

A just transition towards a coal-free steel industry: perspectives from labour

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Abstract

Limiting global warming to 'safe' levels will require rapid and radical reductions of greenhouse gas emissions across all sectors of the global economy. The discontinuation of incumbent industrial structures, that will be an unavoidable part of such sustainability transitions, will disproportionately burden certain groups. Recent events including the social and political unrest linked to the imminent deterioration of coal communities and the fuel tax protests of the 'Gilets Jaunes' have loudly shown that distributional effects of climate transitions cannot be ignored. Trade unions and NGOs have for some time called for an inclusive transition and brought increased attention to the justice dimension of energy transitions. In this paper, we analyse potential social impacts in a concrete case: the planned transition from coal to hydrogen-based steelmaking in the Swedish steel industry. To this end, we conduct a series of semi-structured interviews to examine the role of trade unions and the national trade union federation in re-orienting the industry. By doing so we aim to widen the scope of the just transitions debate to include process industries and to explore the concrete meaning of a just transition in the case of the planned transition of the Swedish steel industry.

We analyse, on the one hand, the capacity of trade unions to influence the transition process, and, on the other hand, the potential social impacts of the transition on the labour force and local communities. As the transition of the Swedish steel sector kicks into gear, we highlight a number of social issues that should be addressed both within industry and through policy. We conclude that it is important to early on: include stakeholders in the process, bring up social and political aspects of the transition, and acknowledge and address potential conflicting interests associated with it.

Reading instructions for the conference workshop

Consider this paper a first scoping study yielding a diverse range of results. We especially appreciate comments that could help us to develop this paper further into an article, and those that help identifying future research questions in this field. Further comments on our approach and method, on onto- and epistemological issues, and the relevance and generalisability of our findings are highly appreciated. For further development of this paper we plan to extend our interview study to more participants, e.g. miners at LKAB or steel workers at Borlänge or Raahe. We the authors have a background in engineering, techno-economic studies and economic history, but work on the interface between these fields and social science.

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1 Introduction

Rapid sustainability transitions such as those necessary to meet the 1.5 °C climate target must be anchored in broad public support. Present-day events illustrates how the neglect of the social dimension of climate policy can easily delay or paralyse climate realpolitik. In the EU, strong fossil interests and fossil-fuel-dependent countries such as Poland continuously attempt to block more ambitious climate policy in order to protect its coal-producing regions from demise (Marcinkiewicz & Tosun, 2015), and the election of Donald Trump in the 2016 US Presidential election succeeded on an agenda founded partly in opposition towards climate change and the existing environmental justice policy regimes (Faber et al., 2017). More recently, the 'Gilets Jaunes' protests in France since autumn 2018 have been directed against what was perceived as a regressive social and climate policy agenda (Carattini et al., 2019; Kinniburgh, 2019).

The transformation of industry through climate policy will, like all major societal transformation, have both positive and negative social side-effects. The negative side-effects tend to be unequally distributed and are often geographically highly concentrated (see e.g. Spencer et al., 2018). The workforce in affected sectors might face threats to job security (e.g. displacement or job losses) and challenges to their future prospects and work identity. Local communities might face mass unemployment, a loss of collective purchasing power, and threats to communal identity. The vision of a sustainability transition promise new industries and green jobs but also requires discontinuation of production systems reliant on fossil fuels, and consequently on the phasing out of particular industrial activities. Steelmaking exemplifies this challenge: alternative processes are yet to be proven and large physical assets must be substituted while preserving global competitiveness. A transition to an economy devoid of carbon emissions entails large-scale changes to jobs and skills required in such an economy.

Visions and strategies of an equitable and just response to such challenges – a 'just transition' for workers and frontline communities – were first forged by North American trade unions in the 1990s (Stavis & Felli, 2015). Since then the vision has spread. At the most recent COP in Katowice, 54 countries signed the Silesia declaration noting “the importance of a participatory and representative process of social dialogue involving all social partners ... when developing ... long-term low greenhouse gas emission development strategies” (COP24 Presidency, 2018, p. 2). The Paris Agreement also acknowledges the importance of a just transition of the workforce (United Nations, 2015a). Similarly, both Agenda 21 and its successor the 2030 Agenda for Sustainable Development, acknowledge the importance of involving public, private, and civil society in the realization of the sustainable development goals (United Nations, 1992, 2015b). The Agenda 21 (Chapter 29) clearly recognized, almost 30 years ago, the importance of including organized labour and trade unions in the sustainability transition. Noting the trade unions unique position in workplace relations and in wider political representation in countries where they are legally permitted to operate (Hampton, 2018) the Agenda 21 (United Nations, 1992) called for actions to seek “the active participation of workers and their trade unions in

decisions on the design, implementation and evaluation of national and international policies and programmes on environment and development, including employment policies, industrial strategies, labour adjustment programmes and technology transfers”(pp. 287) within the ‘joint (employer/worker) or tripartite (employer/worker/government) collaborative mechanisms’(pp. 288).

