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A just transition from the perspective of Finnish peat entrepreneurs

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SUMMARY

The Paris Climate Change Agreement and the European Union (EU) Green Deal transitional assistance policy use the Just Transition (JT) process to support the business sectors most affected by actions to reduce greenhouse gas emissions. The purpose of JT is to ensure social and economic justice in the implementation of climate change mitigation policy. The EU countries that have utilised significant amounts of energy peat, such as Finland and Ireland, will potentially seek JT support for the peat industry. We studied the attitudes of Finnish peat entrepreneurs towards JT by investigating the forms of support they would prefer during the green transition. The data were descriptive, collected by questionnaire, and analysed using Spearman's correlation coefficients. The results show that the preference of entrepreneurs is for direct financial support. Our analyses also suggest that low education level, high age and negative attitude towards the current energy policy can reduce the ability of entrepreneurs to adapt to the current climate change policy. We propose that support should be targeted especially at older entrepreneurs lacking higher-level education, who could be at high risk of being left out of the JT process.

KEY WORDS: climate change, Finland, green transition, peat extraction, peat industry, peatlands

INTRODUCTION

The Finnish energy peat industry: background

Peat is used as a fuel for energy production in several European countries, e.g., in Finland, Sweden, Ireland and the Baltic countries (World Energy Council 2013), where it may be regarded as a domestic energy resource supporting national energy self-sufficiency and energy security. However, peat extraction on drained peatlands and the combustion of energy peat produce significant greenhouse gas (GHG) emissions (e.g., Holmgren *et al.* 2006, Ojanen *et al.* 2020). Because GHG emissions from peat are classified as fossil fuel emissions, the reduction of energy peat usage has been under discussion in the European Union (EU) (European Commission 2022a), and Finland has decided to halve the use of energy peat by 2030 as part of the country's commitment to achieve carbon neutrality by 2035 (Ministry of Environment 2022). The role of peat is significant, since 10–15 % of the national GHG emissions in 1990–2015 originated from peat extraction areas and peat combustion (Statistics Finland 2017). Thus, from an environmental perspective, significant reductions to greenhouse gas emissions can be achieved by replacing energy peat with alternative renewable energy sources. Because the peat industry also has a relatively low employment rate and provides low economic value addition in the national

context (Leinonen *et al.* 2020), it has become one of the key targets for reducing GHG emissions in Finland (Ollikainen 2019). On the other hand, the prospect of reducing energy peat usage is socially and economically challenging in various ways. In particular, there may be major negative social and economic consequences at regional level - especially in rural areas - in the form of reduced regional employment opportunities, household income levels, and tax income for municipalities (see, for example, Soimakallio *et al.* 2020, Korhonen *et al.* 2021, Valonen *et al.* 2021).

The reduction of GHG emissions related to energy peat will directly and negatively affect the peat industry by reducing demand for its product and, therefore, potential incomes. It is typical for Finland that those working in peat extraction are not on the payroll of the State but are independent entrepreneurs and subcontractors. Furthermore, peat entrepreneurs do not typically own the land from which they extract peat. Consequently, to ensure a just transition that is implemented fairly regarding all parties through controlled change, attention should be paid to the interests of workers in the peat industry and to peat entrepreneurs. However, changes in the peat market, the value of allowances and the national energy taxation of peat have led to a situation where the use of energy peat in Finland has fallen much more rapidly than was expected; whereas 21.6 TWh of

energy peat was extracted in 2018, annual extraction had declined to only 2.85 TWh by 2021 (Salo 2021, The Bioenergy Association of Finland 2021). This situation poses an urgent challenge for peat entrepreneurs, whose businesses are in turmoil and disappearing uncontrollably quickly (Korhonen *et al.* 2021). The rapid collapse of companies also creates risks for the environment because the environmental monitoring and after-use of peatlands is endangered (Korhonen *et al.* 2021).

At the time of writing (during the spring months of 2022), the effect of the war in Ukraine on the Finnish peat industry remains unknown. According to one scenario, the peat extraction policy will be reversed, at least temporarily, as the demand for self-sufficient energy production is increasing unexpectedly (Leskelä 2022). This would mean an increase in peat extraction and the restoration of economic opportunities for entrepreneurs and subcontractors. However, the resumption of energy peat extraction may not be straightforward because some of the entrepreneurs have already terminated their peat-related activities owing to the preceding circumstances.

