



Greening work: labor market policies for the environment

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Abstract

Jobs are essential for social inclusion, raising taxes, and guaranteeing the financial resilience of (welfare) states. At the same time, the Sustainable Development Goals, the Paris Agreement, and the European Green Deal require the greening of our economies and labor markets. This paper assesses how labor market policies can green employment. The paper analyses the potential effects of eight different policy strategies on four dimensions of the Taxonomy of Sustainable Employment: conversion of plants and businesses, environmental labor law, climate decommmodification, socio-ecological job guarantee, vocational guidance and retraining, distribution of employment time, alternative income sources, and equalization of income. All eight strategies have the potential of greening employment but feature different intensities in the four dimensions. In the light of environmental crises, the results suggest widening the toolbox of labor market policies for a green and just transition.

Keywords Employment · Work · Sustainability · Climate policy · Just transition · Socio-ecological transformation · SDGs

1 Introduction

Our societies depend on jobs and high employment levels in numerous ways: For citizens, jobs are a key factor in providing social inclusion and gaining enough income to make a living. For states and governments, employment raises taxes, guaranteeing the financial resilience of (welfare) states. At the same time, environmental and climate targets are increasingly being mainstreamed into new policy fields, like labor market policy, that—until now—had little collaboration with environmental topics. In order to bring the Sustainable Development Goals, particularly SDG8, the Paris

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Agreement, and the European Green Deal into effect, it will hence be of utter importance to make jobs greener while maintaining a high level of employment. Given the importance of jobs and high levels of employment for household income, state budgets, stable social security systems, and social participation in communities, it is not surprising that the threat of unemployment has been the most powerful argument against adequate environmental policies, particularly climate policies that entail a profound change of production processes (Vona 2019). However, there will be no jobs on a dead planet (ITUC 2015), so greening employment is a prerequisite for maintaining employment in the long run. Employment relationships exhibit large leverage for a sustainability transition as the largest share of income stems from gainful employment, people spend most of their disposable time working (or preparing for work e.g. studying, commuting), while the cultural importance of employment shapes our society's institutions, for example through unions and professional ethos.

This paper presents research on the relationship between employment and its impacts on the environment. Using a Taxonomy of Sustainable Employment, this paper analyses how eight different strategies in employment and social policies contribute towards environmental sustainability. Contentwise this entails two foci: First, the paper focuses on the environmental dimension of work—it therefore blanks other aspects of what matters for the evaluation of jobs. This is no disregard of the importance of jobs being quality opportunities to earn sufficient income and labor laws protecting workers. Yet, with organizations like the International Labor Organization, the social dimension of employment has already been elevated to an established position, while the environmental dimension of work is largely disregarded in assessments of employment. This paper contributes to closing this gap. Second, this paper focuses on formal, paid employment. Hence, it neglects the largest share of work: unpaid work, like care work and volunteering. Contrary to paid employment, additional time spent on care work barely increases resource consumption (Smetschka et al. 2019). Hence, a shift from paid employment to care work could protect the environment (De Lauretis et al. 2017). Existing labor policies focus on employment and largely disregard the domain of unpaid work. The (un-)sustainability of work is therefore currently predominantly institutionalized through the regulation of paid employment. As this paper seeks to analyze the institutionalizing and potentially transformative power of labor (market) policies, it focuses on the domain of work mostly structured by labor (market) policies: paid, formal employment.

The paper focuses on describing how the eight strategies manifest in a change in the jobs of individuals. Individuals will, however, in most cases not be the agents of change or might only become agents of change under different structural conditions. Which legal and institutional changes are necessary for this structural change and which actors can develop and implement the policies depends on country-specific labour market characteristics. The paper gives examples of implemented policies but does not systematically discuss the role of individuals, companies, unions, social security insurances or other actors in a green labour market transformation.

After a short recap on the theoretical approaches to greening employment, the paper summarizes the Taxonomy of Sustainable Employment with its four dimensions: the output type approach, the occupation approach, the work-lifestyles

approach, and the outcome efficiency approach (Sect. 2). The data used and methods applied are then described (Sect. 3). Hereafter, the results identify eight major strategies of greening work through labor market policies and discuss their contribution along the dimensions of the Taxonomy of Sustainable Employment (Sect. 4). The conclusion summarizes and presents future research applications (Sect. 5).

2 Theoretical approaches to the greening of work: the sustainable employment taxonomy

So far, there exist different notions of what makes a job green or sustainable (Bottazzi 2019). This section introduces the different scholarly perspectives on this question and summarizes the Typology of Sustainable Employment, that structures the different school of thought into a coherent framework. Several theoretical perspectives have dealt with the topic of sustainable employment: International Organisations like the United Nations Environment Programme and the International Labor Organisation raise the issue of “green jobs” (International Training Centre of the International Labor Organization 2016) (UNEP 2008); “Greenness-of-tasks” and “green skills” concepts that analyse the greenness of professions have been developed by labor market researchers (Janser 2018) (European Centre for the Development of Vocational Training 2019); labor environmentalists highlight the contributions of unions and workers as allies for environmental protection (Stavis et al. 2018) (Räthzel and Uzzell 2013); the discourse on “sustainable work” considers different types of work, beyond formal employment, and emphasizes the role of work as a structuring factor for sustainability transitions (Barth et al. 2016); and Post-work research emphasizes the negative implications a fetish on employment has for people and planet (Hoffmann and Paulsen 2020). Overviews of the different perspectives on employment and the environment have recently been presented by several researchers (Bottazzi 2019) (Mair et al. 2020) (Räthzel and Uzzell 2019) (Baldwin and College 2014) (Kreinin and Aigner 2021). A variety of concepts on this topic exists not only in academic but also in political institutions, which adopt narrower notions of sustainable employment: Even the definitions of green jobs vary by national statistical institutions (Cedefop 2019, p. 47) (International Labor Organisation 2018).

