

Ewa ROLLNIK-SADOWSKA

LABOR MARKET IN SUSTAINABILITY TRANSITIONS: A SYSTEMATIC LITERATURE REVIEW

Ewa **ROLLNIK-SADOWSKA** (ORCID: 0000-0002-4896-1199) – *Białystok University of Technology*

Correspondence address:
Tarasiuka Street 2, 16-001 Kleosin, Poland
e-mail: e.rollnik@pb.edu.pl

ABSTRACT: The study objective is to analyse scientific literature relating to the labour market in sustainability transitions and identify emerging research directions and implemented research methods. A bibliometric analysis method was used to review the literature from the SCOPUS database. Moreover, an in-depth review of selected publications that fall into the field of social sciences was made. In literature, it is recognised that there is a scarcity of research linking the labour market and sustainability. However, in the analysed period of 1997-2023, a gradual growth was noticed in the number of publications. Four thematic clusters were identified in relation to green growth, twin transition, green employment and sustainable European labour market policy issues. The majority of authors based their study results on a critical analysis of literature, case study and database analysis. Even though qualitative research is popular among researchers studying the labour market in sustainability transitions, foresight methodology has not been used so far. The topics researched to an insufficient extent include, among others, career ecosystem, precarious employment, digital transformation, just transition, artificial intelligence or the future of work.

KEYWORDS: labour market, sustainability transitions, twin transition, systematic literature review, bibliometric analysis

Introduction

Sustainability transitions (STs) are one of the major changes in socio-technical systems based on coevolution and multi-actor interactions between social groups on a path toward sustainable production and consumption patterns (Moilanen & Alasoini, 2023). Workers are crucial actors embedded in product and service production processes. Work organisations and workers may seek to create niche innovations that redefine their habitual practices, rules, and cultures.

Sustainability issues diffuse into novel education for workers to renew their skills or to work out new competencies that contribute to transitioned production. Such adaptation of skills takes place at various professional levels – from managers to production workers. At the same time, new jobs have emerged due to a transition. In literature, it is recognised that there is a scarcity of research linking the labour market and sustainability. This study aims to review literature sources to investigate existing research on the labour market in sustainability transitions.

The study objective is to analyse scientific literature relating to the labour market in sustainability transition issues and identify emerging research directions and implemented research methods. A bibliometric analysis method was used to review the literature. This is a popular method, implemented particularly at the initial stage of interestina research topic (Ejdys & Szpilko, 2022).

The paper is structured as follows. The next section covers the theoretical background for understanding the main concepts of sustainability transitions from the social sciences perspective. Further, a selected research methodology is presented. The next section lists research findings. The last two sections provide a discussion linking research results with the results of other studies, some perspectives for future research based on the labour market in the sustainability transitions concept, and conclusions, including a summary of the performed bibliometric analysis.

An overview of the literature

Sustainability transitions in the labour market represent a critical and evolving facet of the global economy as societies worldwide grapple with the challenges posed by climate change, resource scarcity, and environmental degradation. This concept encompasses a wide range of changes in employment patterns, job creation, skill requirements, and workplace practices that are driven by the imperative to create a more sustainable and environmentally friendly future.

The process of progress in sustainability transitions is defined in the literature as a just transition, which is economic restructuring from unsustainable economies toward ecological and social sustainability while creating new green

jobs and supporting people and communities who might be disadvantaged during the change process (Evans, 2007).

It has become common to view sustainability primarily in terms of two pillars, environmental and economic, excluding a third, “social” pillar (Novitz, 2020). Labour standards are a vital facet of social sustainability while acknowledging the multiple intersections among what has been described as the three pillars of sustainability. The multidimensional sustainability angle covers environmental, economic, and social dimensions (Boyer et al., 2016; Vallance et al., 2011). In the environmental domain, the core issue is the relationship between technology and the use of resources. The economic aspect is about costs and benefits, both tangible and intangible. If costs overrun benefits, an economic unit is destined for closure. At times, the scope of environmental and economic elements may concur, while it may sometimes diverge. The social facet is more intricate than the other ones (Boström, 2012; Colantonio, 2009). It deals with the social–psychological–economic well-being of people and is more idiosyncratic. The future of work is transitioning from a linear economy to a circular economy, thus creating green jobs (Paul et al., 2023).

The transition to greener forms of production, distribution and consumption is commonly touted as a source of long-term benefits in the form of reduced environmental damage but also of new opportunities for economic development (Porter & van der Linde, 1995).

Grasping the labour market implications of green growth requires a clear understanding of qualitative transformations in the organisation and the content of work activities. To put matters in context, the spectrum of actions for tackling environmental issues includes such diverse alternatives as reducing greenhouse gas emissions by developing renewable energy sources, increasing the efficiency of energy usage in transport, building and industrial productions, or recycling and reusing materials, etc. Such a variety of options implies that environmental sustainability has the potential to modify the status quo of established industries but also to stimulate the emergence of new ones (Consoli et al., 2016). Either way, the implications for the workforce are manifold and encompass the appearance of new professional categories, the disappearance of old occupations, or simply changes in the job content for continuing ones (Dierdorff et al., 2009; Vona & Consoli, 2015).

Consoli et al. (2016) pointed out in their study that – compared to non-green jobs – green occupations exhibit a stronger intensity of high-level cognitive skills. Also, occupations that are changing qualitatively, i.e. in terms of their skill content, have, on average, more formal education, more work experience and more on-the-job training relative to non-green jobs. Interestingly, on-the-job training is a distinctive feature only of new occupations that are emerging as a consequence of higher demand for environmental-specific skills (Consoli et al., 2016).

Analysing the growing literature on sustainability transitions, one can notice the scarcity of information or insights on macroeconomics. This is despite the

fact that the macro or landscape level is supposed to play a major role according to the influential multi-level perspective on transitions (Geels, 2011). At the same time, many of the dynamic processes that make up a transition are macroeconomic in nature and have been studied extensively in macroeconomics. Transferring knowledge from this field to transition studies is likely to increase understanding of how to respond to barriers and opportunities for transitions. A lack of understanding of macroeconomic complexities easily results in the design of policies that are ineffective (Antal & Van Den Bergh, 2013). The challenge for companies is to design innovation strategies to support a wide variety of stakeholders and, at the same time, improve well-being in society, deal with redistribution of resources and equality among the rich and the poor, and maintain key target economic variables (e.g., inflation) to stable positive levels behind these sustainability initiatives (Pasqualino et al., 2021).

In his taxonomy of sustainable employment, Bohnenberger identifies four dimensions (Bohnenberger, 2022b), including both micro and macro effects.

1. The direct and macro-level effects describe sectors that are defined by the type of goods and services a plant or company produces (output type approach).
2. The direct and micro-level effects cover the tasks and activities of employees in their jobs (occupation approach).
3. The indirect and micro-effects assess the consequences of employment relationships for environmentally friendly lifestyles beyond the workplace (Work-lifestyles approach).
4. The indirect and macro-effects detail the scalability of production processes within plants and sectors (outcome efficiency approach).

Parallel to the transition to sustainability, the digitisation of the labour market is progressing. Connecting sustainability transitions and digital transformations in the labour market is crucial in achieving a more sustainable and technologically advanced economy. Both sustainability and digitalisation are significant drivers of change, and their integration can create synergies that benefit the workforce and the environment.

Radical changes have emerged in how we work due to sources such as artificial intelligence (AI)-based technologies or the occurrence of a global pandemic. These events are dynamic, impacting human engagement in the labour markets. However, their impacts may vary; for some people, it means such displacement from occupations as unemployment or non-participation in the labour market (David, 2015). Nevertheless, these technologies may be complementary to some occupations. Another crucial aspect is economic efficiency (Paul et al., 2023). Technological change may alter the profit margin by reducing the value/supply chain cost and labour. AI-based systems, such as platform economies, use data and analytics extensively to recommend customer choices (Kellogg et al., 2020). On the final demand side, it culminates in lower prices. This means that last-mile delivery is at the lowest price.

The advancement of digital equipment following technological development has established two orientations in the labour market. According to one, the equipment has become so user-friendly, and each operator, even with a low level of skills, could work with it. Still, equipment could be too advanced and working with it would require a high level of skills. Under these orientations, a job position for low-skilled people with low wages as they deserve it would increase, as well as for high-skilled persons with high wages. As a result, wage and employment development of medium-skilled persons lag behind that of low- and high-skilled persons, and inequality is felt more strongly by these classes of people (Zhai et al., 2018).

Combining environmental and digital transformations is called the twin transition in the literature. The twin transitions result in profound shifts in the labour market and related skills. European Commission (2021) claims that on the EU level, sectors and regions with heavy dependency on coal mining, fossil fuel extraction, and related processing and supply chains will observe job losses. On the other hand, new jobs will be created as a result of the green transition, e.g. in clean energy, renovation, and the circular economy.

The twin transition can have both positive and negative impacts on workers and businesses. There is no single predetermined transformation path, and how the transitions affect employment and workplaces greatly depends on how technologies are introduced (Bednorz et al., 2022). Virtually, every impact dimension presents both potential benefits and threats to workers, including work organisation (such as worker autonomy vs. AI surveillance), work content (a shift to more complex non-repetitive tasks vs a “trap” of precarious low-skilled service jobs, especially in platform economy), skills (up skilling opportunities vs. the risk of exclusion due to skills becoming obsolete and insufficient availability of training), and working conditions (easier and safer physical tasks vs. psychosocial risks related to permanent connectivity).

Another important takeaway relates to the distribution of gains between firms (i.e. capital) and employees (i.e. labour) and between different categories of workers. In the digitalisation context, companies can achieve gains in productivity (and subsequently, profit) by increasing employee workload or maintaining working conditions that are detrimental to employee health and well-being (including low pay, surveillance, etc.). Alternatively, gains achieved through digitalisation can be shared with or redistributed among the workforce by improving work-life balance and/or allocating some working time for up skilling (e.g. a 4-day work week and a “training Friday”). The twin transition (particularly digitalisation) can also contribute to increasing inequalities and labour market polarisation. While highly skilled and mobile workers can reap the benefits of digitalisation more easily, workers with insufficient skills and/or situated in collapsing industries face increasingly precarious working conditions, threats of dismissal, or exclusion from the labour market entirely (Bednorz et al., 2022).