Just Transition and the peat industry

The concept of Just Transition can be realised in a variety of ways, depending on the context. The key objective is to take economic and social sustainability into account when seeking to achieve ecological sustainability. In recent years, justice in climate policy and Just Transition have been studied worldwide (e.g., Klinsky & Dowlatabadi 2009, Stevis & Felli 2015, Evans & Phelan 2016, Jenkins *et al.* 2016, Goddard & Farrelly 2018, McCauley & Heffron 2018, Routledge *et al.* 2018, Zadek 2019). Many of these studies deal with the concept itself (e.g., McCauley & Heffron 2018) or are reviews (e.g., Jenkins *et al.* 2016), while others are case studies (e.g., Evans & Phelan 2016, Goddard & Farrelly 2018, Mayer 2018). However, previous studies concerning the European peat industry are limited and have produced mostly ‘grey literature’ (not peer reviewed) reports, assessments and working papers (e.g., Dekker 2020, Leinonen *et al.* 2020, Reform 2020, Korhonen *et al.* 2021, Valonen *et al.* 2021).

In their synthesis article, Green & Gambhir (2020) acknowledge that the transition to a zero-carbon economy will bring growth to newly emerging businesses but also “cause significant disruption, dislocation, costs and losses to many individuals, groups, and possibly countries, at least in the short term”. They also consider various transitional assistance policies (TAPs) for the low-carbon transition, which may be narrow (focused on

financial losses only) or address a wider range of losses, and identify five categories of agents and groups at high risk of being affected by the transition in the short and medium term (consumers, workers, specially-affected communities, corporations, and states). Healy & Barry (2017) had previously emphasised that energy policies and planning should take into consideration the broader social and economic systems rather than focus simply on technical solutions.

The Paris Agreement recognises “the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities” (UNFCCC 2015). To ensure that nobody is left behind in the green transition of Europe, the EU has set up a Just Transition Mechanism (JTM) to support the sectors most affected by GHG reduction actions (European Commission 2022b, 2022c). The associated Just Transition Fund (JTF) will be used to support areas transitioning from intensive coal mining activities and, additionally, to counteract the regional economic impacts of reducing the use of energy peat in Finland and Ireland.

There is some overlap between the concepts of TAP and JTM. To clarify our use of terminology, for the purposes of this study we regard the EU JTM as a tool for implementing the European TAP set by the Green Deal (European Commission 2022d), in the specific context of peat industry corporations and entrepreneurs who are facing the loss of both job opportunities and the value of their investments.

Dekker (2020) describes Just Transition in the context of Ireland as a framework and process for designing and implementing policies that respond to climate change, involving consideration of the needs and concerns of affected individuals and communities. This sets a requirement for continuous dialogue between different stakeholders. Chilvers *et al.* (2021) suggest that a systematic approach to surveying participation, based on an understanding of communication and public engagement, is one of the key factors needed to govern the low-carbon transition. Debate and communication in Finland have included, for example, events arranged in 2020 by the Finnish Innovation Fund (Sitra) that enabled peat entrepreneurs and stakeholders to discuss the Just Transition. The outcome of those dialogues was a working paper with recommendations for decision-makers towards successful transition of the Finnish peat industry (Laita 2020, Leinonen *et al.* 2020) that highlights a need for the voices of entrepreneurs and other operators in the peat industry to be heard more clearly. The following recommendations from Sitra’s working paper apply directly to peat entrepreneurs:

- clear government policy on steering mechanisms for giving up peat;
- ensuring that the people and organisations at the heart of the Just Transition can have their voices heard;
- supporting employment and the diversification of economic activities;
- making use of existing funding channels for funding the measures; and
- training - such as retraining and supplementary training to support personnel in gaining employment in new fields.

Despite the results achieved through dialogue, the exact nature of available support remains unclear. For instance, Leinonen *et al.* (2020) do not consider what the financial support tools for entrepreneurs should be in practice.