A review of the literature on environment and employment shows that the different aspects can be well integrated with a “Taxonomy of Sustainable Employment” (Bohnenberger, forthcoming). This taxonomy classifies environmental aspect of employment along two axes: the first being the level of analysis and the second the type of environmental effect. The level of analysis ranges from the micro-level of the worker to the macro-level of industries. The environmental effects enter as direct workplace-related effects or indirect societal-wide effects. Accordingly, the taxonomy consists of four dimensions:

- The direct and macro-level effects describe the sectors that are defined by the type of goods and services a plant or company produces (output type approach).
- The direct and micro-level effects cover the tasks and activities of employees in their jobs (occupation approach).

- The indirect and micro-effects assess the consequences of employment relationships for environmentally friendly lifestyles beyond the workplace (Work-life-styles approach).
- The indirect and macro-effects detail the scalability of a plants' and sectors' production processes (outcome efficiency approach).

The following subsections summarize the four dimensions of the taxonomy in order to enable an assessment of labor market policies along these lines and to identify strategies for improving the environmental consequences of employment.

2.1 Output type approach

Most of the studies that deal with the integration of employment and the environment through “green jobs” take a sectoral approach that highlights jobs in the renewable energy sector, energy-efficient retrofitting of buildings, or the recycling industry (UNEP 2008). Often statistics using the sectoral approach approximate green jobs through the environmental goods and services sector, like wastewater treatment, renewable energies, or end-of-pipe technologies (Janser 2018, p. 80). EUROSTAT for example defines the environmental goods and service sector as “activities to measure, prevent, limit, minimize or correct environmental damage” (EUROSTAT 2009). However, that approach falls short of assessing the sustainability of jobs in other sectors (e.g. education or retail) and tends to blank sectors with a high share of female employees as opportunities for green employment (e.g. health care sector). Furthermore, the existing approaches overlook that even environmentally friendly processes consume energy and resource. Whether this impact is justifiable should be evaluated by the usefulness of the output for human needs (Gough 2020) and whether using these goods and services to meet everyone’s needs would keep environmental impact within planetary boundaries (Steinberger and Roberts 2010). The *output type approach* of the taxonomy of sustainable employment, therefore, defines jobs as sustainable which provide goods or services that serve human needs (and not only their desires) in an environmentally generalizable way.

2.2 Occupation approach

Recognizing that some green jobs might not be identifiable by the sector or output but by occupations, researchers have started to develop a task-based approach to green jobs (Janser 2018). That approach calculates the share of “green tasks” in a job or occupation and can therefore calculate the greenness of all professions—even beyond green sectors. This approach is particularly helpful for linking labor market changes with (green) skills development. However, for the environment it not only matters what tasks people should fulfill in their profession but equally what other activities they do at the workplace and whether this is energy- and resource-intensive or whether it even improves environmental quality (Süßbauer and Schäfer 2018). For example, the transport mode of business travel has large environmental leverage and is seldomly within the scope of private consumption choices. It should

therefore be attributed to the tasks and activities of employees at work. Hence, the *occupation approach* of the taxonomy of sustainable employment evaluates jobs by the greenness of the activities people do at workplaces, which covers the tasks of the job description and other activities that are taking place at the workplace or in preparation for it.

2.3 Work-lifestyles approach

The third dimension of the Taxonomy of Sustainable Employment analyses the effects of jobs and employment relationships on lifestyles beyond the workplace (*work-lifestyles approach*). Jobs and job-preparing activities, like education or commuting, structure our societies. They form temporal institutions, geographical patterns, and firm status positions in society and households. Specifically, employment shapes the sustainability of lifestyles through two channels: On the one hand, income and time-use effects, for example, work-spend cycles and efficiency-consumption, that saves time when overtime hours require fulfilling household duties is less time (Schor and Jorgenson 2019). On the other hand, workplaces train behavior, and this will likely spill over to private life and shape practices at home. For example, recycling habits that are trained at work might be applied to private life (Mira et al. 2013). Workplaces are also institutions of learning, information exchange, and they thereby indirectly influence employees' political beliefs. For example, the fear of losing one's job could crowd out voters' wish to protect the environment, or information gained at the workplace can raise environmental awareness. Depending on the conditions, workplaces can both promote and inhibit sustainable lifestyles.