Research methods

To achieve the aim of the paper, a systematic review of scientific literature containing references to the phrases “labour market” and “sustainability transitions” and, at the same time, indexed by the Scopus databases till August 2023 was conducted. Scopus is one of the most popular bibliographic and abstract databases, which is characterised by high-quality accumulated resources (Ejdys & Szpilko, 2022; Barkun et al., 2020; Álvarez-Melgarejo & Torres-Barreto, 2018).

The bibliometric analysis was selected as a technique for systematic literature analysis because it allows the estimate of the impact of publications, demonstrates the level of elaboration of the topic in the literature and facilitates the recognition of the latest trends (Uribe-Toril et al., 2018). Two principal procedures were applied: performance analysis and science mapping (Gaviria-Marin et al., 2019).

The research process of systematic literature analysis consisted of four stages (Figure 1).



Figure 1. Stages of systematic literature review

At the first stage of the research, a set of articles was generated, which, in its bibliographic description, contains references to the phrases: “labour market” and “sustainability transitions”. The generated lists included 148 records from the Scopus database.

At the second stage of the research, a bibliometric analysis was performed. It included the identification of the number of articles dealing with the analysed topic, taking into account the year of the publication, the structure of publications covering the subject area, and the most productive authors, countries and journals. Moreover, the bibliometric resources were processed and presented with the support of the VOSviewer software, which allowed the preparation of a map showing the existing relationships between keywords indicated by the authors of the articles. The VOSviewer software is particularly useful for working with a sheer volume of data (Gudanowska, 2017). It is a tool for constructing and visualising bibliometric networks which use advanced clustering techniques to show the relationships between keywords characterising articles from scientific databases. The program highlights the frequency and co-occurrence of keywords that appear in the network (Cichowicz & Rollnik-Sadowska, 2018; Siderska & Jadaan, 2018). The VOSviewer software facilitated the combination of the set of data into clusters (Glińska & Siemieniako, 2018). A cluster is a set of closely related nodes. Each node in a network is assigned to exactly one cluster. The number of clusters is determined by a resolution parameter (van Eck & Waltman, 2014). Cluster analysis allowed us to identify the main subareas of research on the topic of the labour market in sustainability transitions. As for the analysis parameter, the minimum number of occurrences equal to 5 was determined. As a result, the number of keywords that met the threshold was 27 in the Scopus database. The bibliometric network allows for the identification of clusters, including the above keywords. The identification of clusters of keywords provides the opportunity to determine research areas which can be crucial from the perspective of further research on the analysed topic.

In the third stage, 148 papers were limited to those subject areas which are crucial from the labour market perspective – social sciences; economics, econometrics and finance; business, management and accounting. As a result, 113 papers were qualified for an in-depth analysis as they were assigned to the above-mentioned disciplines.

At the last stage of the research, the final 113 papers were verified in terms of the most cited publications, research issues discussed as well as research methods implemented. The author identified the main research topics and methods through a detailed reading of the text of the selected publications.

Results of the research

As was already mentioned in the literature, it is recognised that there is a scarcity of research linking the labour market and sustainability. Only 148 papers were identified in the Scopus database from 1997 (when the first paper on that topic was published) up to August 2023. However, in the analysed period, a gradual growth in the number of publications was observed (Figure 2). A growing interest of researchers in the topic of the labour market in sustainability transitions was noticed, especially after 2019, which can be connected with the influence of the pandemic period on labour market transformation. In earlier years, references to the labour market in the sustainable shift were sporadic and rather “emerging thematic”.

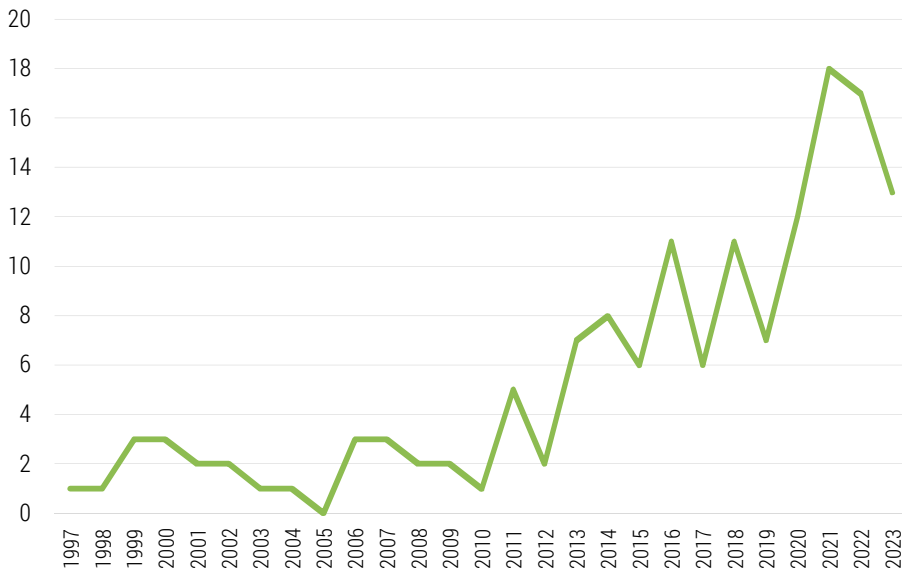


Figure 2. The number of publications, including key keywords “labour market” and “sustainability transitions” in the Scopus database in 1997-2023

Source: author’s work based on Scopus database.

The majority of publications in the Scopus database, which include keywords “labour market” and “sustainability transitions”, are assigned to the discipline of social sciences – Figure 3. Other most popular subject areas to which publications are assigned are environmental science, economics, econometrics and finance, business, management and accounting.

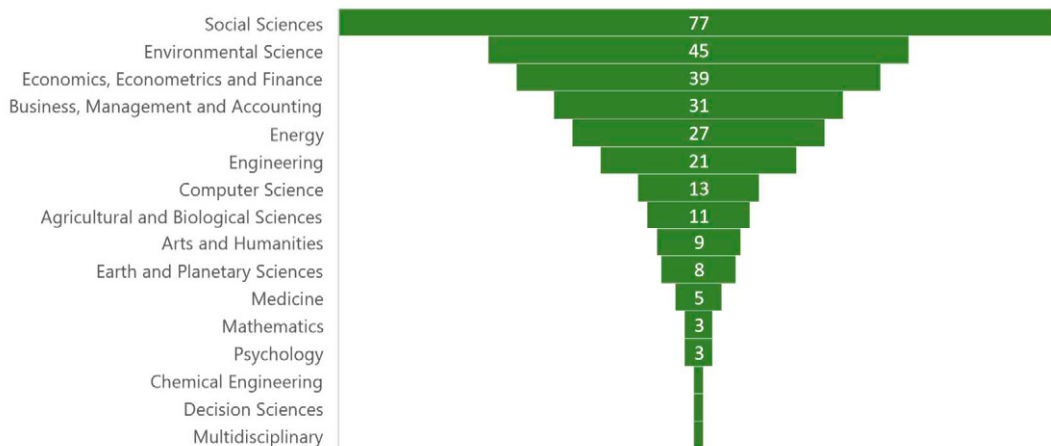


Figure 3. The number of publications, including key keywords “labour market” and “sustainability transitions” by subject area in the Scopus database in 1997-2023

Source: author’s work based on Scopus database.

Table 1 enumerates the most productive authors, countries and journals. The authors who published at least two papers on the topic of the labour market in sustainability transitions were Bohnenberger, Hechem, Natali and Reims. At the same time, Natali had the highest *h*-index in the Scopus database. The highest number of publications were from the United Kingdom (21 publications) and the United States (20). The UK also reached the highest average citation count (42.5). Sustainability (Switzerland) ranked first (14 publications) in the ranking of the most productive journals. However, the journal *Geoforum* achieved the highest average number of citations (24.2).

The most frequent keywords related to the topic of the labour market in sustainability transitions were also extracted as part of the bibliometric analysis. The final set contained 27 keywords. The most frequent terms and the links between them are presented in Figure 4. Among the most frequent keywords related to the analysed topic were the terms “sustainability”, “labour market”, “sustainable development”, and “employment”. It should be noted that these terms also show the most links to other keywords.

Table 1. Most productive authors, countries and journals

No.	Item	NP	[%]	Average citation count
Authors*				
1	Bohnenberger, K.	2	1.4	4
2	Hechem, A. D.	2	1.4	4
3	Natali, D.	2	1.4	12
4	Reims, N.	2	1.4	4
Countries				
5	United Kingdom	21	14.2	42.5
6	United States	20	13.5	17.6
7	Australia	14	9.5	13.9
8	France	13	8.8	28.5
9	Germany	13	8.8	8
10	China	11	7.4	7.8
Journals				
11	Sustainability Switzerland	14	10.6	9.8
12	Geoforum	4	2.7	24.2
13	Environmental Innovation And Societal Transitions	3	2	20.7
14	International Labour Review	3	2	22.3

Note: NP – number of publications, [%] – percentage of the total number of publications (148), * – For authors the average citation count was calculated as an *h*-index.

Source: author's work based on Scopus database.