Yet, almost three decades after the Rio de Janeiro Earth Summit, the notion of trade unions, as natural and indispensable parties in formulating and achieving sustainability transitions, seems far from settled. Until quite recently, with the exception of trade unions with close ties to the fossil fuel industry opposing climate action, the role of workers and trade unions has remained at the fringes of political and public discussions on societal responses to climate change. Similarly, sustainability transitions and climate change literatures devoted to the role of social actors often include governments, business leaders, non-government organizations (NGOs) and other agents, whereas the role of workers or trade unions has tended to receive less attention (Hampton, 2018; Köhler et al., 2019; Rätzl & Uzzell, 2011).

However, while research on technological solutions and macro analyses of the consequences of climate mitigation measures on employment is dominant the literature on industrial transformation, recognition of the importance of trade unions as one of the principal social actors in the production process has, again, begun to gain traction. Furthermore, academic interest on the topic of just transitions has recently surged, with an average of 4 articles published yearly between 2012 and 2016, up to 12 publications in 2017 and 28 in 2018. The focus of the just transition debate is often the energy sector, and more specifically the moratorium of coal mining and coal power (Caldecott, Sartor, & Spencer, 2018; Johnstone & Hielscher, 2017). Studies on the role of labour in sustainability transitions in sectors other than energy are so far lacking (Prinz & Pegels, 2018).

In this article, we begin to close this gap by exploring the role of labour in the specific case of a process industry transition: the makeover of the Swedish steel industry through the HYBRIT initiative and its planned switch from coal to renewable hydrogen. Since 2018 the steel industry in Sweden, which accounts for 10% of national greenhouse gas emissions, operates under the jurisdiction of the Swedish Climate act, which sets out a plan for a net-zero emission economy by 2045 (Government Offices of Sweden, 2018). In the planned timeline, existing steelworks will undergo a fundamental redesign in the years up to 2045. The HYBRIT-project which is carried out by three large companies, two of which are state-owned, has received a lot of attention and political support since its initiation in 2016. Since then, research has been focussed on the techno-economic challenges and opportunities of a transition and the importance of a strong innovation policy framework.

The aim of this paper is to study the role, position, and strategy of trade unions in sustainability transitions, both as an agent of change shaping the emerging socio-technical system, as well as an affected stakeholder impacted by these changes. More specifically the paper focusses on IF

Metall, the trade union organising blue-collar workers in the Swedish steel industry. The aim is to highlight their perception of the progressing transition through a case study based on a desktop study of trade union reports, newspaper articles as well as scientific literature, and a small interview study with union officials. Two different but related strands of literature focused on the role of organized labour have been of particular relevance for this work; one focused on labour unions environmental practices and policies (e.g. Hampton, 2018; Lundström, 2017; Marcinkiewicz & Tosun, 2015; Räthzel & Uzzell, 2011; Stevis, Uzzell, & Räthzel, 2018), and the other exploring union involvement and conceptualisation of just transitions (e.g. Evans & Phelan, 2016; Morena et al., 2018; Rosemberg, 2017; Stevis & Felli, 2015).

We proceed by describing our methodological approach in section two. Section three provides the theoretical basis for our analysis. In section four we introduce our case and examine the possible social impacts of the transition and the role of labour. Section five provides the analysis, which is grouped into three themes: characterising IF Metall's response to sustainable transformation; the union-employer relationship; and worker identity. We conclude with a discussion and suggestions for further research in section six.

2 Method

The approach to data collection for this paper consisted of a desktop analysis of scientific literature and relevant trade union reports as well as semi-structured interviews with trade union officials. The desktop study encompassed a range of reports and policy documents published by the trade union and the confederation it is a part of, as well as material (incl. reports, newspaper articles and company communications) related to the case of the Swedish steel transition. With respect to IF Metall's stance on climate transitions three recent policy documents were of particular relevance: *Svensk industri för klimatet* (IF Metall, 2019b), *LO's Miljö- och klimatpolitiskt program* (LO, 2018) and *Klimatsteget* (SSAB and Oxelösunds Hamn, 2019).