2.4 Outcome efficiency approach

Next to the output approach, many institutions, including the US-American Bureau of Labor Statistics, apply a process approach: The process approach identifies environmentally friendly production processes and practices—even if the output is not related to the environment (U.S. Bureau of Labor Statistics, n.d.). The environmental friendliness of production processes can be evaluated in relation to the output produced, for example, the energy required for the provision of a specified quantity of bread, steel, or health care. In addition, it should be evaluated concerning the hours of employment it provides to workers. With these two aspects, the environmental impact of the process can be rated by the environmental efficiency for the two main functions (outcomes) production has in our societies: the supply of goods and services for society and the provision of employment and income for workers. Defining the *outcome efficiency approach* in this way can take into account that many jobs in the social and cultural sector are particularly resource-light and are even likely to use less energy and resources per hour worked than “green-collar” jobs, like jobs in renewable energies (Rossu 2018). This perspective has important implications for the undesirability of increasing labor productivity (see Sect. 4.8.), the environmental prospects of servicisation, and the question of whether labor market policies help to

meet society's need for goods/services and employment at a reduced level of production and consumption (Bottazzi 2019).

3 Data and method

The previous section presented the Taxonomy of Sustainable Employment with its four distinct dimensions that matter for the evaluation of employment in respect to its environmental sustainability. The subsequent sections will analyze the performance of eight labor-market strategies concerning these four dimensions of the taxonomy. In principle, very specific policy designs could be evaluated with the taxonomy. However, this paper only seeks to provide an overview of the different policy strategies that exist, discuss how they can promote sustainable employment, and elaborate on what needs to be considered to maximize the environmental benefits of the policies.

Three steps were undertaken to identify and select the eight major policy strategies: First, relevant literature in the domain of labor markets and social policy was scanned for policy proposals that claim to promote the environment. The documents cover peer-reviewed papers, press releases of interest groups and NGOs, research project reports, newspaper articles, and briefings of relevant organizations at the science-policy interface. Geographically, they mainly cover Western, European, economies—except for documents of international organizations that also include policies in the Global South. The temporal coverage focuses on publications between 2005 and 2021. Second, the policy proposals were extracted from the texts and listed. If applicable, the reasoning behind the environmental benefit of the instrument was noted to inform the evaluation. Third, the proposals were clustered and categorized: The text fragments were grouped around what makes the core of the mechanism in greening employment, with policy proposals or implemented examples forming subcategories. Some policies can be attributed to multiple strategies—the policies are then listed in the strategies with their highest impact potential. For example, a reduction of paid work time can be a strategy to distribute employment time more equally and also a measure to reduce inequality of income. In this process, eight different strategies in the field of labor market policies could be identified. The next section describes the strategies, provides examples, and evaluates the contribution of the strategies on the four dimensions of the Taxonomy of Sustainable Employment.

4 Results and discussion: eight labor market strategies and their contribution to sustainable employment

The eight strategies in greening employment differ in their general idea and in terms of the actors who can implement them. They target different sectors, workplaces, and situations and thereby feature particular intensities in greening employment. In summary, all eight strategies positively impact the four dimensions of sustainable employment but their suitability varies across the four different dimensions (see Table 1). The most effective strategies for each dimension are as follows: Greening

the output type dimension is most likely through the conversion of plants and businesses and environmental decommodification; Tasks and activities of the occupation can be best improved by environmental labor law, vocational guidance and training, and alternative income sources. Processes can be made resource- and energy-lighter by addressing the distribution of employment time and an eco-social job guarantee. The consequences of employment on the sustainability of lifestyles can be easiest ameliorated by equalizing income and better distribution of employment time. The subsections discuss the mechanisms in detail for each of the eight strategies.

4.1 Conversion of plants and businesses

The traditional yet profound approach to greening workplaces is the conversion of plants with a change towards products that are required for a green transition. Already in the 1970s workers at Lucas Aerospace, a producer of military products, tried to convert the products of their plants into more peaceful and socially useful products (Rätzzel et al. 2010). Although their quest did not succeed, their development of 150 prototypes of different products shows that employees possess rich skills and imagination, which can help to convert formerly brown and harmful sectors of the economy into more sustainable and useful businesses. Nuances of socio-ecological conversion are the ecological modernization of products, e.g. the processing of grain-based milk instead of animal milk in dairy plants, the diversification of the business model, e.g. the provision of mobility services instead of vehicles, the exnovation/phase-out of a product or business model, e.g. terminating the production of airplanes, and the cooperation with or foundation of other companies or start-ups that change the outputs (CON LABOR 2021) (Heyen et al. 2017) (Wehnert 2017).

Table 1 Evaluation of labor market policies by the four dimensions of the taxonomy of sustainable employment: *strongly positive impact* *positive impact*; *rather positive impact*; *neutral/mixed/unclear impact*

Policy type/	Taxonomy of Sustainable Employment (dimensions)			
	Output type	Occupation	Work-Lifestyles	Outcome efficiency
Conversion of plants & businesses	<i>strongly positive impact</i>	<i>strongly positive impact</i>	<i>positive impact</i>	<i>rather positive impact</i>
Environmental labor law	<i>positive impact</i>	<i>strongly positive impact</i>	<i>positive impact</i>	<i>rather positive impact</i>
Environmental decommodification	<i>strongly positive impact</i>	<i>strongly positive impact</i>	<i>positive impact</i>	<i>rather positive impact</i>
Eco-social job guarantee	<i>strongly positive impact</i>	<i>strongly positive impact</i>	<i>positive impact</i>	<i>rather positive impact</i>
Vocational guidance & retraining	<i>strongly positive impact</i>	<i>strongly positive impact</i>	<i>positive impact</i>	<i>rather positive impact</i>
Distribution of employment time	<i>positive impact</i>	<i>neutral/mixed/unclear impact</i>	<i>strongly positive impact</i>	<i>strongly positive impact</i>
Alternative income sources	<i>positive impact</i>	<i>strongly positive impact</i>	<i>positive impact</i>	<i>rather positive impact</i>
Equalization of income	<i>strongly positive impact</i>	<i>positive impact</i>	<i>strongly positive impact</i>	<i>strongly positive impact</i>