Governments have a variety of transitional assistance policies and instruments that can be used to mitigate the transition losses. Green (2018) identifies three categories of support, namely: compensatory policies, adjustment assistance and holistic adaptive support, which have taken various forms in compensating workers in the coal and oil industries (Piggot *et al.* 2019). They include support for workers (unemployment and retirement bridging grants, relocation assistance, career counselling, tuition vouchers, social assistance, re-training programmes), funding for business initiatives, and grants to local government for, e.g., conducting impact studies (Piggot *et al.* 2019). Green & Gambhir (2020) consider that comprehensive adaptive support strategies have the greatest potential for just, equitable and smooth transition outcomes, but point out that they are costly and complex to implement.

The JTF will be based on regional plans approved by the European Commission. In Finland, eastern and northern regions, as well as the areas with intensive peat industry in the west and south, will receive support. The regional Just Transition plans have been in preparation since 2021 (personal communication with the EU administration). At the beginning of 2022, the exact structures of the JTM and the JTF were still partially unknown and the final JTF plans had not yet been accepted by the European Commission. Debate as to when and how this tool would be brought into use was ongoing but it was estimated that the mechanism would be open by the end of 2022. The importance of the peat industry as part of the national green transitions has been highlighted by two member countries (Finland and Ireland) in particular. As in Finland, the environmental effects of peat industry have been under debate in Ireland (e.g., Murphy *et al.* 2015,

Reform 2020). Even though the Irish peat industry is mainly state-owned, which makes the effects of transition somewhat different compared to Finland where peat industry is run largely by independent entrepreneurs, the two countries have similar issues with the Just Transition (Irish Congress of Trade Unions 2019).

The Finnish Government reserved financial support of EUR 60 million in 2021 and EUR 10 million in 2022 for entrepreneurs and workers in the peat sector. The Finnish national working group on peat, appointed by the Ministry of Economic Affairs and Employment, proposed that these funds should be allocated to support new business development, the re-employment and training of entrepreneurs and workers, the provision of guidance and information, and measures for scrapping machinery and equipment. The final proposal of the working group was the establishment of emergency stockpiling in order to secure the supply of peat (Ministry of Economic Affairs and Employment of Finland 2021).

It has been noted that the need for transformation and its implications for energy supply have been insufficiently addressed in the scientific literature (Healy & Barry 2017). There have also been few studies on the attitudes of energy peat entrepreneurs towards the Just Transition in Finland, and there remains a notable lack of knowledge about background factors relating to the entrepreneurs and the support mechanisms they would prefer in different contexts. This is surprising, considering their currently challenging situation and that they are the key players for a successful transition. Their opinions should be heard, because they make decisions for their companies and thus bear financial responsibility for implementing the transition. Moreover, Just Transition actions should take the peat entrepreneurs into close consideration to ensure that the transition is truly just and in line with United Nations sustainable development goals (UN 2022).

Aim of the study

The aim of this study was to seek (by questionnaire) and analyse peat entrepreneurs' opinions concerning the Just Transition, and thus to highlight their views and the forms of financial support they want, without commenting on the details of any specific support mechanism such as the JTF. In other words, we set out to study how the entrepreneurs themselves would like to be supported, rather than to suggest how transitional assistance policies should be directed at entrepreneurs in practice. To the best of our knowledge, this is the first quantitative study of Finnish peat entrepreneurs' attitudes towards Just Transition support actions.

METHODS

Questionnaire survey

The geographical area of the study was the region of South Ostrobothnia in western Finland. This is the country's most intensive peat extraction area, where the economic role of peat industry is higher than for any other region in the entire country (Valonen *et al.* 2021). South Ostrobothnia has approximately 150 peat companies operating on around 15,000 hectares of workings, i.e., this region encompasses 25 % of the total area under peat extraction in Finland (Regional Council of South Ostrobothnia 2022). The peat extraction is concentrated in remote rural areas in the eastern and southern parts of the region (ELY 2020).