Four interviews were conducted: three with representatives from IF Metall, and one with a representative from the national trade union confederation LO. In two of the interviews, more than one interviewee took part in the conversation. While interpersonal relationships might have an influence on the interviewees' answers, the discussions between interviewees were also a rich source of information. The interview material was analysed thematically with respect to the research questions and interpretations were attuned among the authors. The interviews were conducted in April 2019 and lasted between 1 ¼ and 2 hours. They were recorded with the consent of the interviewees, transcribed and the transcripts shared with the interviewees. The results are reported in an anonymised way in this paper.

To capture a breadth of union activity both local and headquarter-based representatives were interviewed. The interviewees were selected based on their relatedness to the transition of the Swedish steel industry and involvement in environmental and climate issues within their organisations. The questions focused on the perspectives and experiences of the interview

respondents. The interview sample is small and the interview material obviously does not represent the average position of trade unionists. However, the respondents are all strategically positioned in their respective organisation and the interview material, combined with the union policy documents, gives a relevant representation of a range of possible positions among Swedish unionists on sustainability transitions and just transitions in general, and the steel industry climate transition in particular.

In order to minimise bias induced by the asymmetric power relation of the interview process (Kvale & Brinkmann, 2008, pp. 33-34) we employed several strategies. First, we explained the purpose and the practicalities of the interview upfront to avoid misunderstandings or false expectations. Second, the questionnaire was handled flexibly in order to not restrict the conversation to what we could imagine *ex ante*. Finally, we aimed to strengthen our interpretations by sharing transcripts and interpretations with the interviewees.

3 Theoretical approach

3.1 Theory of discontinuation

Today there seems to be some level of agreement globally, at least on a principle level, about the need for a rapid transition towards sustainability. Whereas progress has undoubtedly been made on some fronts, the overall picture still suggests that there is a gap between principles and practice. The transition away from fossil fuels is one such example. A transition implies a shift from something old to something new. When it comes to electricity generation globally, the investments in renewable energy and new sustainable practices has so far not so much meant a *transition* but *addition* of further capacity (York, 2012; Johnsson et al., 2018; York & Bell, 2019). Whereas renewable energy has been added, fossil fuels have of yet not been displaced and greenhouse gas emissions are still rising. In the energy sector it could be said that the new is born (but still needs to grow up) while the old refuses to die¹. With the intensifying urgency of the climate crisis, the time to treat phase-out of fossil fuels as an epiphenomenon of transitions must thus come to an end.

Calls have therefore been made to not only focus on the creative side (i.e. promoting new innovative low carbon technologies) of what Joseph Schumpeter famously called *creative destruction*, but also the destructive side (i.e. the displacement/discontinuation/phase out of unsustainable practises and structures): "There is a rich and inspiring literature that focuses mainly on the creative side of the transition ...It is now time to acknowledge, discuss and implement also the crucial 'darker' side of this creativity" (Holgerson & Warlenius, 2016, p. 527).

¹ A reversal of Gramsci's famous quote "the old is dying and the new cannot be born", which some on the other hand hold to be true of neoliberalism today.

Rapid discontinuation of unsustainable practises is imperative, but not unproblematic. The destructive side of change emphasises “the socially embedded nature of energy technology” (Johnstone & Hielscher, 2017, p. 459). It affects workers, communities and their identities, and often have distributive effects that disproportionately harm marginalized groups in society. For this reason, protection of jobs and the environment have sometimes been considered antagonistic – jobs vs. environment (Räthzel & Uzzell, 2011). Idealist environmentalists, concerned with long-term survival on earth, have been pitted against workers and marginalized groups, concerned with short term livelihood – existence vs. subsistence. An unfortunate division that has hampered close collaboration between the environmental movement and the labour movement, and has been taken advantage of by actors with vested interests in the incumbent fossil industry.

