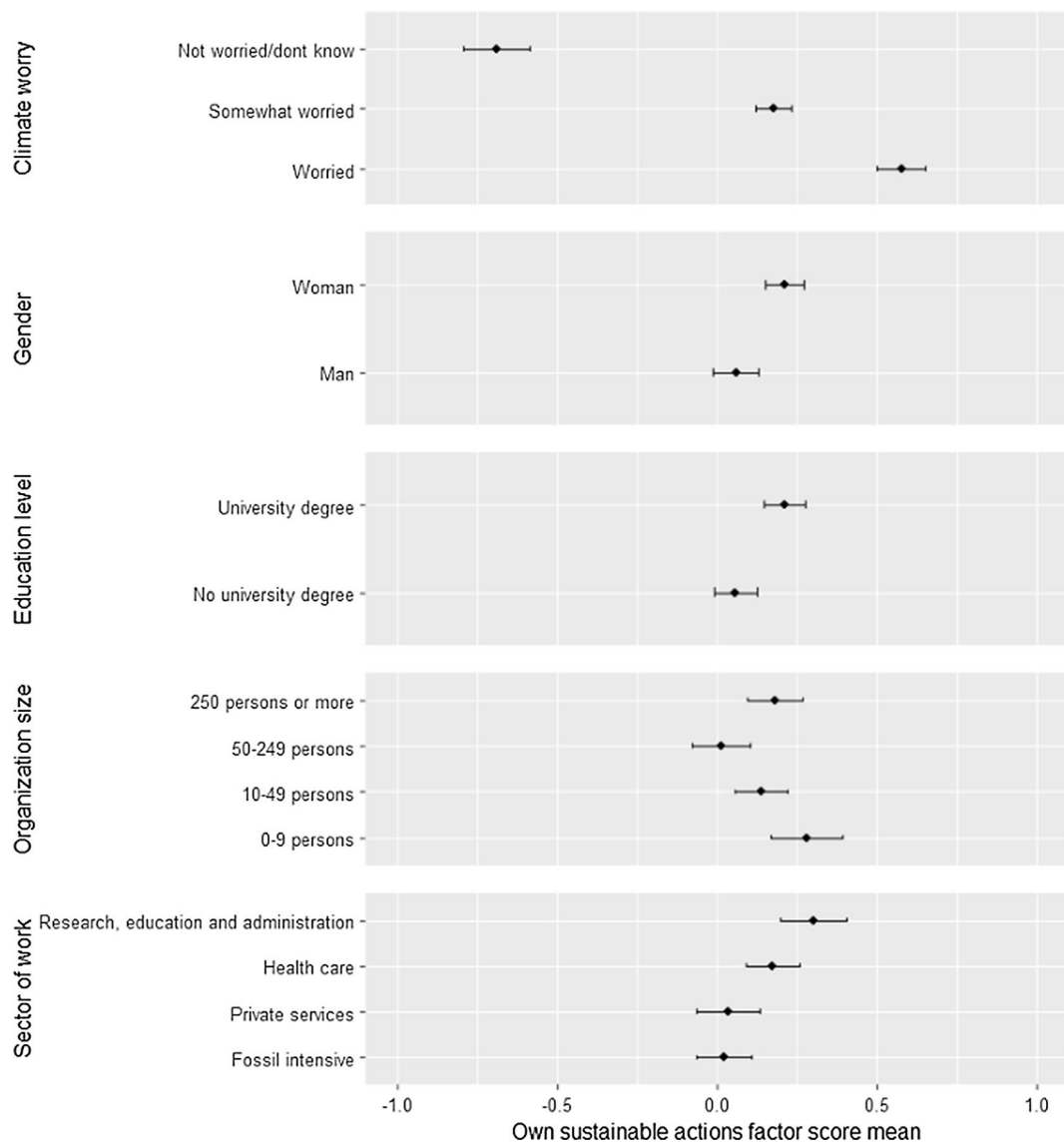
Fig. 4 Own sustainable actions factor score means

5 Discussion

This section discusses the developed survey method and the findings presented in section four from two perspectives, namely environmental and climate policies, and ST research.