The attitudes of peat entrepreneurs towards Just Transition were studied using a questionnaire and the data were collected using the Webropol program (ver. 3.0). The questionnaire was sent to 140 peat entrepreneurs (selected from the public regional business registers) in South Ostrobothnia in September 2020. It included questions about the

respondents' backgrounds, such as gender, age, education and the total area of the peat extraction sites they managed. Respondents were also asked to indicate which support mechanisms they preferred (multiple choice questions; Table 1). The support mechanism choices can be categorised as direct and indirect financial support, such as "direct financial investment support for new acquisitions and actions for energy peat entrepreneurs" or "indirect support for research and development funding (universities / higher education institutions / research institutes)". The questions were chosen on the basis of existing support mechanisms that could be applied in the context of the peat industry at the time. Respondents were also given an opportunity to suggest other support mechanisms by selecting the option "something else" and using a free-text section to explain what that would be in practice. The total number of respondents was 37, the response rate being 26 %. All of the respondents were male, and 97 % of them worked as energy peat entrepreneurs in South Ostrobothnia. Most were engaged in several

Table 1. The support mechanism choices (direct and indirect) offered in the questionnaire.

Type	Choice number	Support mechanism
Direct	1	Direct financial support for power plants of all sizes
	2	Direct financial investment support for new acquisitions and actions by energy peat entrepreneurs
	3	Direct financial support to compensate for lost work and unnecessary purchases of machinery and equipment by energy peat entrepreneurs
	4	Direct support for sustainable after-uses of peat extraction areas (eg., afforestation, restoration, wetland creation)
	5	Direct support for research and development actions in the field
	6	Direct support for continuous learning and retraining
Indirect	1	Indirect support for labour market policy training
	2	Indirect support for research and development funding (universities / higher education institutes / research institutes)
	3	Indirect support for entrepreneur counselling by municipalities and cities
	4	Indirect support for trade unions / associations and interest groups
	5	Open financial development programme for energy peat entrepreneurs
	6	Indirect support to landowners of peat extraction areas on after-use related issues

industries, with peat accounting for 10–100 % of the net sales of the company. The modal age group was 31–40 years, and most respondents controlled more than 100 ha of peat workings. The most common company forms were limited company (54 %) and trade name (35 %). Some of the respondents operated in South Ostrobothnia and also in the nearby regions of Central Finland (27 %), Ostrobothnia (14 %), Satakunta (3 %), Pirkanmaa and South-West Finland (3 %). Descriptive statistics are presented in Table 2.

Statistical analysis

The statistical analysis aimed to find the best ways to support peat entrepreneurs in the Just Transition process by detecting statistically significant correlations between the background data they provided and the forms of financial support they selected. First, descriptive statistics were computed (Table 1). Secondly, Spearman's correlation coefficients were computed using SPSS statistics software (ver. 25). Spearman's correlation coefficient was chosen because the data were nonparametric (descriptive).

RESULTS

Preferred choices for type of support

The peat entrepreneurs' most preferred answers to the multiple choice questions were different forms of direct financial support. Direct financial support to compensate for lost work and unnecessarily purchased machinery and equipment (Option 3) was highlighted by 83 % of the respondents (Figure 1). More than half of them favoured direct support for the after-use of peat extraction areas (e.g., afforestation, restoration, wetland creation) and

direct financial investment support for new acquisitions and actions (Options 2 and 4).

The various forms of indirect financial support were regarded as less attractive alternatives. Except for Option 5 (selected by 26 %), none of the indirect support mechanisms was selected by more than 6 % of the respondents. For example, indirect support for re-training activities or labour facilities (Option 1), along with Options 3 and 6, was supported by only 3 % of the entrepreneurs (Figure 1). Indirect support to trade unions/associations and interest groups (Option 4) was not selected in any of the responses.

Peat entrepreneurs' background variables and Spearman's correlation coefficients

The Spearman's correlation coefficients indicated positive and negative correlations between the background information about the entrepreneurs and their questionnaire choices (Table 3). The strongest positive correlations were detected between level of education and opinion on the success of government energy policies (0.703, p -value = 0.001), and between level of education and choice of the option to receive support for the after-use of peat extraction areas (0.548, p -value = 0.031). Gross revenue and the extent of the peat extraction site were also highly positively correlated (0.427, p -value = 0.009).