An in-depth analysis of the most frequently occurring keywords made it possible to identify four thematic clusters and link them to four research areas on the subject of the labour market in sustainability transitions (Table 2). The first cluster mainly concerns issues related to green growth. The research areas which can be implemented within this cluster concern determinants of green growth, environmental, economic and social pillars of sustainability, the influence of green growth on the labour market and a case study analysis of countries as good practices of sustainable development. The second cluster covers issues connected with twin transition. The proposed research areas relate to foresight studies implementation for anticipation of the future of the labour market in twin transition or sustainable-oriented innovation on the labour market. The third cluster of keywords is associated with green employment. The research areas for that cluster are connected to just transition in employment organisa-

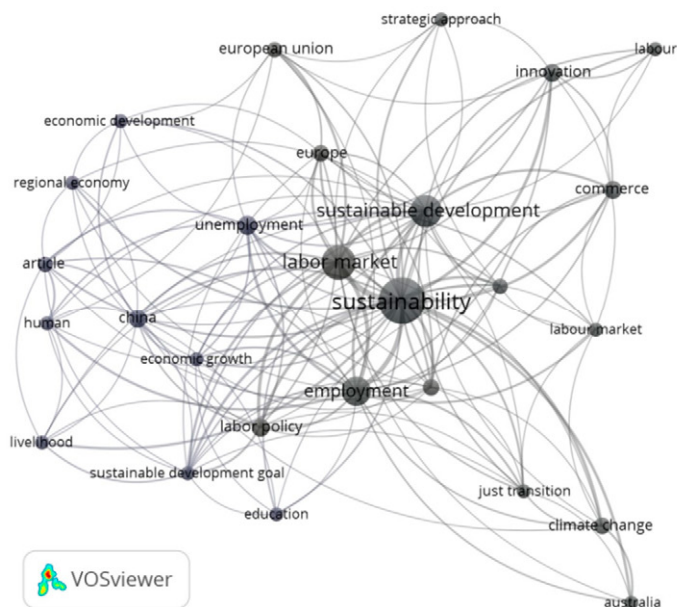


Figure 4. The number of publications, including key keywords “labour market” and “sustainability transitions” in the Scopus database in 1997-2023

Source: author’s work based on Scopus database.

tion and the case studies of countries implementing good practices in green employment. The fourth cluster includes sustainable European labour market policy issues. The research areas which are worth exploring are relevant to EU labor market policies assuring green growth; economic transition on EU labor markets and diversification of EU labor markets in terms of core competences enabling sustainability transitions.

At the next stage, the analysed publications were limited to those representing social sciences, economics, econometrics and finance, business, management and accounting. As a result, 113 publications in the Scopus database were selected for in-depth analysis.

In Table 3, the top ten publications out of 113 are presented in terms of citation frequency. The most cited publication (404) was an article by Watermeyer et al. (2021), “COVID-19 and digital disruption in UK universities: afflictions and affordances of emergency online migration”. The research objective of that paper was to identify UK academics’ perspectives as individuals in the very mix of online transitioning in the wake of COVID-19 and what they identify and forecast as its immediate and prospective impacts. To obtain that objective, 1,148 academics were surveyed.

Table 2. Subareas of the labour market in sustainability transitions research

Cluster number	Cluster name	Key words	Research areas
1	Green growth	article, China, economic development, economic growth, education, human, livelihood, regional economy, sustainable development goal, unemployment	Determinants of green growth Three pillars of sustainability The influence of green growth on the labor market Case studies of countries implementing sustainable development
2	Twin transition	commerce, decision making, innovation, labor, strategic approach, sustainability, sustainable development	Foresight studies for anticipation of the future of labor market in twin transition Sustainable oriented innovation on the labor market
3	Green employment	Australia, climate change, employment, just transition, labor market	Just transition in employment organization Case studies of countries of green employment good practices
4	Sustainable European labor market policy	environmental economics, Europe, European Union, labor market, labor policy	EU labor market policies assuring green growth Economic transition on EU labor markets Diversification of EU labor markets in terms of core competences enabling sustainability transitions

Source: author's work based on Scopus database.

Ayres (1997), in the paper “Metals recycling: economic and environmental implications”, was quoted 169 times. The publication objective of identifying the economic and environmental implications of metal recycling was obtained by data analysis and literature review.

Consoli et al. (2016) hold another position in the ranking of the ten most cited publications (127 citations). Their paper “Do green jobs differ from non-green jobs in terms of skills and human capital?” aimed at profiling the key occupational characteristics of green jobs in the United States. They used cross-sectional data on 905 occupations based on the O*NET (Occupational Information Network) repository of occupation-specific information.

Other most cited publications concerned students' career sustainability within a career ecosystem; immigration, ethnic minorities and social exclusion; the rural gap; forms of farm worker precariousness; a case study of transition society; a pattern for sustainable agricultural production; and a macroeconomic approach to sustainable economy. The authors of those publications mainly used literature reviews and qualitative studies as research methods.

At the last stage, the selected 113 publications were analysed in terms of research topics undertaken and research methods used. Figure 5 constitutes a word cloud of research topics represented in 113 publications in the Scopus database in the selected subject areas, and Table 4 presents the most popular research topics with reference to sources (repeated in at least 3 publications). In the publications under study, the most frequent areas of research were connected with green employment, green jobs, and sustainable employment. Other issues

that have aroused scientific interest are sustainable production, sustainable economy, sustainable transport, social sustainability, and local sustainability. Scientists also researched certain labour supply groups, such as migrant workers and refugees, which could have been formed by the outbreak of the conflict in Ukraine. Another event which affected transitions in the labour market was COVID-19, which has been reflected in scientific publications. Labour market reforms, including pension system policy directed at sustainability transitions, were another popular research area.



Figure 5. Word Cloud of research topics on the labour market in sustainability transitions represented in 113 publications in the Scopus database

Source: author's work using WordArt.

The analysis of research methods in the selected 113 publications indicated that the most popular was a critical analysis of the literature (Figure 6, Table 5). It was followed by a case study analysis as situation indifferent countries/regions was investigated in terms of sustainability transitions with references to the labor market. The authors also used national and international databases for their studies and implemented an indicator analysis. It is worth noting that qualitative studies (such as semi-structured interviews, in-depth interviews) were more often used than quantitative ones (such as surveys).

Table 3. Ten most cited publications on the labour market in sustainability transitions in the selected subject areas

No.	Authors	Publication title	Journal	Number of citations in Scopus	The research objective/research method
1	Watermeyer et al. (2021)	COVID-19 and digital disruption in UK universities: affictions and affordances of emergency online migration	Higher Education	404	<ul style="list-style-type: none"> RO: consultation of UK academics and their perspectives as individuals in the very mix of online transitioning in the wake of COVID-19, and what they identify and forecast respectively as its immediate and prospective impacts RM: quantitative, a survey of n = 1,148 academics
2	Ayres (1997)	Metals recycling: economic and environmental implications	Resources, Conservation and Recycling	169	<ul style="list-style-type: none"> RO: identifying economic and environmental implications of metals recycling RM: data analysis and literature review
3	Consoli et al. (2016)	Do green jobs differ from non-green jobs in terms of skills and human capital?	Research Policy	127	<ul style="list-style-type: none"> RO: empirical analysis of green employment, and focus on the salient labor force characteristics that emerge, or change, as a result of commitment towards environmental sustainability. The main goal of the paper is to profile the key occupational characteristics of green jobs in the United States (US) RM: analysis of cross-sectional data on 905 occupations based on the O*NET (Occupational Information Network) repository of occupation-specific information
4	Donald et al. (2018)	Students' perceptions of education and employability: Facilitating career transition from higher education into the labor market	Career Development International	92	<ul style="list-style-type: none"> RO: understanding how students perceive their future careers and how university has prepared them to enter the global labor market; student perceptions regarding benefits vs. associated costs of pursuing higher education (HE) on employability and earnings; and the anticipated barriers and how to overcome these in pursuit of career sustainability within a career ecosystem RM: qualitative method using semi-structured interviews on a small sample of 38 final year students from a UK university
5	Samers (1998)	Immigration, "ethnic minorities", and "social exclusion" in the European Union: a critical perspective	Geoforum	69	<ul style="list-style-type: none"> RO: exploring the relationship between immigration, "ethnic minorities", and so-called "social exclusion" by questioning the concept of "social exclusion" itself, and the stance of Brussels and individual European states on policies of "integration" RM: critical analysis of literature

No.	Authors	Publication title	Journal	Number of citations in Scopus	The research objective/research method
6	Camarero and Oliva (2019)	Thinking in rural gap: Mobility and social inequalities	Palgrave Communications	61	<ul style="list-style-type: none"> • RO: exploring the rural gap as a source of citizen inequality by focusing on four concatenated issues: habitat structure, demographic imbalances, accessibility, and mobility transition • RM: critical analysis of literature and data analysis
7	Weiler et al. (2016)	Rock Stars and Bad Apples: Moral Economies of Alternative Food Networks and Precarious Farm Work Regimes	Antipode	56	<ul style="list-style-type: none"> • RO: assessment of forms of farm worker precariousness that persists in both dominant agriculture and human-intensive AFNs • RM: in-depth interviews, participant observation and document analysis
8	Singh et al. (2001)	Social metabolism and labor in a local context: Changing environmental relations on Trinket Island	Population and Environment	53	<ul style="list-style-type: none"> • RO: describing patterns of environmental relations, • from a material and energetic perspective, of a local horticultural and hunter-gatherer society in transition • RM: indicator analysis
9	Stür et al. (2013)	Transformation of smallholder beef cattle production in Vietnam	International Journal of Agricultural Sustainability	50	<ul style="list-style-type: none"> • RO: analysis of adapting of smallholder crop livestock farmers in rural Ea Kar, Vietnam, to the rising demand for meat in urban centers • RM: case study analysis, surveys, group discussions, Rapid Market Appraisal (RMA) method
10	Anfal and van Den Bergh (2013)	Macroeconomics, financial crisis and the environment: strategies for a sustainability transition	Environmental Innovation and Societal Transitions	49	<ul style="list-style-type: none"> • RO: analyzing several fundamental macroeconomic issues that are relevant to the aims of escaping from the financial crisis and making a transition to a sustainable economy • RM: literature review

Source: author's work based on Scopus database.