The conversion can be led by workers or initiated by business heads and supervisory boards who seek to make their business model future-fit (Antonioli and Mazzanti 2017). Furthermore, the conversion can also be nudged or initialize by external factors, such as government decisions, creditors, and legal rulings that render former business models unprofitable, e.g. phase-out of fossil subsidies. The most profound conversion of businesses took place during World War II when all non-essential production processes were steered to produce military equipment. More recently, at the beginning of the Covid19 health crisis, non-medical companies quickly shifted to the production of masks and disinfectants to help meet spontaneously risen needs. Although the climate crisis requires more fundamental transformation, these examples illustrate how quickly the production process can be changed in a profound way when it is considered necessary.

In the past, politically-led conversions were less accepted than market-led conversions (Fromhold-Eisebith et al. 2018). This suggests that many conversions will only come about once external conditions disable unsustainable business models. These “silent” conversions can accelerate through a rationalization of the production process that results in fewer employees in the sector and thereby a reduced bargaining power of the unsustainable sectors, putting less pressure on policy-makers to create fertile market conditions for sustainable business models. This scenario might evenuate in the automotive sector that reduces employment through the shift to electric vehicle production and might thereby enter a transformation scenario that largely exnovates the energy-intensive transport mode of cars altogether.

An alternative to this silent death is the active and planned conversion of car and airplane production plants into sites for producing public transport vehicles, like trams and trains, or energy-efficient modes of individual travel like cargo bikes. Workers and their representatives are often very well aware if their work is future-proof: For example the German industrial union IG Metall states: “... for many of today’s ‘successful’ products there will be no room in a climate-neutral world” (IG Metall et al. 2019). In cooperation with environmental interest groups, unions can establish conversion scenarios. For example, the UK’s Public and Commercial Services Union together with the NGO Stay Grounded developed a concept to transform the aviation sector, which includes retraining flight attendants to become train attendants (PCS and Stay Grounded 2021).

Workers’ participation can support the conversion processes to successfully shift to different products (Pichler et al. 2021, p. 148). For example, workers at the plants hold specific knowledge that is necessary for the transformation but usually this knowledge is not formalized because it has not been useful for the production process beforehand. The same holds for workers’ skills that are required for the new products but were not part of the prior occupations. Hence, it is crucial to motivate workers to contribute their knowledge and skills to the conversion process. This is most likely to occur in companies of high workplace democracy and cooperatives (Alvarez et al. 2019) because workers suspect less that the transformation process is used by company management as a vehicle of rationalization for company profit at the expense of worker rights. In addition, regional transformation councils that take on board citizens beyond a single plant or company can overcome existing actor

networks and establish opportunities for new cooperations, a prerequisite for new products (Pichler et al. 2021).

The conversion of plants mainly targets the output type dimension of sustainable employment since the change of products and services is at the center of the transformation. Furthermore, it has implications for the occupation dimension because other (green) skills are required and the workplace activities of employees are likely to change profoundly. The outcome efficiency dimension will also be affected because the change of the production process opens up the opportunity to reduce resource and energy use or improving process efficiency by shifting to more durable (and sustainable) products or replacing energy-consuming machines with manual work. This is no sure-fire success but a focus on environmental targets in the output selection will raise awareness on the environmental impact of the production process. The lifestyles-dimension is the one least addressed by this strategy, yet small spillovers from a socio-ecological conversion to sustainable practices and political beliefs are likely.

4.2 Environmental labor law

Labor law is the key instrument for protecting people from exploitation and hazardous working conditions. Traditionally, this is a field with established links between good working conditions and local environmental protection. With environmental problems becoming more global and polluters and victims less entangled, this natural synergy fades. However, while the physiological downsides of environmentally destructive production processes decrease, the psychological consequences of environmentally destructive work become more prevalent (e.g. eco-anxiety, depression).

Labor law will have to deal with cases in which companies demand their workers perform climate destructive labour which the workers will refuse to do. Labor laws might adapt by elaborating on aspects of workers' rights that cover the environmental consequences of their occupation and so develop the right to rebel against performing environmentally destructive tasks and activities (Tomassetti 2020). Even now, in many countries, people can decline job offers that are not reconcilable with their religious or ethical beliefs without losing entitlements to unemployment benefits. At the workplace level, employees can reject tasks which are either illegal or profoundly violate ethical norms—however the latter usually holds only when the task has been newly mandated to the employee (Hold 2014). Recent climate lawsuits illustrate that greenhouse gas emissions are increasingly in direct conflict with basic human rights (Bundesverfassungsgericht 2021). Tasks or activities at work that contribute towards such environmental destruction are hence incompatible with society's ethical standards. With the climate crisis becoming more pressing, labor laws will have to answer whether “employees can be forced to perform job tasks at the expense of future generations”. For example, which workers' rights emerge when job tasks remain unchanged but unsustainability of these tasks is exposed over the course of time (e.g. the incompatibility of natural gas with climate targets)? Another field of labor law is the situation when workers strike because of their company's environmental impact. For example, in 2019 tech workers at Amazon, Google,

Facebook and Microsoft went on strike for climate neutrality and against the funding of climate denial by their companies. This issue is also relevant for job alternatives and social security: Can benefits be denied to the unemployed when they decline job offers at companies that destroy the climate? Are employees entitled to compensation when fired because they disobeyed environmentally harmful job orders?