The strongest negative correlation was obtained between the respondent's age and his opinion on the success of the Government's energy policies (−0.686, p -value = 0.001), and between extent of the peat extraction site and the main business being peat extraction (−0.541, p -value = 0.005). There were also negative correlations between support for direct financial compensation and opinion on the success of government energy policies, and between age and level of education.

Table 2. Descriptive statistics for the backgrounds of respondents.

Attribute	N	Min.	Max.	Modal value
Age group	37	18–30	over 60	31–40
Education	37	comprehensive school	Master's degree	vocational education and training
Area of peat extraction sites managed	36	less than 10 hectares	over 100 hectares	over 100 hectares
Age of the company	35	less than 6 years	over 45 years	15–20 and 35–40 years
Annual sales of the company	31	less than 1 million €	over 6 million €	less than 1 million €

DISCUSSION

Justice in climate policy, transitional assistance policies and Just Transition have been studied in several publications (e.g., Klinsky & Dowlatabadi 2009, Stevis & Felli 2015, Evans & Phelan 2016, Jenkins *et al.* 2016, Goddard & Farrelly 2018, Mayer 2018, McCauley & Heffron 2018, Routledge *et al.* 2018, Zadek 2019, Green & Gambhir 2020). However, there are limited recent studies of the challenges for European and (specifically) Finnish peat industry.

According to our survey of the opinions of peat entrepreneurs regarding their support for the energy transition policy and its implementation in Finland, the most educated respondents were the most satisfied in this regard. The elderly respondents, on the other hand, considered that the success rate of government energy policies was low. Direct financial compensation was better supported by respondents who were more dissatisfied with the Finnish energy policies, although it should be noted that none of the respondents was fully satisfied with these policies.

According to Green & Gambhir (2020), small corporations constitute one of the groups at highest risk of being affected by the energy transition. We

surveyed the perspectives of small peat extraction corporations and entrepreneurs who are already highly influenced by the transition. Therefore, it is not surprising that they expressed dissatisfaction with the energy policies. As our survey covered the entrepreneurs' experience of the policies only at a general level, there is need for a further study encompassing the disruption, dislocation, costs and losses of the different groups associated with peat extraction businesses in Finland. Furthermore, the present study should be complemented by adding the perspectives of other agents and groups that are at risk of being affected by the energy transition. These include, according to Green & Gambhir (2020), consumers, workers, specially affected communities, and states.

The overwhelming majority of respondents preferred direct compensation for financial losses resulting from the decline in usage of energy peat caused by the energy transition. Direct support for the sustainable after-use of peat extraction areas (Direct Option 4; see Figure 1) gained positive responses from more than half of the respondents, and was preferentially endorsed by those with higher education levels. On the other hand, the various