Table 4. The most popular research topics on the labour market in sustainability transitions are represented in 113 publications in the Scopus database

The main research topic	Source
green employment, green jobs, sustainable employment	Consoli et al. (2016), Bohnenberger (2022a), Bohnenberger (2022b), Pearse and Bryant (2022), Renner (2000), Moilanen and Alasoini (2023), Sankaran (2022), Tošovská (2011), Montmasson-Clair (2018)
sustainable production	Stür et al. (2013), Bisht et al. (2020), Navarrete et al. (2015), Heinze (2020), Ferguson (2016), Härrri et al. (2020), Lynch (2006), Kumar et al. (2023)
sustainable energy	Keyzer et al. (2008), Angouria-Tsorochidou et al. (2022), Evans (2007), Pearse and Bryant (2022), Pelletier et al. (2021), Haldar and Tripathi (2023), Berthaud and Fontana (2020)
migrant workers, refugees	Samers (1998), Weiler et al. (2016), Wang (2011), Barrett and McEvoy (2013), Seidelsohn et al. (2020), Turnock (2000), Ferrara and Villani (2017)
sustainable economy	Antal and van Den Bergh (2013), Angouria-Tsorochidou et al. (2022), Eppel (1999), Menon (2013), Wallimann (2014), Shutters et al. (2016)
pension system, pension policy	Maier et al. (2007), Kuné (2009), Rosado-Cebrián and Domínguez-Fabián (2017), Marè and Pennisi (2004), Natali et al. (2023), Marin and Zaidi (2017)
sustainable transport	Oviedo and Guzman (2020), Meelen et al. (2021), Eppel (1999), Björner Brauer and Khan (2021), Sauer (2016)
local sustainability	Singh et al. (2001), Gullette et al. (2017), Hechem (2016), Abellán et al. (2022), Hechem (2016)
social sustainability	Matthies et al. (2019), Novitz (2020), Minzenberg and Wallace (2011), Turnock (2000), Tošovská (2011)
social inequalities	Samers (1998), Klasen et al. (2018), Liu et al. (2020), Barrett et al. (2015), Natali et al. (2023)
labor market reforms	Sommers and Woolfson (2014), Lu and Gao (2011), Maier et al. (2007), Agostini and Natali (2016), Charni (2020)
effectiveness and efficiency	Pillay et al. (2014), Angouria-Tsorochidou (2022), Mursa et al. (2018), Agostini and Natali (2016), Azizan et al. (2021)
public–private partnerships, multi-stakeholder initiatives	Obirih-Opareh and Post (2002), Eppel (1999), Sauer et al. (2016), Amuzu et al. (2022), Wickramasingha (2022)
rural gap	Camarero and Oliva (2019), Wang (2011), Jansen et al. (2006), Brown et al. (2019), Lewis (2014)
COVID-19	Watermeyer et al. (2021), Bansal et al. (2023), Govorova (2021)
sustainable oriented innovation	Pasqualino et al. (2021), Reese-Taylor et al. (2022), Christensen et al. (2021)
school-to-work transition programs	Pillay et al. (2014), Pattanayak and Peri (2018), Irwin (2018)
Sustainable Development Goals	Novitz (2020), Silva-da-Nóbrega et al. (2022), Christensen et al. (2021)
youth unemployment and employment	Mursa et al. (2018), Istrate et al. (2019), Hosgelen and Saikia (2016)

Source: author's work based on Scopus database.



Figure 6. Word Cloud of research methods on the labour market in sustainability transitions represented in 113 publications in Scopus database

Source: author’s work using WordArt.

Table 5. The most popular research topics on the labour market in sustainability transitions represented in 113 publications in Scopus database

The main research method	Source
critical analysis of literature	Ayres (1997), Samers (1998), Camarero and Oliva (2019), Antal and Van Den Bergh (2013), Oldekop et al. (2018), Sommers and Woolfson (2014), Keyzer et al. (2008), Novitz (2020), Phillips (1999), Fauchald et al. (2017), Maier et al. (2007), Meelen et al. (2021), Evans (2007), Eppel (1999), Hārri et al. (2020), Mamedov (2018), Bohnenberger (2022a), Bohnenberger (2022b), Pearse and Bryant (2022), Agostini and Natali (2016), Casano (2019), Klasen et al. (2019), Hosgelen and Saikia (2016), Turnock (2000), Charni (2020), Bansal et al. (2023), Jakovljevic et al. (2021), Kuné (2009), Renner (2000), Sankaran (2022), Reese-Taylor et al. (2022), Lee et al. (2020), Pattanayak and Peri (2018), Lewis (2014), Tošovská (2011), Suciú et al. (2023), Natali et al. (2023), Chidzungu and Wafer (2023), Cotsomitis (2022), Abellán et al. (2022), Christensen et al. (2021), Govorova (2021), Eichhorst et al. (2018), Montmasson-Clair (2018), Marin and Zaidi (2017), Ferrara and Villani (2017)
case study analysis	Stür et al. (2013), Oviedo and Guzman (2020), Matthies et al. (2019), Pillay et al. (2014), Novitz (2020), Evans (2007), Ferguson (2016), Minzenberg and Wallace (2011), Jansen et al. (2006), Björner Brauer and Khan (2021), Wallimann (2014), Pelletier et al. (2021), Brown et al. (2019), Hosgelen and Saikia (2016), Gullette et al. (2017), Liu et al. (2020), Hechem (2016), Lynch (2006), Azizan et al. (2021), Hua (2014), Wickramasingha (2022), Christensen et al. (2021)
database analysis	Ayres (1997), Camarero and Oliva (2019), Oldekop et al. (2018), Sommers and Woolfson (2014), Wang (2011), Oviedo and Guzman (2020), Keyzer et al. (2008), Fauchald et al. (2017), Lu and Gao (2011), Maier et al. (2007), Evans (2007), Menon (2013), Mursa et al. (2018), Agostini and Natali (2016), Otoiú et al. (2017), Hosgelen and Saikia (2016), Cunfer (2021), Tošovská (2011), Paul et al. (2023), Askarkyzy et al. (2016)

The main research method	Source
indicator analysis	Singh et al. (2001), Mursa et al. (2018), Istrate et al. (2019), Charni (2020), Startiene and Remeikiene (2013), Nicolae and Amalia (2020), Kuné (2009), Popa et al. (2021), Rosado-Cebrián and Domínguez-Fabián (2017), Dovlatyan et al. (2015), Bakanova and Freinkman (2006), Maré and Pennisi (2004), Paul et al. (2023), Budzinskaya and Teregulova (2021), Berthaud and Fontana (2020)
qualitative method	Donald et al. (2018), Weiler et al. (2016), Stür et al. (2013), Matthies et al. (2019), Heinze (2020), Meelen et al. (2021), Björner Brauer and Khan (2021), Seidelsohn et al. (2020), Startiene and Remeikiene (2013), Liu et al. (2020)
semi-structured interviews, in-depth interviews	Donald et al. (2018), Weiler et al. (2016), Heinze (2020), Meelen et al. (2021), Björner Brauer and Khan (2021), Sauer (2016), Barrett and McEvoy (2013), Liu et al. (2020), Chidzungu and Wafer (2023), Amuzu et al. (2022), Pham (2021)
survey	Watermeyer et al. (2021), Stür et al. (2013), Stanes et al. (2015), Navarrete et al. (2015), Jansen et al. (2006), Haldar and Tripathi (2023), Chidzungu and Wafer (2023), Pham (2021)

Source: author's work based on Scopus database.

The analysis of the selected publications also allows for the identification of so far rarely discussed research topics of the labour market in sustainability transitions. They include, among others, career ecosystem, precarious employment, digital transformation, just transition, artificial intelligence or the future of work.

Discussion/Limitation and Future Research

The bibliometric analysis enabled the identification of research areas on the labour market in sustainability transitions that have been explored in the literature so far. They relate to green growth, green employment, sustainable labour market policies and twin transition.

The topic of green growth in relation to the labour market in the literature concerns mainly new job creation and the impact of environmental standards on employment (Tazhbayeva et al., 2023).

The authors analyzing sustainable employment aim at profiling the key occupational characteristics of green jobs (Consoli et al., 2016). The AI impact on employment and the workplace is also of great importance (Bednorz et al., 2022).

Sustainable European labour market policy is diversified as European countries represent a different extent of implementation of sustainability transitions in the labour market. There is, therefore, a strong emphasis in publications on government policies and regulations, which play a significant role in shaping the labour market in sustainability transformation. Tax incentives, emissions standards, and environmental regulations can drive demand for certain skills and industries. At the same time, there is a growing need for education and training programs that help individuals acquire skills required for sustainability-related

careers. Universities and vocational institutions are crucial in offering programs in sustainability studies and green technologies (Askarkyzy et al., 2016; Watermeyer et al., 2021; Silva-da-Nóbrega et al., 2022).

Twin transition is a wider concept than sustainability transitions, and it allows for a multidimensional strategic approach toward the future of the labour market. In the study prepared by the European Parliament, the authors over-viewed the impacts of the twin transition on the labour market and the workplace (Bednorz et al., 2022). The authors underline that the influence of the twin transition on the labour market is twofold. While highly skilled and mobile workers can benefit from digitalisation, workers with insufficient skills and/or who are situated in collapsing industries increasingly face risks of precarious working conditions, dismissals, or labour market exclusion. Therefore, the situation of the most vulnerable (especially low-skilled and elderly) workers must be highlighted on the policy agenda.

So far, the only study that has used a systematic literature analysis for the concept of sustainability transitions in the labour market perspective is Moilanen and Alasoini (2023). They identified the role of workers in sustainability transformation and created five categories of how STs are connected to workers at micro levels of industries. They claim that workers can be affected by indirect effects arising from changes in environmental policies or markets, which may weaken working conditions. On the other hand, workers can become employed in new jobs that result from a transition, and in this way, STs may create jobs. In addition, workers can contribute to more sustainable production modes in industries in their daily work practices; some may even be able to influence other actors, such as collaborators or citizens, to engage in more sustainable conduct. However, the results of the review also show how workers can be constrained by their collaborators or work organisations, whose actions externally shape their work practices, and this external influence can hinder the shift toward sustainable work practices.