An interest in discontinuation has recently emerged in sustainability transitions research (STR) – a relatively new but increasingly influential field, with a variety of perspectives, which seeks to understand the dynamics of innovation and socio-technical transitions toward low carbon futures (see e.g. Grin, Rotmans, & Schot, 2010; Markard, Raven, & Truffer, 2012; Van Den Bergh, Truffer, & Kallis, 2011; Köhler et al., 2019). So far most STR work has focused on how to support so called “niches”, i.e. “protected spaces” for radical innovation. At the same time, STR research has shown that support for niches is not enough as they are hindered by incumbent vested interests. This has for example been studied, explained and conceptualised through key concepts to the field such as “*lock-in*” and “*path dependence*” (Unruh, 2000). In innovation studies, discontinuation has been conceptualized as breakage of such lock-in and path dependence, as *destabilization* of incumbent resisting regimes (Kivimaa & Kern, 2016), or as *exnovation* – the opposite of innovation (David, 2018).

As a result, studies have recently brought more explicit attention to discontinuation and phase out of for example coal in the UK and nuclear power in the German case of Energiewende (Johnstone & Hielscher, 2017; Rogge & Johnstone, 2017; Stegmaier, Kuhlmann, & Visser, 2014) but cases are relatively rare, and the relation between socio-technical transformation and labour is almost absent.

3.2 Just Transition

Although academic interest in the concept of the just transition has surged just the last couple of years, it has been around in the trade union movement for several decades. It was first referenced by North American chemical unions in the 1990s, but its origins can be traced back to US trade unions in the 1970s, and especially the work of Toni Mazzochi of the OCAW (Oil, Chemical and Atomic Workers International Union) (Rosemberg, 2017; Stevis & Felli, 2015). Mazzochi sought to move beyond short-term defensive strategies, vis-à-vis environmental regulations, to rather argue that environmental protection and jobs in fact could go hand in hand. To support workers displaced by environmental regulations against air and water pollution, the OCAW

demanded a *superfund for workers* – later called *just transition fund*. This was the first conception of the just transition, and had no direct connection to climate change but rather had its emphasis on environmental health and safety in a particular industry.

Later in the 1990s and 2000s, US and Canadian unions came to adopt broadened agendas for a just transition, and the concept was eventually taken up and globalized by international trade union confederations (Morena et al., 2018). For example, the largest trade union confederation in the world ITUC (International Trade Union Confederation) has made the fight against climate change a priority in their work, and has promoted the concept in global climate negotiations. Notably, after intense advocacy, a commitment was incorporated in the Paris Agreement to secure a “just transition of the workforce and the creation of decent work and quality jobs” (United Nations, 2015a). In 2015, the UN agency working on employment – the ILO (International Labour Organization) – adopted *Guidelines for a just transition towards environmentally sustainable economies and societies for all* (ILO, 2015).

As the concept of the just transition has been globalised and mainstreamed its meaning has also broadened. This has opened up opportunities for coalitions with other social movements that have developed their own conceptions of the just transition, but it has also made the concept something of an empty signifier, acceptable to almost everyone, and open to multiple interpretations (Stavis & Felli, 2015). Actors with different priorities, strategies and positions in the political economy present a great variety of sometimes antagonistic interpretations of what it means for a transition to be “just”. According to Morena et al. (2018) variations can be found in terms of for example *what kind* (environmental, climate, energy, or social), for *whom* (what particular groups are included; only humans or also nature), and *how* (through distributional, procedural, restorative and/or recognition justice) justice should be sought.

To make sense of the variety a number of academic typologies has been suggested. Below, we mention three related classifications that we draw on in the analysis of our case. First, Stevis and Felli (2015), influenced by among others Fraser (2005), identify four ideal type varieties of justice, differentiated

- whether justice can be achieved within the existing political economy (“affirmative”) or whether more radical change of the political economy is needed (“transformative”),
- between justice to humans (“environmental”) and justice to nature (“ecological”).

Morena et al. (2018), again drawing on among others Fraser (2005), identify four ideal type approaches to just transitions: “status quo”, “managerial reform”, “structural reform”, and “transformative”. Just as the Stevis and Felli (2015) classification, these approaches are differentiated by the degree of change envisioned in the political economy. Beyond that Morena et al. (2018) also differentiate in terms of how “*inclusive in scope*” the transition is, i.e. to what degree unions privilege the particular interests of their members over more general interests.

Räthzel and Uzzell (2011) identify “four discourses in which the conflicting relationship between jobs and environment is conceptualised by unionists” (pp. 1221):

- “*technological fix*” (there is no conflict – improved technology will protect both jobs and the environment),
- “*social transformation*” (technological change is not socially neutral – technological and social change interconnected),
- “*mutual interests*” (focus on workers’ immediate interests – aim to reconcile the different interests of their members through dialogue among each other),
- “*social movement unionism*” (situate the interests of their members within the general interest of society at large – aim to change societal conditions).