5.1 Policy relevance of measuring employees' experiences in sustainability transitions

The survey provides information on the employees' current experiences and opinions of sustainability in work. Representative working population data on topic has not been collected before, and the method presents evidence on the currently limited understanding of how transitions are emerging and having consequences for employees in different sectors of the economy. Measuring employees' perceptions of sustainability can provide relevant information for policymakers. First, on-the-job learning on sustainability is becoming a central issue for the practice of STs [15], but it is unclear how it will take place. Second, participatory means to implement STs with employees support their acceptance [70, 71], but there is no information on how general such participatory actions are. Third, the actions of non-state actors, such as work organizations, are becoming increasingly important in time of insufficient national

emissions cuts [25], and employees' views produce information on these non-state actors' actions. The survey methodology fills the timely knowledge needs among policymakers on how employees already are affected or involved in organizations' efforts to hasten transitions to sustainability, and the data can further support policymaking on STs.

Currently, most employees in Finland do not perceive their work organizations sustainable, and actions to hasten transition to sustainability are scarce. Today, sustainability is not a cutting through megatrend at work, although it is envisioned to be one in the future. For the most employees, there is neither clean technologies nor climate change communication in the workplaces, although new climate change mitigating technology is playing a major role in delivering the transition, and communication on climate change mitigation to employees can improve the efficiency of those actions [43]. How environmental policy can leverage transformative actions to all sectors of the economy and support organizations and workers within transitions processes is a crucial question. In previous studies it has been noted that STs affect various communities by forcing them to learn and adapt to new technologies and practices. However, they lack both information on the upcoming changes, and capabilities on how to confront them [4, 58]. Based on the employees' experiences, training on sustainability is not yet common and neither are collaborative climate actions. This provides an indication that most work organizations are not yet providing on-the-job training for their employees, which should be a concern for policymaking. Means to support all communities in transitions requires more attention from policymakers, which would further articulate how to move sustainability visions into daily action. One mean is to provide support for the management, who has the power and position to manage change and provide support for the employees [4]. In addition, learnings from evidence-based policies and policy programmes developed in the field of quality of working life can be useful in such attempts [48].

The findings on sectors and different sized organizations indicate the need to pay more attention on how different organizations implement and manage STs, and how they are supported by policies. In fossil-intensive sectors, such as energy and construction sectors, training on sustainability is more frequent and employees' perceptions of sustainability of their workplace are more positive. These sectors have been more addressed by climate policies due to their high direct environmental impacts, and the findings indicate that actions to shift into sustainable ways to work have already began in these fields. Regarding organization size, smaller organizations do not seem as active, and they have also less resources and capabilities to develop their operations more sustainable. The low factor scores of health care sector employees also indicate that the topic has not gained attention in this field, although systematic efforts for climate change mitigation in the field are presented [e.g. 67]. Future policy at the nexus of employment and environment needs to carefully consider the differences between social groups and organizations of different sectors so that policy does not maintain the already existing inequalities at the labour market. The means for supporting all kinds of organizations in transitions by sharing information and supporting their capabilities is an essential question for policymakers.

Even though sustainable actions carried out by individuals at work have mitigation potential [72, 73], employees' actions at work have not been investigated before with large and nationally representative data sets [38]. The results show that employees in Finland are already engaged in sustainable actions, indicating that there is willingness to do one's work in a more sustainable way. Engagement with these sustainability frontrunners can be useful in supporting STs at grassroots level because they are already motivated and willing to learn and change the accustomed ways at work. The activity of forerunners is central in initiating change in their own work communities, and this has already been investigated with qualitative research methods [30, 74, 75]. However, previous research has also noted that the power and agency of individuals is limited in changing the unsustainable norms of a larger group. Therefore, actions at the collective level on the work organization and occupational community are simultaneously needed to implement STs on a larger scale. Policy tools for strengthening all employees' capacities in each sector of the economy with fair means is a crucial question for future policy. Employee engagement is a mean to implement just transition, and here, acknowledging their opinion is a critical point.