The limitation of the presented research is the small number of publications which concern the topic of the labour market in sustainability transitions. In addition, despite the reduction of disciplines to those relevant from the point of view of labour market research, selected publications often refer to a wide range of issues going beyond the scope of social sciences.

The systematic review of the literature also allowed for the identification of gaps in the research activity conducted in the labour market in sustainability transitions in both topics and research methods. So far, no attempt has been made to develop a comprehensive model of the labour market in sustainability transformation, covering both supply and demand perspectives. Such a prospective model could incorporate, among others, demanded skills, forms of employment and work organisation, and social and economic policy, including reskilling and training programs. The prospective model should be dynamic and adaptable to changes in the economic, technological, and social landscape. Moreover, while

qualitative research is popular among researchers, the foresight methodology, which deals with anticipating the future and is suitable for the subject of the future of the labour market (Kononiuk et al., 2021; Kononiuk et al., 2020), has not been used yet. Implementation of foresight methods would allow identifying of the potential changes, challenges, opportunities and threats in the process of developing a prospective labour market model.

Conclusions

The study mostly focused on the identification of current and future directions for research relating to the labour market in sustainability transitions. The labour market in sustainability transformation refers to the evolving job landscape and employment opportunities that arise as societies and industries move towards more sustainable and environmentally responsible practices. Sustainability transitions encompass a wide range of efforts aimed at addressing environmental, social, and economic challenges such as climate change, resource depletion, inequality, and more. These transitions require changes in how we produce and consume goods and services, which, in turn, impact the types of jobs and skills in demand. Sustainability transitions in the labour market perspective are based on coevolution and multi-actor interactions between social groups.

In the literature, it is recognised that there is a scarcity of research linking the labour market and sustainability. Only 148 papers were identified in the Scopus database from 1997 (when the first paper on that topic was published) up to August 2023. However, in the analysed period, there was a gradual growth in the number of publications.

The majority of publications in Scopus databases, which include keywords “labour market” and “sustainability transitions”, are assigned to the discipline of social sciences. An in-depth analysis of the most frequently occurring keywords made it possible to identify four thematic clusters and link them to four research areas on the subject of the labour market in sustainability transitions. The first cluster mainly concerns issues related to green growth. The second cluster covers topics connected with twin transition. The third-cluster keywords are associated with green employment. The fourth cluster includes sustainable European labour market policy issues.

The most frequent areas of research were connected with green employment, green jobs, and sustainable employment. Other issues that have aroused scientific interest are sustainable production, sustainable economy, sustainable transport, social sustainability, and local sustainability. Scientists also researched certain labour supply groups, such as migrant workers and refugees. Labour market reforms, including pension system policy directed at sustainability transformation, are another popular research area.

The study also identifies the most popular research methods that are used to explore the topic of the labour market in sustainability transitions. The majority of authors based their study results on a critical analysis of the literature. It was followed by a case study analysis as the situation in different countries/regions was investigated in terms of sustainability transformation with references to the labour market. The authors also used national and international databases for their studies and implemented an indicator analysis. It is worth noting that qualitative studies (such as semi-structured interviews and in-depth interviews) were more often used rather than quantitative ones (such as surveys).

The analysis of selected publications also allows for the identification of research topics of the labour market in sustainability transitions that have so far rarely been discussed. They include, among others, career ecosystem, precarious employment, digital transformation, just transition, artificial intelligence or the future of work. Moreover, even though qualitative research is popular among researchers, the foresight methodology has not been used so far.

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References

- Abellán, F. C., Sposito, M. E. B., & Dammert-Guardia, M. (2022). Urban Growth, Metropolization, and Growth Management in Latin America and the Caribbean. In J.M. González-Pérez, C. Irazábal & R.C. Lois-González (Eds.), *Routledge Handbook of Urban Studies in Latin America and the Caribbean: Cities, Urban Processes, and Policies* (pp. 35-53). New York: Routledge.
- Agostini, C., & Natali, D. (2016). Italian welfare reforms: Missed opportunities for a paradigmatic change? In K. Schubert, P. de Villota & J. Kuhlmann (Eds.), *Challenges to European Welfare Systems* (pp. 395-418). New York: Springer.
- Álvarez-Melgarejo, M., & Torres-Barreto, M. (2018). Can resources act as capabilities foundations? A bibliometric analysis. *Revista UIS Ingenierías*, 17(2), 185-200. <https://doi.org/10.18273/revuin.v17n2-2018017>
- Amuzu, D., Neimark, B., & Kull, C. (2022). Bittersweet cocoa: Certification programmes in Ghana as battlegrounds for power, authority and legitimacy. *Geoforum*, 136, 54-67. <https://doi.org/10.1016/j.geoforum.2022.08.002>
- Angouria-Tsorochidou, E., Teigiserova, D. A., & Thomsen, M. (2022). Environmental and economic assessment of decentralized bioenergy and biorefinery networks treating urban biowaste. *Resources, Conservation and Recycling*, 176, 105898. <https://doi.org/10.1016/j.resconrec.2021.105898>
- Antal, M., & van den Bergh, J. C. J. M. (2013). Macroeconomics, financial crisis and the environment: Strategies for a sustainability transition. *Environmental Innovation and Societal Transitions*, 6, 47-66. <https://doi.org/10.1016/j.eist.2013.01.002>

- Askarkyzy, S., Toibayev, A., Algozhaeva, N., Iskakova, G., & Arynova, A. (2016). Result-oriented management: The experience of Kazakhstani universities. *International Journal of Environmental and Science Education*, 11(18), 11699-11708.
- Ayres, R. U. (1997). Metals recycling: Economic and environmental implications. *Resources, Conservation and Recycling*, 21(3), 145-173.
- Azizan, N., Pangil, F., & Zin, M. L. M. (2021). Human Capital Development in Malaysia: Issues and Challenges. In B.S. Sergi & A.R. Jaaffar (Eds.), *Modelling Economic Growth in Contemporary Malaysia* (pp. 151-175). Leeds: Emerald Publishing Limited. <https://doi.org/10.1108/978-1-80043-806-420211013>
- Bakanova, M., & Freinkman, L. (2006). Economic Growth in Belarus (1996–2004): Main Drivers and Risks of the Current Strategy. In L. Vinhas de Souza & O. Havrylyshyn (Eds.), *Return to Growth in CIS Countries* (pp. 213-266). Berlin, Heidelberg: Springer. https://doi.org/10.1007/3-540-34264-8_9
- Bansal, S., Garg, I., & Singh, S. (2023). Corporate social responsibility: Insights from COVID-19 and stakeholder theory. *Global Business and Organizational Excellence*, 42(6), 154-169. <https://doi.org/10.1002/joe.22222>
- Barkun, Y., Rollnik-Sadowska, E., & Glińska, E. (2020). The concept of 'talent' in the labor management perspective-the bibliometric analysis of literature. *International Journal of Industrial Engineering and Management*, 12(2), 104-115. <http://doi.org/10.24867/IJIEM-2020-2-25>
- Barrett, G. A., & McEvoy, D. (2013). An emerging African business quarter amid urban decline. *Journal of Enterprising Communities*, 7(3), 274-292. <https://doi.org/10.1108/JEC-12-2011-0041>
- Barrett, G., Cigdem, M., Whelan, S., & Wood, G. (2015). The relationship between intergenerational transfers, housing and economic outcomes. AHURI Positioning Paper, (163), 1-64.
- Bednorz, J., Sadauskaite, A., Czarzasty, J., & Surdykowska, B. (2022). *Unionisation and the twin transition*. [https://www.europarl.europa.eu/RegData/etudes/STUD/2022/733972/IPOL_STU\(2022\)733972_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2022/733972/IPOL_STU(2022)733972_EN.pdf)
- Berthaud, P., & Fontana, Y. (2020). Is China's energy transition sustainable? A labor surplus absorption analysis. *Mondes en Développement*, 191(3), 31-48. <http://doi.org/10.3917/med.191.0031>
- Bisht, I. S., Rana, J. C., & Ahlawat, S. P. (2020). The future of smallholder farming in India: Some sustainability considerations. *Sustainability*, 12(9), 3751. <https://doi.org/10.3390/su12093751>
- Björner Brauer, H., & Khan, J. (2021). Diffusion of biogas for freight transport in Sweden: A user perspective. *Journal of Cleaner Production*, 312, 127738. <https://doi.org/10.1016/j.jclepro.2021.127738>
- Bohnenberger, K. (2022a). Greening work: labor market policies for the environment. *Empirica*, 49(2), 347-368. <https://doi.org/10.1007/s10663-021-09530-9>
- Bohnenberger, K. (2022b). Is it a green or brown job? A Taxonomy of Sustainable Employment. *Ecological Economics*, 200, 107469. <https://doi.org/10.1016/j.ecolecon.2022.107469>
- Boström, M. (2012). A missing pillar? Challenges in theorizing and practicing social sustainability: Introduction to the special issue. *Sustainability: Science, Practice and Policy*, 8, 3-14. <https://doi.org/10.1080/15487733.2012.11908080>
- Boyer, R. H., Peterson, N. D., Arora, P., & Caldwell, K. (2016). Five approaches to social sustainability and an integrated way forward. *Sustainability*, 8, 878. <https://doi.org/10.3390/su8090878>