Progressive environmental labor laws promote opportunities for employees to become allies of environmental transformation, protecting employees against dismissal who engage in environmental action at the workplace. For example, workers could be allowed to challenge business flights that breach justifiable per capita emissions. Today these decisions are beyond workers' mandates and frequently bosses can, for example, force employees to use airplanes instead of trains to save time and travel expenses. For instance, until recently the German federal travel law even forced public employees to use environmentally harmful air travel when it was cheaper than train travel. Environmental labor law includes the right to disobey tasks and activities that harm the environment.

Another dimension of labor law is the tools and workplace infrastructure workers are entitled to. Climate-friendly work infrastructures can be promoted by entitling employees to climate-friendly options: For example, providing the optional use of business bikes instead of cars, providing climate-neutral menus at the staff canteen, or offering work shifts in accordance with public transport schedules that allow for a carless commute. At a Dutch hospital, for example, health workers are provided with free bicycle repair during work hours, thus supporting climate-friendly commuting.

Environmental labor law can also widen job descriptions: Some companies are already nominating climate delegates whose task it will be to help to reduce the environmental footprint of the company (Escribano Gutiérrez 2018). Some programs explicitly train energy scouts in medium-sized companies to detect energy-saving options. A reduction of energy consumption is often in line with the company's interests when it saves costs. From an economy-wide perspective, environmental protection measures are also desired when these measures create no additional profits for the company. Hence, the effectiveness of energy scouts depends on the requirements of companies for putting the proposals of their energy scouts into effect—even when this entails profound changes of the business model.

Environmental labor law mainly addresses the tasks and activities of workers and to a smaller extent the outcome efficiency dimension of green jobs and the work-lifestyles dimension. For sectors that need to shrink to stay within planetary boundaries, environmental labor law can even establish profound justifications for workers to leave or renounce working in the sector. For example, it could authorize coal workers to either stop work or strike for transformation. This could speed up the conversion of unsustainable businesses and protect climate-striking workers against dismissal. Yet, employees can only make use of these rights when they are also financially secured when leaving unsustainable jobs—this highlights the need for the next strategy.

4.3 Environmental decommodification

In comparative welfare studies, typologies of similar welfare states are often distinguished by their degree of decommodification (Esping-Andersen 1990). Decommodification measures the degree to which citizens do not have to take up work or can leave jobs for non-employment-related reasons and the level of social provision they receive in these situations. Occasions can be family work, care duties, health, etc.. With environmental crises worsening, the question arises whether climate and environmental reasons establish a reason for decommodification. Legal rights that establish the right to deny climate-damaging tasks or leave environmentally harmful workplaces are an option for establishing environmental reasons for decommodification. As few people will be able to make use of their formal rights unless their financial means are secured, legal rights must be accompanied by income replacement schemes. A general version of climate decommodification is an unconditional basic income and universal basic vouchers or services at a financial level that allows full participation in society. This enables all people to step down from jobs—whether for climate protection or any other reason. Companies with brown business purposes might face a labour shortage because people might prefer to work for sustainable purposes and this might force brown companies to reduce production or green their business. Another option is the ecological transition income (Swaton 2019)—a program that targets people in brown jobs. The transformation short-time work program (Transformationskurzarbeitsgeld) proposed by IG Metall in Germany is another variant (Metall 2019). However, this program would keep people in their unsustainable workplaces and only reduce the hours worked. It could thereby even manifest unsustainable business models. The program would be more effective if workers in this program were retrained for other sectors and occupations. A collective version of environmental decommodification is the introduction of collective times off work. For example, in 1974 Austria introduced energy holidays—a general week off work intending to reduce energy consumption (Kaltenhofer 2017). Whether this form of work time reduction actually reduces energy consumption depends on several factors, for example, whether less income is spent and whether production is reduced (Antal et al. 2020).

Environmental decommodification primarily focuses on brown jobs as defined by the output type and occupation approaches—however, one could extend the eligibility criteria to aspects of the outcome-efficiency-dimension and even the work-lifestyles-dimension. Collective time off work, like the Austrian energy holiday, targets the outcome efficiency approach—its national environmental impact depends on the alternative time use during the time off. Yet when collective times off result in lower production levels, consumption levels decrease as well, making the impact on the outcome efficiency dimension rather positive. The lifestyle dimension is least affected by climate decommodification—although altered income and time wealth during participation in the program could have a positive impact for sustainable lifestyles and the option of leaving an unsustainable job could make workers in unsustainable sectors more open to reconsidering their lifestyles.

4.4 Socio-ecological job-guarantee

Just as climate decommmodification is a transition tool that is likely to be implemented by states, an employment guarantee is another state-driven program with similar effects: Employment guarantees have a long tradition and worldwide application. In the Philippines, for example, a green works program was introduced to provide people with income and rebuild infrastructure in the aftermath of a natural disaster (International Labor Organisation 2017). In India, rural low-income households are guaranteed one hundred days of paid employment (Dutta et al. 2012). Recently, job guarantee programs have experienced a revival that is mainly led by indicators of joblessness among the young and long-term unemployed (Tcherneva 2020). Also, with the economic consequences of Covid19, the calls for job guarantees have increased (Dhingra 2020). In 2020 for example, Austria started a pilot project “Marienthal reversed” offering a paid job to every long-term unemployed in the municipality of Gramatneusiedl (programme description (Arbeitsmarktservice Österreich 2020), more context on job guarantees options in Austria (Tamesberger and Theurl 2019) (Picek 2020)).