5.2 Contributions of the survey and measuring of regime actors' perceptions to ST literature

The survey and the findings provide evidence of STs on a large scale among Finnish working population. Survey data representing the whole population level describes the regime as it is experienced by the employees. The measurements provide an indicator of how general individuals' and organizations' actions are in STs. Survey data representing the Finnish working population provides new perspective for the field on STs, which the accustomed methods used in the field, such as case studies, are not able to do. The contribution of this survey to the field is to show that workers and work organizations are actors in transitions who can act and reshape work and production systems more sustainable. Measuring of

these actions indicates the latecomers of sustainability and the forerunners, but in order to deliver a transition, change has to take place on a broad front, eventually touching upon the regime actors [59].

The results show the sustainability forerunners, namely climate worried employees, large organizations and fossil intensive sectors, who are already acting to work in more sustainable ways. However, and more importantly, the results show the infrequency of action and disagreement among working population. As noted in the introduction, there are knowledge gaps in taking into account the employees' points of views. For instance, there is lack of knowledge of the prevalence of organizational change to operate in a more sustainable way and whether these actions influence their employees. As illustrated in the section four, the results show that changes in the regimes of work are rare. Large scale change in the 'rules of the game' at work is not taking place when measured by employees perceptions. Although Hölsgens [58] presents that large scale adoption of alternatives rarely happens, participation of regime actors is a key for fulfilling the sustainability targets [59]. Future research on topic should further elaborate the regimes of work, and the actions taken to reshape work sustainable. Repetition of the employee survey data collection in the future will show if employees' perceptions change over time. This will help create a more dynamic understanding of sustainability transitions at working life.

5.3 Limitations of the research

A limitation of this study is that it focused on the views of wage earners working in one country, Finland. Future studies could compare differences in employees' views between countries. Another limitation is that the results are based on a cross-cut data. The follow-up surveys will enable a time-series analysis, which will show how employees' perceptions change over time. The initial target of this survey was to initiate a new time-series data collection on topic and future studies will show if work changes more sustainable.

Low factor scores of small organizations raise a concern on whether suitability of the survey questions could be improved for them. Although small organizations do not do organizational sustainability actions, it does not mean that they are necessarily less sustainable. Their actions may be different, since employees working in small organizations report of higher individual actions. Organization size may be both an enabler or a constraint for certain kinds of actions, and this topic requires further research. In addition, future studies and survey research on topic will help develop the most relevant questions for all organization sizes and employees.

6 Conclusions

The aim of this article is to push forward the current discussion at the intersection of STs and work by showing that changes driven by STs at work can be made measurable by a new survey method presented in this article. STs are expected to have influence on all employees with various degrees, and thus, the survey is targeted to employees regardless of the economic sector in which they work at. Acceleration of transitions, scale up of alternatives and their diffusion can be better understood when their effects are measured with systematic means [8]. Scaling up STs requires changes on a large scale, and survey is a well-suited method for understanding general trends in the society. Until now, there have been no prevailing quantitative indicators or ways of measuring STs at work or the effects of climate change at work, although the urgency of such information has been acknowledged [9]. The results of the survey provide an indication of the differences among employees' perceptions and sustainability actions on both among organizations and employees.

This research and survey data highlight the role of work organization as a community, where accustomed practices and norms should be acknowledged, questioned, and reshaped to enable STs. It points out to social groups and sectors of the economy, where actions guiding toward STs are needed. Based on the results, sustainability of the health care sector provides an interesting point for future research, since its performance is weakest in the light of the results. Future research on work organizations and employees' roles will provide new insight for previous discussion on community action [4, 27] and actors [56, 57] in ST research. More research is needed on how to scale-up sustainable alternatives to the regimes at work and create a truly sustainability working life.

Current policy discussion is mostly focused on new employment opportunities and innovation resulting from STs, and they do not sufficiently address how to reshape the already ongoing activities of work organizations more sustainable. Measuring transitions and pointing out their hindrances, such as lack of sustainability training, can further inform decisionmakers to plan better-suited policy. Policy relevance of organizational actions is increasing as nation states fail

to act in reaching international climate targets. Employees' opinions can guide policymaking and provide information of the current state of STs in working life, since based on the employees' views, work is not yet environmentally sustainable.

Data availability The research data will be published in Finnish Social Science Data Archive.