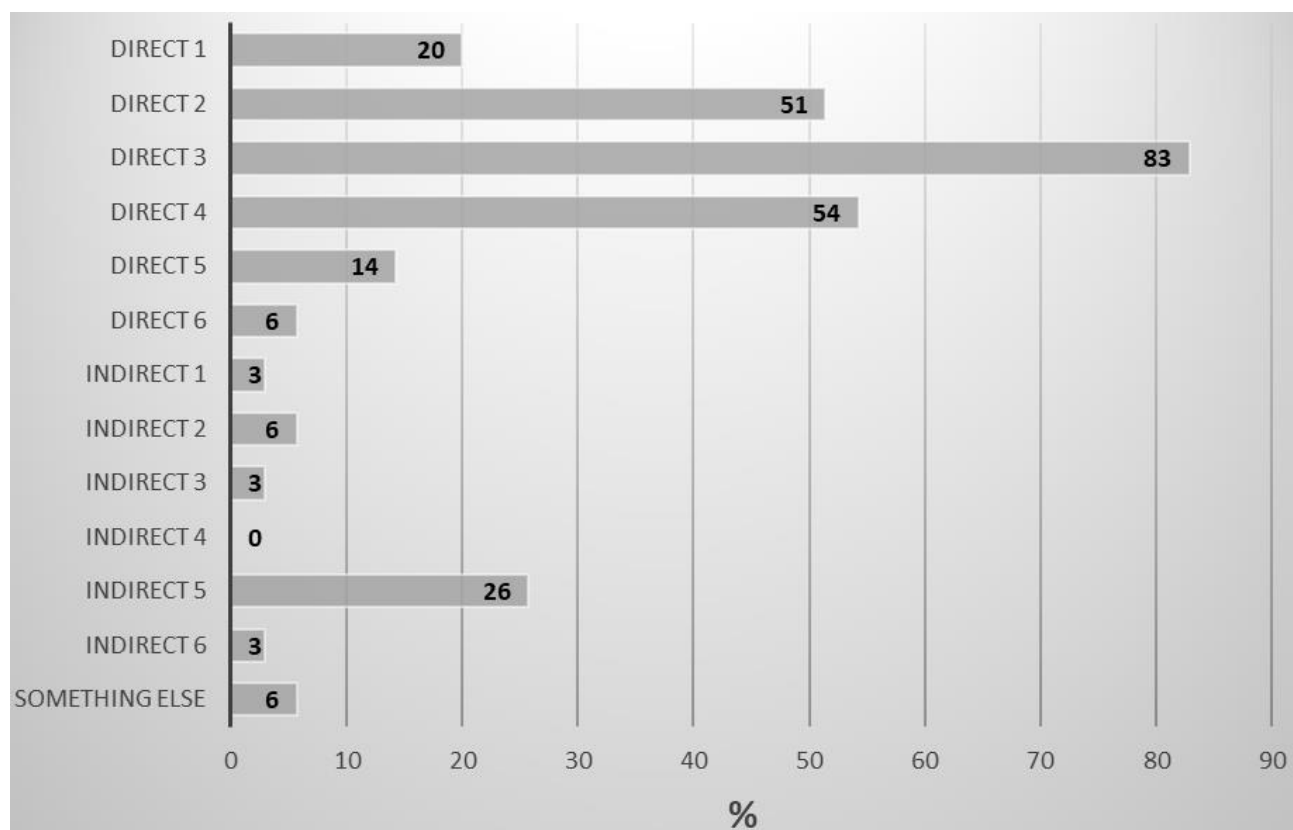


Figure 1. The best ways to support the Just Transition process according to Finnish peat entrepreneurs ($n = 35$, the number of selected choices = 96). For explanation of the 12 choices, see Table 1.

forms of indirect financial support were seen as less attractive alternatives by all respondents.

As Healy & Barry (2017) note, Just Transformation should support democratic processes, bearing in mind that energy policy decisions are indeed political rather than solely technical. As stated in the Paris Agreement, the transition should guarantee decent work opportunities and, as Dekker (2020) reminds, this

will require an understanding of the implications of government policy for individuals and communities at local level. The key factor for energy transition is that policymakers should work in cooperation with stakeholders and communities in designing and implementing the policies (Dekker 2020, Chilvers *et al.* 2021). In practice, this is the only way the JTM can truly ensure that nobody is left behind in the green transition.

Table 3. Spearman's correlation coefficients (2-tailed, $p < 0.05$) for the variable pairs that showed significant correlations.

Variable pairs	Correlation coefficient	p-value (2-tailed)	N
<i>Positively correlated variables</i>			
Gross revenue // surface area of the peat extraction site	0.427	0.009	30
Economic prospects of the respondent's company // economic prospects of the peat entrepreneurs' companies	0.369	0.032	26
Level of education // opinion on the success of government energy policies*	0.703	0.001	18
The surface area of the peat extraction site // support for direct financial compensation	0.293	0.046	34
The level of education // endorsement for after-use support for the peat extraction areas	0.548	<0.000	35
The level of education // endorsement for open development support for the entrepreneurs	0.319	0.031	35
Endorsement for power plant support // endorsement for direct investment support and indirect support for employment	0.343	0.022	35
<i>Negatively correlated variables</i>			
Age // level of education	-0.412	0.006	37
The surface area of the peat extraction site / main business in peat extraction	-0.541	0.005	22
Age // opinion on the success of government energy policies	-0.686	0.001	18
Support for direct financial compensation // opinion on the success of government energy policies	-0.469	0.025	18
Endorsement for power plant support // endorsement for direct financial compensation	-0.341	0.022	35

*Nevertheless, none of the respondents regarded the government energy policies as successful.