- Brown, C., Yadav, L. P., Zhang, J., & Zhouma, D. (2019). Sustainability of agricultural diversity in the farm households of southern Tibet. *Sustainability*, 11(20), 5756. <https://doi.org/10.3390/su11205756>
- Budzinskaya, O. V., & Teregulova, N. F. (2021). Labour Market Trends in the Transition to the Digital Economy. In J.V. Ragulina, A.A. Khachatryan, A.S. Abdulkadyrov & Z.S. Babaeva (Eds.), *Research for Development* (pp. 253-261). Cham: Springer. https://doi.org/10.1007/978-3-030-70194-9_25
- Camarero, L., & Oliva, J. (2019). Thinking in the rural gap: mobility and social inequalities. *Palgrave Communications*, 5, 95. <https://doi.org/10.1057/s41599-019-0306-x>
- Casano, L. (2019). Skills and Professions for a Just Transition. Some Reflections for Legal Research. *E-Journal of International and Comparative Labour Studies*, 8(3), 31-46.
- Charni, K. (2020). Do the French pension reforms increase re-employment of older unemployed workers? *Applied Economics*, 52(19), 2015-2043. <https://doi.org/10.1080/0036846.2019.1682114>
- Chidzungu, T., & Wafer, A. (2023). Can Social Impact Assessments (SIAs) be a sustainable strategy to address the skills development gap and community sustainability challenges in Just Energy Transition (JET) policy decision-making? Evidence from the South African mining communities of Kriel and Carolina in Mpumalanga. *South African Geographical Journal*. <https://doi.org/10.1080/03736245.2023.2214537>
- Christensen, J. L., Gregersen, B., Holm, J. R., & Lorenz, E. (2021). *Globalisation, new and emerging technologies, and sustainable development: The Danish innovation System in Transition*. London: Routledge. <https://doi.org/10.4324/9781003037750>
- Cichowicz, E., & Rollnik-Sadowska, E. (2018). Inclusive Growth in CEE Countries as a Determinant of Sustainable Development. *Sustainability*, 10(11), 3973. <https://doi.org/10.3390/su10113973>
- Colantonio, A. (2009). Social sustainability: A review and critique of traditional versus emerging themes and assessment methods. *Proceedings of the Sue-Mot Conference 2009: Second International Conference on Whole Life Urban Sustainability and Its Assessment*, UK, 865-885. <https://eprints.lse.ac.uk/35867/>
- Consoli, D., Marin, G., Marzucchi, A., & Vona, F. (2016). Do green jobs differ from non-green jobs in terms of skills and human capital? *Research Policy*, 45(5), 1046-1060. <https://doi.org/10.1016/j.respol.2016.02.007>
- Cotsomitis, J. A. (2022). The Learning Economy Regime. *Journal of the Knowledge Economy*, 13(1), 687-722. <https://doi.org/10.1007/s13132-021-00756-3>
- Cunfer, G. (2021). Soil fertility on an Agricultural Frontier: The US Great Plains, 1880-2000. *Social Science History*, 45(4), 733-762. <https://doi.org/10.1017/ssh.2021.25>
- David, H. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of Economic Perspectives*, 29(3), 3-30. <https://doi.org/10.1257/jep.29.3.3>
- Deslatte, A., Feiock, R. C., & Wassel, K. (2017). Urban pressures and innovations: Sustainability commitment in the face of fragmentation and inequality. *Review of Policy Research*, 34(5), 700-724. <https://doi.org/10.1111/ropr.12242>
- Dierdorff, E. C., Norton, J. J., Drewes, D. W., & Kroustalis, Ch. M. (2009). *Greening of the World of Work: Implications for O*NET-SOC and New and Emerging Occupations*. https://www.onetcenter.org/dl_files/Green.pdf
- Donald, W. E., Ashleigh, M. J., & Baruch, Y. (2018). Students' perceptions of education and employability: Facilitating career transition from higher education into the labor market. *Career Development International*, 23(5), 513-540. <https://doi.org/10.1108/CDI-09-2017-0171>

- Dovlatyan, G. P., Makeeva, E. I., Oboymova, N. T., & Cherkesova, E. Y. (2015). Potential for use of foreign experience in evaluation of strategic sustainability of enterprises relating to transition of Russia's economy to strategic path of development. *Asian Social Science*, 11(20), 56-65. <https://doi.org/10.5539/ass.v11n20p56>
- Eichhorst, W., Souza, A. P., Cahuc, P., Valfort, M.-A., & Visser, J. (2018). The Future of Work – Good Jobs for All*. In W. Eichhorst, A.P. Souza, P. Cahuc, D. Demazière, C. Fagan, N.A. Guimarães, H. Fu, A. Kalleberg, A. Manning, F. McGinnity, H. Rapoport, P. Scranton, J. Siegrist, K. Thelen, M.-A. Valfort & J. Visser (Eds.), *Rethinking Society for the 21st Century: Report of the International Panel on Social Progress* (pp. 255-312). Cambridge: Cambridge University Press. <https://doi.org/10.1017/9781108399623.008>
- Ejdys, J., & Szpilko, D. (2022). European Green Deal – research directions. a systematic literature review. *Economics and Environment*, 81(2), 8-38. <https://doi.org/10.34659/eis.2022.81.2.455>
- Eppel, J. (1999). Sustainable development and environment: A renewed effort in the OECD. *Environment, Development and Sustainability*, 1(1), 41-53. <https://doi.org/10.1023/A:1010052116045>
- European Commission. (2021). *The future of jobs is green*. <https://doi.org/10.2760/07981>
- Evans, G. (2007). A just transition from coal to renewable energy in the Hunter Valley of New South Wales, Australia. *International Journal of Environment, Workplace and Employment*, 3(3-4), 175-194. <https://doi.org/10.1504/IJEW.2007.019278>
- Faria, J. R., & Mixon, F. G. (2022). Labor Markets and Sustainability: Short-Run Dynamics and Long-Run Equilibrium. *Sustainability*, 14(7), 4307. <https://doi.org/10.3390/su14074307>
- Fauchald, P., Hausner, V. H., Schmidt, J. I., & Clark, D. A. (2017). Transitions of social-ecological subsistence systems in the Arctic. *International Journal of the Commons*, 11(1), 275-329. <https://doi.org/10.18352/ijc.698>
- Ferguson, P. (2016). Productivity growth as a barrier to a sustainability transition. *Environmental Innovation and Societal Transitions*, 20, 86-88. <https://doi.org/10.1016/j.eist.2015.10.003>
- Ferrara, L., & Villani, S. (2017). Immigration policies, public decision-making processes, and urban regeneration: The Italian Case. In S. Sacchetti, A. Christoforou & M. Mosca (Eds.), *Social Regeneration and Local Development: Cooperation, Social Economy and Public Participation* (pp. 209-230). New York: Routledge. <https://doi.org/10.4324/9781315302478>
- Gaviria-Marin, M., Merigó, J. M., & Baier-Fuentes, H. (2019). Knowledge management: A global examination based on bibliometric analysis. *Technological Forecasting and Social Change*, 140, 194-220. <https://doi.org/10.1016/j.techfore.2018.07.006>
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24-40. <https://doi.org/10.1016/j.eist.2011.02.002>
- Glińska, E., & Siemieniako, D. (2018). Binge drinking in relation to services – bibliometric analysis of scientific research directions. *Engineering Management in Production and Services*, 10(1), 45-54. <https://doi.org/10.1515/emj-2018-0004>
- Govorova, N. (2021). The European Silver Economy. *Sovremennaya Evropa*, 106(6), 109-119. <https://doi.org/10.15211/soveurope62021109119>
- Gudanowska, A. E. (2017). Modern research trends within technology management in the light of selected publications. *Procedia Engineering*, 182, 250. <https://doi.org/10.1016/j.proeng.2017.03.185>

- Gullette, G., Thebpanya, P., & Singto, S. (2017). Assessing urban expansion and livelihoods in Thailand's transitional spaces through combined ethnography and Landsat data. *Human Organization*, 76(3), 227-239. <https://doi.org/10.17730/0018-7259.76.3.227>
- Haldar, S., & Tripathi, T. (2023). What besets entrepreneurs in renewable energy sector? – Insights from the Indian state of Gujarat. *International Journal of Energy Sector Management*, 17(2), 209-226. <https://doi.org/10.1108/IJESM-06-2021-0002>
- Härri, A., Levänen, J., & Koistinen, K. (2020). Marginalized small-scale farmers as actors in just circular-economy transitions: Exploring opportunities to circulate crop residue as raw material in India. *Sustainability*, 12(24), 10355. <https://doi.org/10.3390/su122410355>
- Hechem, A. D. (2016). Metropolization in the fastest growing region in Chile. *AUS*, (19), 45-50. <https://doi.org/10.4206/aus.2016.n19-08>
- Heinze, L. (2020). Fashion with heart: Sustainable fashion entrepreneurs, emotional labour and implications for a sustainable fashion system. *Sustainable Development*, 28(6), 1554-1563. <https://doi.org/10.1002/sd.2104>
- Hosgelen, M., & Saikia, U. (2016). Timor-Leste's demographic challenges for environment, peace and nation building. *Asia Pacific Viewpoint*, 57(2), 244-262. <https://doi.org/10.1111/apv.12117>
- Hua, S. (2014). Introduction: The East Asian development model. In S. Hua & R. Hu (Eds.), *East Asian Development Model: Twenty-first century perspectives* (pp. 19-26). London: Routledge.
- Irwin, S. (2018). How parents see their children's future education, work and social change in England. In S. Irwin (Ed.), *Transitions to Adulthood through Recession: Youth and Inequality in a European Comparative Perspective* (pp. 55-73). London: Routledge. <https://doi.org/10.4324/9781315231686>
- Istrate, M., Horea-Serban, R., & Muntele, I. (2019). Young Romanians' transition from school to work in a path dependence context. *Sustainability*, 11(5), 1254. <https://doi.org/10.3390/su11051254>
- Jakovljevic, M., Westerman, R., Sharma, T., & Lamnisos, D. (2021). Aging and Global Health. In I. Kickbusch, D. Ganten & M. Moeti (Eds.), *Handbook of Global Health* (pp. 73-102). Cham: Springer. https://doi.org/10.1007/978-3-030-45009-0_4
- Jansen, H. G. P., Pender, J., Damon, A., & Schipper, R. (2006). Rural development policies and sustainable land use in the Hillside Areas of Honduras: A quantitative livelihoods approach. Research Report of the International Food Policy Research Institute, 147. <https://doi.org/10.2499/0896291561>
- Kellogg, K. C., Valentine, M. A., & Christin, A. (2020). Algorithms at work: The new contested terrain of control. *The Academy of Management Annals*, 14(1), 366-410. <https://doi.org/10.5465/annals.2018.0174>
- Keyzer, M. A., Merbis, M. D., & Voortman, R. L. (2008). Notes and communications: The biofuel controversy. *Economist*, 156(4), 507-527. <https://doi.org/10.1007/s10645-008-9098-x>
- Klasen, S., Cornia, G. A., Grynspar, R., Sutz, J., & Thiele, R. (2018). Economic Inequality and Social Progress. In S. Klasen, G.A. Cornia, R. Grynspar, J. Sutz & R. Thiele (Eds.), *Rethinking Society for the 21st Century: Report of the International Panel on Social Progress* (pp. 83-139). Cambridge: Cambridge University Press.
- Kononiuk, A., Pająk, A., Gudanowska, A. E., Magruk, A., Rollnik-Sadowska, E., Kozłowska, J., & Sacio-Szymańska, A. (2020). Foresight for Career Development. *Journal of the National Research University Higher School of Economics*, 14(2), 88-104. <https://doi.org/10.17323/2500-2597.2020.2.88.104>