Declarations

Ethics approval and cosent to participate Informed consent was obtained from all individual participants included in the study. The research was carried out by following the statement of the ethical committee of the Finnish Institute of Occupational Health, and The Finnish code of conduct for research integrity published by The Finnish National Board of Research Integrity TENK.

Consent for publication The research data will be published in Finnish Social Science Data Archive.

Competing interests The authors declare no competing interests.

References

1. Köhler J, Geels FW, Kern F, Markard J, Onsongo E, Wieczorek A, Alkemade F, Avelino F, Bergek A, Boons F, Fünfschilling L, Hess D, Holtz G, Hyysalo S, Jenkins K, Kivimaa P, Martiskainen M, McMeekin A, Mühlemeier MS, Wells P. An agenda for sustainability transitions research: state of the art and future directions. Environ Innovation Soc Transit. 2019;31:1–32. https://doi.org/10.1016/j.eist.2019.01.004.
2. Moilanen F, Alasoini T. Workers as actors at the micro-level of sustainability transitions: a systematic literature review. Environ Innovation Soc Transit. 2023;46:100685. https://doi.org/10.1016/j.eist.2022.100685.
3. Dobson J. Reinterpreting urban institutions for sustainability: how epistemic networks shape knowledge and logics. Environ Sci Policy. 2019;92:33–140. https://doi.org/10.1016/j.envsci.2018.11.018.
4. Parkhill KA, Shirani F, Butler C, Henwood KL, Groves C, Pidgeon NF. 'We are a community [but] that takes a certain amount of energy': exploring shared visions, social action, and resilience in place-based community-led energy initiatives. Environ Sci Policy. 2015;53:60–9. https://doi.org/10.1016/j.envsci.2015.05.014.
5. International Labour Organization. How to measure and model social and employment outcomes of climate and sustainable development policies. Geneva: International Labour Organization; 2017.
6. Méda D. Three scenarios for the future of work. Int Labour Rev. 2019;158:627–52. https://doi.org/10.1111/ilr.12157.
7. Krlev G, Terstriep J. Pinning it down? Measuring innovation for sustainability transitions. Environ Innovation Soc Transit. 2022;45:270–88. https://doi.org/10.1016/j.eist.2022.11.005.
8. Williams S, Robinson J. Measuring sustainability: an evaluation framework for sustainability transition experiments. Environ Sci Policy. 2020;103:58–66. https://doi.org/10.1016/j.envsci.2019.10.012.
9. Eurofound. Impact of climate change and climate policies on living conditions, working conditions, employment and social dialogue: a conceptual framework. Luxembourg: Publications Office of the European Union; 2023.
10. Fazey I, Schäpke N, Caniglia G, Hodgson A, Kendrick I, Lyon C, Page G, Patterson J, Riedy C, Strasser T, Verveen S, Adams D, Goldstein B, Klaes M, Leicester G, Linyard A, McCurdy A, Ryan P, Sharpe B, Young HR. 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.
11. Oliver TH, Benini L, Borja A, Dupont C, Doherty B, Grodzińska-Jurczak M, Iglesias A, Jordan A, Kass G, Lung T, Maguire C, McGonigle D, Mickwitz P, Spangenberg JH, Tarrason L. Knowledge architecture for the wise governance of sustainability transitions. Environ Sci Policy. 2021;126:152–63.
12. Stoker G, Evans M. Evidence-based policy making in the social sciences. Bristol: Policy Press; 2016.
13. United Nations. The sustainable development goals report. San Francisco: United Nations; 2022.
14. European Commission. Commission staff working document. impact assessment. Accompanying the document. Communication from the commission to the european parliament, the council, the European economic and social committee and the committee of the

regions. Stepping up Europe's 2030 climate ambition. Investing in a climate-neutral future for the benefit of our people. European Commission. 2020. https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_1&format=PDF. Accessed 13 Oct 2023.

15. Cedefop. The green employment and skills transformation: Insights from a European green deal skills forecast scenario. Luxembourg: Publications Office of the European Union; 2021.

16. European Economic and Social Committee. Towards an EU strategy for enhancing green skills and competences for all European Economic and Social Committee. Brussels: European Economic and Social Committee; 2020.

17. International Labour Organization. Guidelines for a just transition: towards environmentally sustainable economies and societies for all. Geneva: International Labour Organization; 2015.