There have been some efforts to engage the peat extraction industry in discussions on the Just Transition process in Finland. The practical support tools are to be considered further, in close collaboration with the groups influenced by the transition. This article is one addition to the topic, and we strongly encourage further discussion at the grassroots level, to ensure the democratic nature of the transition.

Direct financial support would compensate several losses

The aim of the present study was to collate the opinions of energy peat entrepreneurs in the year 2020. In 2022, the situation may have changed owing to the war in Ukraine.

This study clearly shows that peat entrepreneurs would prefer direct financial support to compensate for their lost employment and unnecessary purchases of machinery and equipment. Direct financial support is preferred over indirect support, which seems natural in the current situation. In South Ostrobothnia, peat entrepreneurs have made significant investments in special machinery, much of which cannot be utilised elsewhere and which, consequently, has a low resale value. As energy peat production declines, investments will lose value and the development of companies will become more difficult. Also, the fall in demand for peat will lead to a reduction in the value of peatlands, and landowners will lose rental incomes (Korhonen *et al.* 2021, Laasasenaho *et al.* 2021).

Should more attention be paid to background factors when planning JT support?

Some of the background variables show interesting correlations with one another. It is notable that the entrepreneurs have individual needs, which must be considered in the supporting actions. The companies differ in size, and their turnover related to peat varies (Table 1). In addition, entrepreneurs may own peatland areas themselves, or rent them from other landowners. For example, the larger the extraction site owned by the entrepreneur, the more he favours support in the form of direct financial compensation (Table 2). This is understandable because the entrepreneurs who own the largest areas of peatland have the largest peat reserves and most to lose.

According to the results, it appears that low education, high age, and negative attitude towards the current energy policy can reduce the ability of entrepreneurs to adapt to the current climate policy. Especially, entrepreneurs with high age and low level of education may have the highest risk of being left out of the Just Transition process because these

variables seem to correlate with negative attitude towards national energy policy (Table 2). Our interpretation is that the JT process causes the strongest resistance amongst these social groups. Consequently, solutions that reduce social resistance should be found without compromising the success of the green transition.

Results that were almost significant statistically included negative correlations between age and the preference of direct financial support over research, development and innovation activities (-0.262 , p -value = 0.064, $N = 35$), and between age and the choice of financial support for education (-0.251 , p value = 0.073, $N = 35$). These directional results indicate that high age may also be seen as a challenge for creating new activity through research and entrepreneur education in the current situation. This seems logical, as older entrepreneurs may plan to retire in the near future. The elderly respondents had the smallest areas of peat extraction. They also ran other businesses simultaneously. This group of respondents had the lowest level of education found in this study. Also, the potential JTF subsidies for further education could be unwanted by energy peat entrepreneurs who are older and arguably have more conservative mindsets. After 40 to 50 years in a profitable business, these entrepreneurs might have reasonably good economic status. Age also seems to be a barrier to favouring diverse forms of indirect financial support. A question that arises is: Are the planned forms of support sufficiently fair and economically and socially sustainable for older and little-educated entrepreneurs? On the other hand, if some entrepreneurs are in relatively good financial situations, e.g., they have other forms of income, should they be compensated in a different way than those who are fully employed in the peat industry?

As a comparison, young entrepreneurs might be more able to cope with the situation because they are more educated and motivated to make changes. We suggest that young and educated entrepreneurs might have better resilience to adapt to the changing energy policy. Educated entrepreneurs seem to prefer multiple supporting choices more than old and less-educated entrepreneurs do. For instance, the level of education and endorsement for open development support to entrepreneurs are positively correlated with each other in this study (Table 2). In general, it can be argued that investing in education from an early age makes it easier for individuals to adapt to changing situations in the future. This should be considered when the Just Transition process and support tools are planned, even though support for education is not favoured by entrepreneurs in the current situation.