Usually, job guarantees cover tasks that would not be paid on the first labor market, jobs that support the community or social institutions. So far, the environmental consequences have been of little importance for the programs. Many activities in the social, care, and cultural sector, however, are resource-light services (Jackson and Victor 2011). Hence, with a fixed environmental budget more hours of work are environmentally “affordable” in these sectors compared to other sectors. Indeed, a job guarantee could be seen as a subsidy for socially and ecologically beneficial initiatives in the form of labor free of charge for the initiative (Parrique 2019). A job guarantee is therefore a key element in socio-economic scenarios for carbon neutrality (D’Alessandro et al. 2020) and policy strategies for a green recovery (Mastini et al. 2021).

From a Post-work perspective, the conditionality of income on paid work could be seen critically because it reinforces a work fetishism instead of liberating people from employment (Hoffmann and Paulsen 2020). If a job guarantee replaces the right to unemployment benefits, it can be stigmatizing and even worsen environmental impacts because many unnecessary—resource-consuming—tasks would be invented for the program just to keep people occupied. Including environmental considerations in job guarantee programs would be a crucial improvement for sustainable employment. Furthermore, granting universal access to the program is an important feature. So far, many job-guarantees only target long-term unemployed. Extending the eligibility to employees in brown jobs could further reduce the environmental impact because it enables workers in these sectors to switch to greener (job-guarantee) jobs. The same holds for the amount of work time and remuneration backing up the job guarantee—too-low or too-high incomes, or long work-hours inhibit sustainable lifestyles.

The main contribution of a job guarantee rests on its contribution to the outcome efficiency dimension because it supports sectors with low energy consumption per hour worked and work-intensive outputs. The job guarantee is likely to take place in sectors that serve human needs in an environmentally generalizable way. It

consequently promotes the output type dimension. If designed as a “universal eco-social job guarantee” it promotes the occupation dimension. For example, if the tasks of the job guarantee serve a green purpose, this might provide people with green skills they can also apply to other jobs. A job guarantee can also set sustainable work standards, like the availability of a work bike or climate-neutral canteens. By establishing a standard of good working conditions, e.g. a regular 25-h week, it can be a tool for spreading green working conditions beyond the public sector, because the private sector would need to keep up with the working conditions provided by the public sector. A job guarantee which is open to everyone reduces the fear of becoming unemployed and therefore emancipates people to choose sustainable lifestyles even if this is not compatible with one’s current job.

4.5 Vocational guidance and retraining

A subtler approach to greening jobs is vocational guidance and retraining. In many exnovation sectors, the transformation can be managed in a socially responsible way by keeping elderly employees occupied with the dismantling of the production site or the restoration of the site, e.g. a transformation of the lignite mines to biotopes (Harrahill and Douglas, 2019). However, this requires that young people do not enter unsustainable sectors. Making sure young people do not start their careers in unsustainable sectors, but acquire green skills in future-fit professions, prevents a need for future reskilling in unsustainable sectors (International Labor Organisation 2018). This requires that knowledge of the green transformation and the implications for job market scenarios is included in basic instruction, vocational training, and job orientation.

Furthermore, many occupations linked to unsustainable sectors can be easily transformed into occupations essential to green sectors, e.g. car mechanics to bike mechanics. Workers are themselves best acquainted with their occupations and are therefore most likely to anticipate when there will be no future need for their particular line of work. Therefore, an active labour market policy should grant employees access to retraining for the sustainable job market—even if they are still employed. This can enable them to switch occupations themselves without having to wait until they cannot find employment within their current occupation or sector and face unemployment. Being able to leave one occupation and receive retraining for a new profession will reduce the opposition against transitions. Studies find that a lack of supporting career counseling reduces the success of retraining programs—it is hence important that job centers provide information on the sustainability of occupations (Cameron et al., n.d.). Job counseling should be strictly in line with scientific and realistic scenarios on structural change meeting planetary boundaries. Foreseeable pathways are strongest when in line with a sound industrial strategy for carbon neutrality.

Retraining often only takes place once sectors face mass layoff. While in this situation retraining programs are certainly necessary, they have little transformative impetus. It would be more effective to target retraining at workers in (still) profitable but unsustainable sectors—leading to an exnovation from inside the company. This

is not always easy, because many jobs in unsustainable sectors are well paid. With brown sectors getting considered more and more unethical, this challenge might increase as there seems to be an immoral work premium: For example, Schneider et al. (2020) find 64% higher pay for immoral sectors in Switzerland. Retaining of workers in unsustainable sectors is important for transformation. However, one risk is that workers misuse the retraining in order to boost their careers back into these same unsustainable sectors. For example, six months after having received training through the Scottish Just Transition Fund, 56% of the workers trained were still employed in the oil and gas industry (Just Transition Fund 2020). This is problematic because in these cases retraining programs might form a work subsidy and skill training may subsidize unsustainable industries, making the sector more competitive and delaying its phase-out. For jobs in brown sectors for which exnovation is the only sustainable option, longer and coordinated retraining programs covering a larger share of the workforce should be contingent upon the termination of work contracts with unsustainable companies, the phase-out of the sector, and trainings should only cover green skill trainings.