18. European Environment Agency. Employment in the environmental goods and services sector—8th EAP. Copenhagen: European Environment Agency; 2023.

19. Casano L. Skills and professions for a "just transition". Some reflections for legal research. E J Int Comp labour stu. 2019;8:31–46.

20. International Labour Organization. The employment impact of climate change adaptation. Input document for the G20 Climate sustainability working group. Geneva: International Labour Organization; 2018.

21. International Labour Organization. Skills for a greener future. key findings. Geneva: International Labour Organization; 2019.

22. Montt G, Fraga F, Harsdorff M. The future of work in a changing natural environment: climate change, degradation and sustainability. ILO future of work research paper series. Geneva: International Labour Organization; 2018.

23. European Commission. Special eurobarometer 2019. Report. Climate change. Brussels: European Commission; 2019.

24. Poortinga W, Whitmarsh L, Steg L, Böhm G, Fisher S. Climate change perceptions and their individual-level determinants: a cross-European analysis. Glob Environ Change. 2019;55:25–35. https://doi.org/10.1016/j.gloenvcha.2019.01.007.

25. Dietzel A. Non-state climate change action: Hope for just response to climate change? Environ Sci Policy. 2022;131:128–34. https://doi.org/10.1016/j.envsci.2022.01.023.

26. Kuramochi T, Roelfsema M, Hsu A, Lui S, Weinfurter A, Chan S, Hale T, Clapper A, Chang A, Höhne N. Beyond national climate action: the impact of region, city, and business commitments on global greenhouse gas emissions. Climate Policy. 2020;20:275–91. https://doi.org/10.1080/14693062.2020.1740150.

27. Seyfang G, Smith A. Grassroots innovations for sustainable development: towards a new research and policy agenda. Environ Politics. 2007;16:584–603. https://doi.org/10.1080/09644010701419121.

28. Rebelatto BG, Salvia AL, Reginatto G, Brandli L, Frandoloso MAL. Energy efficiency initiatives and the academic community's behaviour: a Brazilian experience. Discov Sustain. 2022. https://doi.org/10.1007/s43621-022-00101-x.

29. Norton TA, Parker SL, Zacher H, Ashkanasy NM. Employee green behavior: a theoretical framework, multilevel review, and future research agenda. Organ Environ. 2015;28:103–25. https://doi.org/10.1177/1086026615575773.

30. Hemström K, Mahapatra K, Gustavsson L. Architects' perception of the innovativeness of the Swedish construction industry. Constr Innovation. 2017;17:244–60. https://doi.org/10.1108/CI-06-2015-0038.

31. Rickards L, Wiseman J, Kashima Y. Barriers to effective climate change mitigation: The case of senior government and business decision makers. WIREs Clim Change. 2014;5:753–73. https://doi.org/10.1002/wcc.305.

32. Räthzel N, Stevis D, Uzzell DL. The Palgrave handbook of environmental labour studies. Cham: Palgrave Macmillan; 2021.

33. Bottazzi P. Work and social-ecological transitions: a critical review of five contrasting approaches. Sustain. 2019;11:3852. https://doi.org/10.3390/su11143852.

34. Hoffmann M, Paulsen R. Resolving the 'jobs-environment-dilemma'? The case for critiques of work in sustainability research. Environ Sociol. 2020;6:343–54. https://doi.org/10.1080/23251042.2020.1790718.

35. Cameron L, van der Zwaan B. Employment factors for wind and solar energy technologies: A literature review. Renew Sustain Energy Rev. 2015;45:160–72. https://doi.org/10.1016/j.rser.2015.01.001.

36. Süßbauer E, Maas-Deipenbrock RM, Friedrich S, Kreß-Ludwig M, Langen N, Muster V. Employee roles in sustainability transformation processes: a move away from expertise and towards experience-driven sustainability management. GAIA Ecol Perspect Sci Soc. 2019;28:210–7. https://doi.org/10.14512/gaia.28.S1.7.

37. Yuriev A, Boiral O, Francoeur V, Paillé P. Overcoming the barriers to pro-environmental behaviors in the workplace: a systematic review. J Clean Prod. 2018;182:379–94. https://doi.org/10.1016/j.jclepro.2018.02.041.