3.3 Unionism in Sweden

To understand how and why unions in concrete cases take different positions on sustainability transitions it is important to examine the particular structural position unions have in the political economy today and have had historically. In this section we therefore give a brief background on how unionism in Sweden has developed and its place within the so called ‘Swedish model’.

The Swedish model of industrial relations can be said to originate from the Saltsjöbaden Agreement signed in 1938 between the Swedish Trade Union Confederation (LO) and the Swedish Employers Association (SAF). In 1906 LO and SAF agreed to recognise the right of workers to organise, and the right of employers to “manage and distribute work”. However, after a couple of decades, in the early 20th century, with a labour market characterised by instability and unregulated conflicts, the social parties of the labour market signed the Saltsjöbaden agreement under the threat of state regulation, which both LO and SAF was principally opposed to. The agreement, which essentially still applies, was a compromise signed in a spirit of cooperation to ensure the freedom to self-regulate the labour market without intervention from the state. Employers are required to agree to collective bargaining and unions agree to only take industrial action under certain conditions. This compromise was built on a recognition of the importance of industrial peace, macro-economic stability, and long-term investments in industrial capacity and rationalisation. The “Saltsjöbaden spirit” lasted until the great miners’ strike 1969-1970, and the conflict over the wage-earner funds proposed by LO in the 1970s and 80s to transfer economic control of firms from private to collective employee ownership. After a period of confrontation, the parties sought consensus again and some have argued that the 1997 Industrial Agreement in many respects is a return to the spirit of cooperation and a modern day follow-up to the Saltsjöbaden agreement (Bruhn, Kjellberg, & Sandberg, 2013; Elvander, 2002).

Another central feature of the Swedish model was the presence of a strong welfare state as well as the policies of the Rehn–Meidner model, which were presented by two LO economists in the beginning of the 1950s. The objectives of the model were to promote low inflation, full employment, economic growth, and wage equality. Measures such as the solidaristic wage policy

made sure that capital and labour flowed toward productive industries, while unproductive industries were disadvantaged (Schön, 2007). Schumpeter's creative destruction was amplified at the same time as workers in unproductive industries that lost their jobs were cared for (retraining, unemployment benefits, etc.). In post-war Sweden the destructive side of change was made an integral part of the Swedish model. Sweden was, during this period, in a sort of permanent structural adjustment program – a model which transformed Sweden in the post-war so called Golden Age.

Today the Swedish society looks very different and the transformation needed is a different one. Whereas the transition of the golden age involved intensified discontinuation of unproductive business (e.g. shipbuilding and textile) in favour of more productive and profitable ones, today's transition will have to involve supercharged discontinuation of environmentally unsustainable practises and business, which might however remain more profitable than sustainable competitors. Since the structural transformation of the golden age, economic liberalisation has reformed markets and changed the relation of power between capital and labour. The neoliberalisation of Sweden and the global political economy have generally weakened the structural position of labour, and the capacity of the state to regulate markets and actively intervene in the economy has been circumscribed. For example, that the Swedish government abandoned the policy of full employment in the early 1990s in favour of controlling inflation altered “the relations of power on the labour market in favour of employers and capital” (Bruhn et al., 2013, p. 139). Globalisation has also shifted the power relation in favour of capital, and forced the workers of the world to compete against each other.

In most countries, union membership density has been on decline for some time – so too in Sweden, but the trend has been weaker than in many other countries, and from a relatively high level. Since 1993, when the degree of unionisation was 85% (Bruhn et al., 2013), unionisation has continually fallen, to around 70% today (Kjellberg, 2018). In comparison, in 2016 the degree of unionisation in the UK was 24%, in Germany 17%, and in the USA 11% (Kjellberg, 2018). The relatively high level of unionisation in Sweden has been explained by some of the key characteristics of the Swedish model. For example, that the labour market is self-regulated by the social parties through collective agreements, rather than by state legislation, has safeguarded the relevance of unions (Kjellberg, 2009). Another factor is that industrial relations in Sweden are, at the same time, both centralised and decentralised (Bruhn et al., 2013; Kjellberg, 2009). This means that although collective bargaining is decentralised, and workers are represented by local union “clubs” (workplace-level union organisation), “the continued existence of central (i.e. national industry-wide) collective agreements gives unions at workplaces a nationwide agreement to back them up when negotiating” (Bruhn et al., 2013, p. 130). Furthermore, “the presence of class-based trade unions and the absence of political and religious divisions have contributed to very high union density in Sweden” (Bruhn et al., 2013, p. 134). Union federations in Sweden are separated along class lines, with blue-collar workers in LO (Swedish Confederation of Trade Unions), white-collar workers in TCO (Swedish Confederation of

Professional Employees), and professionals in SACO (Swedish Confederation of Professional Associations). Whereas differences in identity and political orientation have deterred for example white-collar workers to unionise in many other countries, white-collar union density is high in Sweden.