- Kononiuk, A., Siderska, J., & Gudanowska, A. E. (2021). The problem of labour resources as a development barrier to the Polish economy—the application of the Delphi method. *WSEAS Transactions on Business and Economics*, 18, 139-151. <https://doi.org/10.37394/23207.2021.18.15>
- Kumar, R., Kumar, D., Ramtiyal, B., Vijayvargy, L., & Bisht, S. (2023). Assessing feasibility of design constraints for mills in planning and scheduling of cold rolling: A case of steel industry. *International Journal of System Assurance Engineering and Management*. <https://doi.org/10.1007/s13198-023-01982-5>
- Kuné, J. B. (2009). Population ageing and the affluent society: The case of the Netherlands. *Pensions*, 14(4), 231-241. <https://doi.org/10.1057/pm.2009.24>
- Lee, S. S. Y., Lee, J. E., & Kim, K. S. (2020). Evaluating basic income, basic service, and basic voucher for social and ecological sustainability. *Sustainability*, 12(20), 8348. <https://doi.org/10.3390/su12208348>
- Lewis, Q. (2014). Manure Manufactories: Materializing the Metabolic Rift in Nineteenth-Century Deerfield, Massachusetts. *International Journal of Historical Archaeology*, 18(2), 242-258. <https://doi.org/10.1007/s10761-014-0255-4>
- Liu, Y., Daff, S., & Pearson, C. (2020). Shaping sustainable employment and social consequences of indigenous Australians in a remote region. *Sustainability*, 12(21), 9054. <https://doi.org/10.3390/su12219054>
- Lu, M., & Gao, H. (2011). Labour market transition, income inequality and economic growth in China. *International Labour Review*, 150(1-2), 101-126. <https://doi.org/10.1111/j.1564-913X.2011.00107.x>
- Lynch, B. D. (2006). Seeking agricultural sustainability: Cuban and Dominican strategies. In S.L. Baver & B. Deutsch Lynch (Eds.), *Beyond Sun and Sand: Caribbean Environmentalisms* (pp. 86-108). Rutgers University Press.
- Maier, R., de Graaf, W., & Frericks, P. (2007). Pension reforms in Europe and life-course politics. *Social Policy and Administration*, 41(5), 487-504. <https://doi.org/10.1111/j.1467-9515.2007.00569.x>
- Mamedov, O., Tumanyan, Y., Ishchenko-Padukova, O., & Movchan, I. (2018). Sustainable economic development and post-economy of artificial intelligence. *Entrepreneurship and Sustainability*, 6(2), 1028-1040. [https://doi.org/10.9770/jesi.2018.6.2\(37\)](https://doi.org/10.9770/jesi.2018.6.2(37))
- Marè, M., & Pennisi, G. (2004). Financial Constraints and Policy Options: The pension reform process in Italy and its relevance to transition European economies. In *Reforming Public Pensions: Sharing the Experiences of Transition and OECD Countries* (pp. 177-198). France: OECD Publishing.
- Marin, B., & Zaidi, A. (2017). Introduction. In B. Marin & A. Zaidi (Eds.), *Mainstreaming Ageing: Indicators to Monitor Sustainable Policies* (pp. 27-58). London: Routledge.
- Matthies, A. L., Stamm, I., Hirvilammi, T., & Närhi, K. (2019). Ecosocial innovations and their capacity to integrate ecological, economic and social sustainability transition. *Sustainability*, 11(7), 2107. <https://doi.org/10.3390/su11072107>
- Meelen, T., Doody, B., & Schwanen, T. (2021). Vehicle-to-Grid in the UK fleet market: An analysis of upscaling potential in a changing environment. *Journal of Cleaner Production*, 290, 125203. <https://doi.org/10.1016/j.jclepro.2020.125203>
- Menon, J. (2013). Narrowing the development divide in ASEAN: The role of policy. *Asian-Pacific Economic Literature*, 27(2), 25-51. <https://doi.org/10.1111/apel.12025>
- Minzenberg, E., & Wallace, R. (2011). Amazonian agriculturalists bound by subsistence hunting. *Journal of Cultural Geography*, 28(1), 99-121. <https://doi.org/10.1080/08873631.2011.548482>

- Moilanen, F., & Alasoini, T. (2023). Workers as actors at the micro-level of sustainability transitions: A systematic literature review. *Environmental Innovation and Societal Transitions*, 46, 100685. <https://doi.org/10.1016/j.eist.2022.100685>
- Moilanen, F., & Alasoini, T. (2023). Workers as actors at the micro-level of sustainability transitions: A systematic literature review. *Environmental Innovation and Societal Transitions*, 46, 100685. <https://doi.org/10.1016/j.eist.2022.100685>
- Montmasson-Clair, G. (2018). Sustainability transitions and employment in South Africa: A multi-dimensional approach. In N. Mohamed (Ed.), *Sustainability Transitions in South Africa* (pp. 58-79). London: Routledge. <https://doi.org/10.4324/9781315190617>
- Mursa, G. C., Iacobuta, A. O., Socoliuc, O. R., Clipa, R. I., & Butiseaca, A. (2018). Youth unemployment among eu countries – A challenge for sustainable growth and social cohesion. *Transformations in Business and Economics*, 17(2B), 701-720.
- Natali, D., Raitano, M., & Valenti, G. (2023). Pensions and green transition: new inequalities and further challenges for pension systems' adequacy and sustainability. *Politiche Sociali*, (1), 99-122.
- Navarrete, M., Dupré, L., & Lamine, C. (2015). Crop management, labour organization, and marketing: three key issues for improving sustainability in organic vegetable farming. *International Journal of Agricultural Sustainability*, 13(3), 257-274. <https://doi.org/10.1080/14735903.2014.959341>
- Nicolae, B., & Amalia, J. S. (2020). Study Regarding the Effects of Demographic Transition on Labor Market and Public Pension System in Central and Eastern Europe. *Studies in Business and Economics*, 15(1), 158-170. <https://doi.org/10.2478/sbe-2020-0013>
- Novitz, T. (2020). Engagement with sustainability at the International Labour Organization and wider implications for collective worker voice. *International Labour Review*, 159(4), 463-482. <https://doi.org/10.1111/ilr.12181>
- Obirih-Opareh, N., & Post, J. (2002). Quality assessment of public and private modes of solid waste collection in Accra, Ghana. *Habitat International*, 26(1), 95-112. [https://doi.org/10.1016/S0197-3975\(01\)00035-2](https://doi.org/10.1016/S0197-3975(01)00035-2)
- Oldekop, J. A., Sims, K. R. E., Whittingham, M. J., & Agrawal, A. (2018). An upside to globalization: International outmigration drives reforestation in Nepal. *Global Environmental Change*, 52, 66-74. <https://doi.org/10.1016/j.gloenvcha.2018.06.004>
- Otoi, A., Bere, R., & Silvestru, C. (2017). An assessment of the first round impact of innovation industries on Europe's regional economies. *Amfiteatru Economic*, 19(44), 289-301.
- Oviedo, D., & Guzman, L. A. (2020). Revisiting accessibility in a context of sustainable transport: Capabilities and inequalities in Bogota. *Sustainability*, 12(11), 4464. <https://doi.org/10.3390/su12114464>
- Pasqualino, R., Demartini, M., & Bagheri, F. (2021). Digital transformation and sustainable oriented innovation: A system transition model for socio-economic scenario analysis. *Sustainability*, 13(21), 11564. <https://doi.org/10.3390/su132111564>
- Pattanayak, S., & Peri, N. (2018). Informal Education and Learning Pathways: Supporting Livelihood Trajectories of Indian Women in an Urban Slum. In M. Pavlova, J. Chi-Kin Le & R. Maclean (Eds.), *Transitions to Post-School Life: Responsiveness to Individual, Social and Economic Needs* (pp. 105-125). Singapore: Springer.
- Paul, B., Datta, R. C., Patnaik, U., Thomankutty, S. C., & Soman, S. P. (2023). The Dynamics of Indian Labour: Ramifications for Future of Work and Sustainability. *Sustainability*, 15(12), 9312. <https://doi.org/10.3390/su15129312>