38. Francoeur V, Paillé P, Yuriev A, Boiral O. The measurement of green workplace behaviors: a systematic review. Organ Environ. 2021;34:18–42. https://doi.org/10.1177/1086026619837125.

39. Paillé P. Greening the workplace: theories, methods, and research. Cham: Springer; 2020.

40. Reed MS. Stakeholder participation for environmental management: a literature review. Biol Conserv. 2008;141:2417–31. https://doi.org/10.1016/j.biocon.2008.07.014.

41. Boiral O. Tacit knowledge and environmental management. Long Range Plan. 2002;35:291–317. https://doi.org/10.1016/S0024-6301(02)00047-X.

42. Damert M, Baumgartner RJ. External pressures or internal governance—what determines the extent of corporate responses to climate change?: external and internal determinants of climate change responses. Corp Soc Responsib Environ Manag. 2018;25:473–88. https://doi.org/10.1002/csr.1473.

43. Markey R, McIvor J, O'Brien M, Wright CF. Reducing carbon emissions through employee participation: evidence from Australia: reducing carbon emissions through employee participation. Ind Relat J. 2019;50:57–83. https://doi.org/10.1111/irj.12238.

44. Onkila T, Sarna B. A systematic literature review on employee relations with CSR: State of art and future research agenda. Corp Soc Responsib Environ Manag. 2022;29:435–47. https://doi.org/10.1002/csr.2210.

45. Chikoto GL, Sadiq A, Fordyce E. Disaster mitigation and preparedness: comparison of nonprofit, public, and private organizations. Nonprofit Volunt Sect Q. 2013;42:391–410. https://doi.org/10.1177/0899764012452042.

46. Sadiq A, Ollier M, Tyler J. Employees' perceptions of workplace preparedness for climate change-related natural hazards: workplace preparedness. Risk, Hazards & Crisis in Public Policy. 2016;7:62–78. https://doi.org/10.1002/rhc3.12095.

47. Kerry J, Pruneau D, Blain S, Langis J, Barbier P, Mallet M, Vichnevetski E, Therrien J, Deguire P, Freiman V, Lang M, Laroche A. Human competences that facilitate adaptation to climate change: a research in progress. Int J Climate Change Strat Manag. 2012;4:246–59. https://doi.org/10.1108/17568691211248711.

48. Grote G, Guest D. The case for reinvigorating quality of working life research. Hum Relat. 2017;70:149–67. https://doi.org/10.1177/0018726716654746.

49. Huebner L-A, Zacher H. Following up on employee surveys: a conceptual framework and systematic review. Frontiers in Psychol. 2021;12:801073. https://doi.org/10.3389/fpsyg.2021.801073.

50. Corburn J. Frameworks for Slum Health Equity. In: Corburn J, Riley L, editors. Slum Health. Oakland: University of California Press; 2019. p. 51–69.

51. Hahn T, Aragón-Correa JA. Toward cognitive plurality on corporate sustainability in organizations: the role of organizational factors. Organ Environ. 2015;28:255–63. https://doi.org/10.1177/1086026615604446.

52. Geels FW. Reconceptualising the co-evolution of firms-in-industries and their environments: developing an inter-disciplinary triple embeddedness framework. Res Policy. 2014;43:261–77. https://doi.org/10.1016/j.respol.2013.10.006.

53. Rohracher H, Coenen L, Kordas O. Mission incomplete: layered practices of monitoring and evaluation in Swedish transformative innovation policy. Sci Public Policy. 2023;2023(50):336–49. https://doi.org/10.1093/scipol/scac071.

54. Fuenfschilling L, Truffer B. The structuration of socio-technical regimes—conceptual foundations from institutional theory. Res Policy. 2014;43:772–91. https://doi.org/10.1016/j.respol.2013.10.010.

55. Geels FW. Micro-foundations of the multi-level perspective on socio-technical transitions: Developing a multi-dimensional model of agency through crossovers between social constructivism, evolutionary economics and neo-institutional theory. Technol Forecast Soc Change. 2020;152: 119894. https://doi.org/10.1016/j.techfore.2019.119894.