A few shortcomings of this study can be highlighted. The response rate was relatively low. This could be due to some of the information in public business registers being out of date. For example, the name of a company might have remained in the company register after the role of peat in the business had diminished, leading to low proprietor motivation for participation in the survey. Also, motivation to answer the survey may already have been weak if the importance of peat in the company's turnover had decreased. It is very likely that the questionnaire was answered preferentially by active entrepreneurs who were experiencing financial challenges. Consequently, the opinions of such entrepreneurs may be over-represented in the results. Another shortfall might be that some relevant options were neglected within the multiple-choice format. However, there was an opportunity to give additional input in the free text section, which was used by only two respondents, indicating that the list of multiple choices was generally sufficient to represent respondents' opinions. The alternative of "Something else" was chosen by 6 % of respondents, but only two explained what kind of support they meant. These suggestions were direct redemption of peat extraction machinery from the entrepreneurs to the state, and a full retirement programme for peat entrepreneurs over 50 years old.

As mentioned earlier, the three categories of transitional assistance support are: compensatory policies, adjustment assistance, and holistic adaptive support (Green 2018). Green (2018) remarks that sole financial compensation is narrow in nature, and backward-looking as it seeks to maintain the agent's current situation rather than facilitate an adjustment to new financial opportunities. Therefore, a more comprehensive TAP could usefully be further explored for the case of Finnish peat extraction entrepreneurs. This should complement direct financial compensation by taking into consideration the full range of recognised losses by different agents and may include various forms of support for workers, funding for business initiatives, and grants to local government (Piggot *et al.* 2019).

In addition to being detrimental to social and economic sustainability, poorly selected support tools may have indirect negative effects on ecological sustainability. For example, if the wrong financial support is provided, the economic challenges for peat entrepreneurs may lead to poor maintenance of after-use on large areas of cutover peatlands. This could leave a long-persisting legacy of GHG emissions and fluvial carbon losses from residual peat (see, e.g., Korhonen *et al.* 2021).

General discussion

The Finnish peat industry differs from the Irish peat industry and the central European coal mining industry in that it has an entrepreneurial structure with complicated subcontracting, which makes it a challenging sector to support. There are many small and medium enterprises (SMEs) in the Finnish peat industry, which means that an effective JTM for Finland should be different from those for Ireland and other EU countries where peat industry is managed by state-owned companies.

We suggest that there should be different forms of support for, e.g., power plants and smaller companies, so that nobody is left behind in the green transition (European Commission 2022b). Currently, there is a risk that poorly planned support mechanisms will not be effective in practice, even if funds are available. Just Transition must match the needs of the energy peat entrepreneurs, and direct investment aid would be very important for companies that manage large peat production areas.

This study highlights the opinions of the entrepreneurs for use in practical decision-making. The JTF is still undergoing the decision-making procedure of the European Commission, so the situation remains unclear. In practice, politicians make the decisions on the use of subsidies. This study focused on the region of South Ostrobothnia because it is the best known and most important area for energy peat production in Finland. The study is also the first to collect the opinions of Finnish energy peat entrepreneurs at a point in time when the JTF is in preparation and the production of energy peat is reduced. Thus, no other scientific studies are available for comparison so far.

It is known that the JTF cannot be used for direct financial support to cover revenue losses, which led the Finnish government to develop further actions besides the JTM in spring 2021. It is expected that the peat industry will receive a EUR 70 million support package from the Finnish government in 2021 and 2022. However, political decisions have been slow, and the war in Ukraine has triggered reassessment of the support package because of the possible growth in demand for energy peat in 2022 (see Leskelä 2022).

Some recommendations for future studies can be highlighted. Various agents and the implications for local development of the peat extraction industry should be studied more closely. As Green & Gambhir (2020) argue, the literature regarding transitions often focuses on one or two kinds of agents, and this might happen at the cost of excluding other groups. Therefore, we recommend further research on the

interaction between the different groups influenced by the transition from energy peat extraction in Finland. One example of these interactions is the influence of the reduced employment opportunities on rural communities in the sparsely populated towns and villages near the peat extraction areas.

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AUTHOR CONTRIBUTIONS

KL wrote the first draft of the manuscript, participated in the data collection and statistical analyses, and is the corresponding author. RL contributed to the data collection and statistical analyses, and commented on the manuscript. AP took part in writing and commented on the manuscript. KL, RL and AP finalised the manuscript together.

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