- Pearse, R., & Bryant, G. (2022). Labour in transition: A value-theoretical approach to renewable energy labour. *Environment and Planning E: Nature and Space*, 5(4), 1872-1894. <https://doi.org/10.1177/25148486211055542>
- Pelletier, J., Hamalambo, B., Trainor, A., & Barrett, C. B. (2021). How land tenure and labor relations mediate charcoal's environmental footprint in Zambia: Implications for sustainable energy transitions. *World Development*, 146, 105600. <https://doi.org/10.1016/j.worlddev.2021.105600>
- Pham, T. (2021). Reconceptualise graduate employability: The role of 'capitals' in navigating the teaching profession. In T. Pham & B. Soltani (Eds.), *Enhancing Student Education Transitions and Employability: From Theory to Practice* (pp. 136-152). London: Routledge.
- Phillips, A. L. (1999). Exporting democracy: German political foundations in Central-East Europe. *Democratization*, 6(2), 70-98. <https://doi.org/10.1080/13510349908403612>
- Pillay, H., Watters, J. J., Hoff, L., & Flynn, M. (2014). Dimensions of effectiveness and efficiency: a case study on industry-school partnerships. *Journal of Vocational Education and Training*, 66(4), 537-553.
- Popa, A. F., Jimon, S. A., David, D., & Sahlian, D. N. (2021). Influence of Fiscal Policies and Labor Market Characteristics on Sustainable Social Insurance Budgets—Empirical Evidence from Central and Eastern European Countries. *Sustainability*, 13(11), 6197. <https://doi.org/10.3390/su13116197>
- Porter, E. M., & van der Linde, C. (1995). Toward a New Conception of the Environment-Competitiveness Relationship. *Journal of Economic Perspectives*, 9(4), 97-118.
- Reese-Taylor, K., López, V. A. V., Dunning, N. P., Montgomery, S., Hernández, A. A., & Walker, D. S. (2022). The Development of Landesque Capital in the Maya Lowlands during the Middle Preclassic. *Ancient Mesoamerica*, 33(3), 500-516. <https://doi.org/10.1017/S0956536122000062>
- Renner, M. (2000). *Working for the Environment: A Growing Source of Jobs*. Washington: Worldwatch Institute.
- Rosado-Cebrián, B., & Domínguez-Fabián, I. (2017). Influence of Part-Time Work on the Viability of the Spanish Pension System. *CIRIEC-España Revista de Economía Pública, Social y Cooperativa*, (91), 235-266. <https://doi.org/10.7203/CIRIEC-E.91.9900>
- Samers, M. (1998). Immigration, 'ethnic minorities', and 'social exclusion' in the European Union: a critical perspective. *Geoforum*, 29(2), 123-144.
- Sankaran, K. (2022). Transition from the Informal to the Formal Economy: The Need for a Multi-faceted Approach. *Indian Journal of Labour Economics*, 65(3), 625-642. <https://doi.org/10.1007/s41027-022-00398-2>
- Sauer, T., Elsen, S., & Garzillo, C. (2016). *Cities in Transition: Social Innovation for Europe's Urban Sustainability*. London: Routledge. <https://doi.org/10.4324/9781315684765>
- Seidelsohn, K., Flick, U., & Hirseland, A. (2020). Refugees' Labor Market Integration in the Context of a Polarized Public Discourse. *Qualitative Inquiry*, 26(2), 216-226. <https://doi.org/10.1177/1077800419857097>
- Shutters, S. T., Muneeppeerakul, R., & Lobo, J. (2016). How hard is it for urban economies to become 'green'? *Environment and Planning B: Planning and Design*, 43(1), 198-209. <https://doi.org/10.1177/0265813515600108>
- Siderska, J., & Jadaan, K. S. (2018). Cloud manufacturing: a service-oriented manufacturing paradigm. *Engineering Management in Production and Services*, 10, 46-55. <https://doi.org/10.1515/emj-2018-0002>
- Silva-da-Nóbrega, P. I., Chim-Miki, A. F., & Castillo-Palacio, M. (2022). A Smart Campus Framework: Challenges and Opportunities for Education Based on the Sustainable

- Development Goals. Sustainability, 14(15), 9640. <https://doi.org/10.3390/su14159640>
- Singh, S. J., Grünbühel, C. M., Schandl, H., & Schulz, N. (2001). Social metabolism and labour in a local context: Changing environmental relations on Trinket Island. *Population and Environment*, 23(1), 71-104. <http://www.jstor.org/stable/27503774>
- Sommers, J., & Woolfson, C. (2014). *The Contradictions of Austerity: The Socio-Economic Costs of the Neoliberal Baltic Model*. London: Routledge.
- Stanes, E., Klocker, N., & Gibson, C. (2015). Young adult households and domestic sustainabilities. *Geoforum*, 65, 46-58. <https://doi.org/10.1016/j.geoforum.2015.07.007>
- Startiene, G., & Remeikiene, R. (2013). Evaluation of the impact of self-employment factors on self-employment duration in the country with transition economy: a Lithuanian case. *Technological and Economic Development of Economy*, 19(1), 125-140. <https://doi.org/10.3846/20294913.2012.763073>
- Stür, W., Khanh, T. T., & Duncan, A. (2013). Transformation of smallholder beef cattle production in Vietnam. *International Journal of Agricultural Sustainability*, 11(4), 363-381. <https://doi.org/10.1080/14735903.2013.779074>
- Suciu, M. C., Plesea, D. A., Petre, A., Moroianu, R. M., & Nasulea, D. F. (2023). Core Competence – As a Key Factor for a Sustainable, Innovative and Resilient Development Model Based on Industry 5.0. *Sustainability*, 15(9), 7472. <https://doi.org/10.3390/su15097472>
- Tazhbayeva, A., Aimagambetov, Y., Tazhbayev, N., & Grela, M. F. (2023). Impact of Environmental Standards on Employment. *Journal of Environmental Management and Tourism*, 14(3), 767-777. [https://doi.org/10.14505/jemt.14.3\(67\).16](https://doi.org/10.14505/jemt.14.3(67).16)
- Tošovská, E. (2011). Green growth strategy and the labour market. *Ekonomicky casopis*, 59(10), 987-1004.
- Turnock, D. (2000). The human resources of Eastern Europe: A preliminary discussion. *GeoJournal*, 50(2-3), 75-90. <https://doi.org/10.1023/A:1007163629691>
- Uribe-Toril, J., Ruiz-Real, J., & de Pablo Valenciano, J. (2018). Gentrification as an Emerging Source of Environmental Research. *Sustainability*, 10(12), 4847. <https://doi.org/10.3390/su10124847>
- Valente, R., Zaragozí, B., & Russo, A. P. (2023). Labour precarity in the visitor economy and decisions to move out. *Tourism Geographies*. <https://doi.org/10.1080/14616688.2023.2172603>
- Vallance, S., Perkins, H. C., & Dixon, J. E. (2011). What is social sustainability? A clarification of concepts. *Geoforum*, 42, 342-348. <https://doi.org/10.1016/j.geoforum.2011.01.002>
- van Eck, N. J., & Waltman, L. (2014). Visualizing bibliometric networks. In Y. Ding, R. Rousseau & D. Wolfram (Eds.), *Measuring scholarly impact: Methods and practice* (pp. 285-320). Cham: Springer. https://doi.org/10.1007/978-3-319-10377-8_13
- Vona, F., & Consoli, D. (2015). Innovation and skill dynamics: a life-cycle approach. *Industrial and Corporate Change*, 24(6), 1393-1415. <https://doi.org/10.1093/icc/dtu028>
- Wallimann, I. (2014). Social and solidarity economy for sustainable development: its premises – and the Social Economy Basel example of practice. *International Review of Sociology*, 24(1), 48-58. <https://doi.org/10.1080/03906701.2014.894345>
- Wang, Z. (2011). Social security for China's migrant workers. *International Labour Review*, 150(1-2), 177-187. <https://doi.org/10.1111/j.1564-913X.2011.00111.x>
- Watermeyer, R., Crick, T., Knight, C., & Goodall, J. (2021). COVID-19 and digital disruption in UK universities: afflictions and affordances of emergency online migration. *Higher Education*, 81(3), 623-641. <https://doi.org/10.1007/s10734-020-00561-y>

- Weiler, A. M., Otero, G., & Wittman, H. (2016). Rock Stars and Bad Apples: Moral Economies of Alternative Food Networks and Precarious Farm Work Regimes. *Antipode*, 48(4), 1140-1162. <https://doi.org/10.1111/anti.12221>
- Wickramasingha, S. (2022). Multi-stakeholder initiatives through the lens of labour regimes: Towards a heuristic analytical framework. *Geoforum*, 137, 1–11. <https://doi.org/10.1016/j.geoforum.2022.09.017>
- Zhai, P., Pörtner, H. O., Roberts, D., Skea, J., Shukla, P. R., Pirani, A., Moufouma-Okia, W., Péan, C., & Pidcock, R. (2018). *Global warming of 1.5°C*. https://www.ipcc.ch/site/assets/uploads/2018/11/SR1.5_SPM_Low_Res.pdf

Ewa ROLLNIK-SADOWSKA

RYNEK PRACY W ZRÓWNOWAŻONEJ TRANSFORMACJI – SYSTEMATYCZNY PRZEGLĄD LITERATURY

STRESZCZENIE: Celem badania jest analiza literatury dotyczącej rynku pracy w zrównoważonej transformacji oraz identyfikacja pojawiających się kierunków badań i stosowanych metod badawczych. Do przeglądu literatury wykorzystano metodę analizy bibliometrycznej publikacji z bazy SCOPUS. Ponadto, dokonano pogłębionego przeglądu wybranych publikacji, które wpisują się w dziedzinę nauk społecznych. W przeanalizowanych zasobach literatury występuje niewiele badań łączących rynek pracy ze zrównoważoną transformacją. Jednakże w analizowanym okresie 1997-2023 można było zauważyć stopniowy wzrost liczby publikacji o tej tematyce. Zidentyfikowano cztery obszary badawcze, które odnoszą się do zielonego wzrostu gospodarczego, transformacji bliźniaczej, zielonego zatrudnienia i zagadnień zrównoważonej europejskiej polityki rynku pracy. Większość autorów swoje wyniki oparła na krytycznej analizie literatury, studium przypadku i analizie baz danych. Mimo, że badania jakościowe cieszą się dużą popularnością wśród badaczy zajmujących się tematyką rynku pracy w zrównoważonej transformacji, metodyka foresight nie była dotychczas stosowana. Obszary badawcze, które były eksplorowane w niewystarczającym stopniu, obejmują m.in. ekosystem kariery, niepewne zatrudnienie, transformację cyfrową, sprawiedliwą transformację, sztuczną inteligencję czy przyszłość pracy.

SŁOWA KLUCZOWE: rynek pracy, zrównoważona transformacja, bliźniacza transformacja, systematyczny przegląd literatury, analiza bibliometryczna