56. Bögel P, Pereverza K, Upham P, Kordas O. Linking socio-technical transition studies and organisational change management: Steps towards an integrative, multi-scale heuristic. J Clean Prod. 2019;232:359–68. https://doi.org/10.1016/j.jclepro.2019.05.286.

57. Teerikangas S, Onkila T, Koistinen K, Makela M. Research Handbook of Sustainability Agency. Cheltenham: Edward Elgar Publishing Ltd; 2021.

58. Hölsgens R. Introducing the adopter perspective in social innovation research. Innov Eur J Soc Sci Res. 2021. https://doi.org/10.1080/13511610.2021.1964351.

59. Huttunen S, Ojanen M, Ott A, Saarikoski H. What about citizens? A literature review of citizen engagement in sustainability transitions research. Energy Res Soc Sci. 2022;91: 102714. https://doi.org/10.1016/j.erss.2022.102714.

60. EPSU. Survey of health and safety in circular economy. Brussels: European Public Service Union; 2020.

61. García Mira R, Dumitru A. Low carbon at work: modeling agents and organizations to achieve transitions to a low carbon Europe. A Coruña: Institute of Psychosocial Studies and Research "Xoan Vicente Viqueira"; 2014. http://www.locaw-fp7.com/userfiles/Deliverables/Locaw%20Final-Report.pdf. Accessed 13 Oct 2023.

62. Glavas A, Kelley K. The effects of perceived corporate social responsibility on employee attitudes. Bus Ethics Q. 2014;24:165–202. https://doi.org/10.5840/beq20143206.

63. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. Front Public Health. 2018;6:149. https://doi.org/10.3389/fpubh.2018.00149.

64. Ones DS, Dilchert S. Environmental sustainability at work: a call to action. Ind Organ Psychol. 2012;5:444–66. https://doi.org/10.1111/j.1754-9434.2012.01478.x.

65. Piwowar-Sulej K. Pro-environmental organizational culture: its essence and a concept for its operationalization. Sustain. 2020;12:4197. https://doi.org/10.3390/su12104197.

66. Perrin AJ, McFarland K. Social theory and public opinion. Annu Rev Sociol. 2011;37:87–107. https://doi.org/10.1146/annurev.soc.012809.102659.

67. Desmond S. Implementing climate change mitigation in health services: the importance of context. J Health Serv Res Policy. 2016;21:257–62. https://doi.org/10.1177/1355819616645373.

68. Blok V, Wesselink R, Studynka O, Kemp R. Encouraging sustainability in the workplace: a survey on the pro-environmental behaviour of university employees. J Clean Prod. 2015;106:55–67. https://doi.org/10.1016/j.jclepro.2014.07.063.

69. Whitmarsh L. Behavioural responses to climate change: asymmetry of intentions and impacts. J Environ Psychol. 2009;29:13–23. https://doi.org/10.1016/j.jenvp.2008.05.003.

70. Wang X, Lo K. Just transition: a conceptual review. Energy Res Soc Sci. 2021;82: 102291. https://doi.org/10.1016/j.erss.2021.102291.

71. Tarekegne B, Kazimierczuk K, O'Neil R. Communities in energy transition: Exploring best practices and decision support tools to provide equitable outcomes. Discover Sustain. 2022;3:12. https://doi.org/10.1007/s43621-022-00080-z.

72. Pedersen RL, Lam DPM. Second comment on 'The climate mitigation gap: Education and government recommendations miss the most effective individual actions.' Environ Res Lett. 2018;13: 068001. https://doi.org/10.1088/1748-9326/aac9d0.

73. Stern PC. New environmental theories: toward a coherent theory of environmentally significant behavior. J Soc Issues. 2000;56:407–24. https://doi.org/10.1111/0022-4537.00175.

74. Dehnavi S, Al-Saidi M. Educating water professionals for the Arab world: archetypes, change agents and complex realities. Energy Rep. 2020;6:106–13. https://doi.org/10.1016/j.egyr.2020.10.060.

75. Hargreaves T. Making Pro-Environmental Behaviour Work: An Ethnographic Case Study of Practice, Process and Power in the Workplace. Doctoral dissertation. University of East Anglia; 2008.