Another solution would be to connect retraining to new occupations, e.g. by letting the training take place at the sites of sustainable businesses. This enables candidates to experience the new work environment, network, and form new opinions on the value and purpose of one's job. In these situations, it is less likely that people will stick with their previous, unsustainable, jobs. Such an approach is also suitable for individual retraining. For example, a "retraining right" could allow workers to leave their current jobs, access retraining toward a new occupation, and gain the right to return to the previous job. Job centers' would be in charge of approaching workers in brown sectors and to encourage them to switch jobs or retrain to more sustainable jobs.

While for many people the change of occupations is probably a lifetime decision that is not easily made, it can be promoted by shorter retraining periods that enable workers to consider the field of work in which they are in and what their role in a sustainability transition could be. Some countries grant employees an education leave paid for by the employer (Mückenberger 2007). For a period of a few days and weeks workers can participate in educational events of their choice. Introducing a green education leave that enables all workers to acquire green skills or knowledge related to environmental protection is a first step to a change of professions. A green educational leave can also be useful to more sustainability at the workplace and for greening exiting professions. These policy instruments require anticipatory planning in labour market policy and industrial policy that identifies the required innovations, exnovations, skills and retraining to match transformation scenarios.

Overall, vocational guidance and retraining mainly target tasks & workplace aspects of sustainable employment. In addition, it can support the output type dimension when vocational guidance and retraining enable a sectoral shift. The smallest, yet still positive impact will be in the dimensions outcome efficiency and work-lifestyles: During educational leave, people do not contribute to the production process and when employed in brown jobs their absence might lower the production of an unsustainable sector during the time of their leave. While this effect might appear minor—it can be substantial when educational leave for example covers one

or two weeks per year and employee. The effect on lifestyles takes place mainly through the new knowledge acquired at the green trainings which can positively influence everyday practices and awareness for environmental challenges and the required steps for individual and societal change.

4.6 Work time distribution

A popular strategy for improving the environmental impact of employment is better distribution of work time, mainly through a reduction of long working hours. A reduction of employment hours has a long tradition in labor policy, has historically been, and has become once again, a widely articulated policy response to sharing work more evenly, reconciling job with care duties, and improving the quality of life through more free time (work-work-life-balance). Transformation scenarios require a work time reduction for those overworking and overproducing. One can distinguish several subordinate strategies: An external employment time reduction can be implemented by a general reduction of the workweek to 32 h or a 4-day-week, new public holidays, or a reduction of employment time in proportion to labor productivity increases—making sure productivity increases do neither lead to overproduction nor lay-offs (Cieplinski et al. 2021). Temporal differentiation of social security can incentivize employers to offer a 25-h work week, by extending the predominant income-dependent contribution rate by a time-dependent contribution rate for employers that sets the lowest social security contributions rate at 25 h per week and increasing the rates to the margins. Internal employment reduction describes an increase of occasions for which employees can temporarily leave the workplace without or with only a small reduction of income, e.g. parental leave, days to care for children or relatives, volunteering or educational leave.

Another option is the redistribution of work time—for example in the form of classical work-sharing in which employees reduce employment times to hire new people (e.g. Austrian Solidaritätsprämienmodell (Figerl et al. 2021)). Another variant of work-sharing could be an intra-family shift of work time: Employees in exnovation sectors could reduce employment hours and increase care work, enabling their partners in more sustainable jobs to reduce care work and increase employment hours. Since employees in exnovation sectors are predominantly male and many women work in the resource-lighter service sector, such a work-sharing could benefit the environment while also promoting gender equality. However, intra-family work-sharing requires that households face no unbearable income loss. This requires more equal hourly pay among sectors and occupations, a tax system that incentivizes the equal distribution of work times (employment and care work) among household members and labour market programs that incentivize such intra-family work-sharing.

A reduction of employment time affects the environment through multiple channels (for an overview see (Antal et al. 2020)): The most important effect is through the income effect, i.e. reduced income and thereby reduced expenditure, resulting in a lower resource and energy use (Ivanova and Wood 2020). Less consolidated is the knowledge about time effects of working time, less employment time will allow for

more time-intensive yet resource-light solutions, e.g. slower travel. However, more free time might also lead to more or more resource-intensive consumption (indirect time rebound effect), particularly if income is not a limiting factor. Another major factor is through the production process: Unless a reduction of employment hours leads to labor productivity increases and the actual output of the site is not reduced, a reduction of employment time will result in lower production and thereby lower resources for inputs and lower outputs that eventually require energy and resources for operation. While the income and time effects depend on household characteristics, the outcome efficiency depend on the sectoral characteristics. For UK and Germany, a study estimates the energy use per hour worked (including value-chain effects) and finds that the energy-labor ratio is about twice as large for the production of transport vehicles than for education (Hardt et al. 2020). Hence, a reduction of employment hours in the vehicles production sector and an increase of employment hours of the same amount in the education sector, e.g. by other household members, would halve energy consumption while keeping employment levels constant. A selective employment time reduction in particularly energy- and resource-intensive sectors has therefore a massive potential to improve the environmental effects of employment. An improved work time distribution mainly addresses the work-lifestyles and the outcome efficiency approach. It can facilitate the exnovation of unsustainable sectors and therefore contributes positively to the output type dimension. Little or no effect can be presumed for the task and workplace effects.

4.7 Alternative income sources

Another strategy is the decoupling of income from employment volume and thereby production. New sources of income can be provided by the state, social security institutions, or the employer. Most prominent is the unconditional basic income that enables employees to reduce their employment hours while keeping the same income (Andersson 2010; Birnbaum 2010; Malaeus et al. 2020). Another option is to pay employees for the environmental performance of the company, for example for the energy reduction at companies, as discussed in Italy as “Green Pay” (Tomasetti 2018). This integrates environmental considerations into the process organization and sets incentives for both employees and employers to protect the environment. Furthermore, health insurance could pay for healthy commuting, for example, when employees walk or bike to work. Active travel prevents health expenditures and insurance could use the saved expenses to fund a reduction of the daily work volume by the time needed for active commuting. The German ICT-provider Posteo even provides its employees with additional holidays if they stay grounded and do not use airplanes during holidays (Posteo.de, n.d.). In effect, this replaces paid work hours by a payment for climate-protecting lifestyles.

The measures of this strategy vary in their mechanism for protecting the environment. Overall, the strategy directly addresses the tasks and activities most strongly, since employees will change their environmental behavior at the workplace. It can also promote sustainable lifestyles beyond the workplace. And for example, a basic income and green pay can allow for a reduction of work volume and thereby

production. The strategy has little impact on the output type dimension since it provides no reorientation in the company purpose.

4.8 Equalization of income

The eighth strategy is an equalization of income—per hour and in absolute terms. It ensures that neither a lack of nor excess income result in unsustainable lifestyles. A minimum income and a maximum income can promote this goal. The last should take into account income from non-employment-related sources like wealth dividends and rents (Stratford 2020). Companies could be rewarded for low pay differentials (Buch-Hansen and Koch 2019).

Next to wealth inequality and unequal hourly pay, inequality in the hours employed is another factor for unequal income. Keynes had already projected the need to share paid work more equally. For labor markets in 2030, he claimed that “[...] we shall endeavour to spread the bread thin on the butter—to make what work there is still to be done to be as widely shared as possible. Three-hour shifts or a fifteen-hour week may put off the problem for a great while.” (Keynes 1930). Employers can be incentivized to offer reduced full-time jobs of 15–30 h/week by setting the minimum of employer’s rate at social security contribution at that work volume. By confining work volume to fewer instead of more employees, a company creates unemployment costs. By reducing the employer rate for shared jobs, part of the avoided social costs could be given back to companies that work-share. Thereby the reduction of production is viable without rising unemployment while the equalization of income will lead to reduced luxury emissions for top incomes (Ivanova and Wood 2020).

An eco-social tax reform that reduces the taxes on human labor and increases tax rates on resource and energy consumption will shift employment to more resource- and energy-light services (Patuelli et al. 2005). Indeed, current labor productivity increases correlate with increasing energy use (Hardt et al. 2020). This tendency locks in economies in a jobs- and growth-treadmill that forces constant increases in production and consumption to keep the economy running and avoid unemployment (Wiese and Mayrhofer 2020). This is why ecological economists advocate “low-productivity” sectors, like care, culture, and community work (Jackson and Victor 2011). However, these sectors suffer from Baumol’s cost disease, which means the relative prices of person-related jobs constantly increase compared to resource- and energy-assisted tasks (Baumol and De Ferranti 2012). Eco-social tax reforms can milder that tendency and allow for better pay in the resource-light sectors. Currently, inferior working conditions in these sectors inhibit a shift from workers in brown jobs to these sectors. Better pay, work schedules, and quality of work will promote a change of professions.

Depending on the chosen measures, the strategy of equalizing income varies in the dimensions it addresses. Overall, its effect on the work-lifestyles dimension will be most robust, because of the induced consumption changes. It will also address the outcome efficiency dimensions when the relative prices of human labor versus energy and resource change. A sectoral shift might also be enabled when

labor-intensive sectors gain a comparative advantage. Still positively but more indirectly this will also change the occupation of employees.

5 Conclusion

This paper analyzed how eight different labor market strategies contribute to the greening of employment. The eight identified policy strategies cover a wide range of instruments: conversion of plants and businesses, environmental labor law, climate decommodification, socio-ecological job guarantee, vocational guidance and retraining, distribution of employment time, alternative income sources, and equalization of income. The taxonomy of sustainable employment with its four dimensions (output type, occupation, work-lifestyles, outcome efficiency) was applied for the identification and measurement of supporting and impeding factors in greening employment and allows to determine policy measures for a just transition. All eight strategies have the potential of greening employment but vary in their intensities.

The results show that the specific design of the strategies matters. How these strategies can be implemented in the labour market policies of countries depend on the legal and institutional specifics of the welfare state, labour market institutions and industrial relations. Some instruments, such as green pay or additional free days, can be introduced by private actors such as companies. Other instruments, for example conversion can be promoted by unions. Many strategies, e.g. work time distribution, require changes in the social security institutions, such as unemployment insurances or tax and labour law.

Future research is required to explicate country- and time-specific conditions and design options for translating the eight different classes of strategies into specific design. This encourages widening the toolbox of labor market policies in the light of environmental crises and the sustainable development goals.

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