IF Metall is a member of LO, and is the second largest blue-collar union in Sweden with around 313,000 members and a unionisation rate of 80% (IF Metall, 2019a). The Swedish Iron- and Metalworkers Union was founded in 1888. The number of member's grew fast so that in 1905 the organisational rate was already 80% (Berggren et al., 2011). In 1938 the union signed an agreement that regulated among other things wage setting when new machines and methods were introduced, that come to also influence other sector of the Swedish labour market (Berggren et al., 2011). In 2006 the Swedish Metalworkers Union merged with the Swedish Industrial Union to form IF Metall. Today IF Metall holds a relatively strong position within the Swedish political economy. It covers most of the processing and manufacturing industry in Sweden, and as one of the interviewees noted, it organise the blue-collar workers in most of the companies that are the largest greenhouse gas emitters in Sweden. In order to reach the Swedish climate targets a transformation of the sectors covered by IF Metall, sometimes referred to as the "harder-to-abate sectors" (ETC, 2018), will be crucial.

LO and IF Metall have strong historical connections with the Swedish Social Democratic Party, both nationally and locally. For a long time, IF Metall was in fact the largest LO union, and as such it has had a particularly strong influence over the party and national politics (Gingrich, 2013). The connection is also reflected in "the social democratic ideology of the union, which has focused on the material well-being of workers in the Swedish context, achieved through an export-based economy with a strong manufacturing sector and effective wealth redistribution policies" (Gingrich, 2013, pp. 220). In section 4 and 5 we analyse how this has influenced IF Metall's reaction to sustainability transitions in general, and the HYBRIT project in particular.

4 Case study: The transition to fossil-free steelmaking in Sweden

The forthcoming restructuring of SSAB, the major Swedish steel producer, towards fossil-free steelmaking is used as a case to concretise and explore the involvement and position of labour unions both as an agent of change as well as an affected stakeholder impacted by these changes. This section gives a brief overview of main characteristics of the Swedish steel industry of today and outline potential social effects the planned changes to the technological systems.

4.1 Background

Sweden has a long tradition of steelmaking and steel export and the industry has undergone several waves of modernization and restructuring since the first primitive blast furnaces were introduced in the 12th century. The last major restructuring of the Swedish steel industry took place in the late 1970s. Increasing energy prices, competition from newly developing countries,

and a decline in demand for heavy capital goods resulted in crises in many of the countries that had traditionally dominated global steel production. Bain (1992) describes how the Swedish steel restructuring was characterized by a consolidation of the industry, the development of a single nationalized company, the Swedish Steel Corporation (SSAB), and the major role played by the unions, which was a central actor shaping the restructuring strategy.

At present Sweden is home to 13 steel production plants, of which three produce steel from iron ore (virgin steel) and ten from recycled steel scrap. The Swedish steel industry employs around 26,000 directly and through supplier companies, a number which has steadily been declining since the 1960's (Jernkontoret, 2018). More than half of Swedish steel production is exported, with the main market being Europe. Sweden imports simple steels and exports high-grade steels, leading to a significant trade surplus.

In recent years the Swedish steel industry has advanced its response to the threat of climate change. In 2013 the association of steelmakers (Jernkontoret) presented a vision titled “steel shapes a better future”, which has the aim that by 2050 all products and by-products shall be of value to society, and thus waste including emissions of greenhouse gases shall be completely avoided until 2050 (Jernkontoret, 2019). Furthermore, under the umbrella of The Fossil Free Sweden initiative (2018), initiated by the Swedish government ahead of the COP21 in Paris in 2015, the steel sector put forward a sectoral roadmap, which illustrates their plans up to 2050. The industry operates in context of the Swedish Climate Act, which strives to achieve net-zero emissions by 2045, whereby 15% of the emissions versus 1990 can be taken care of through compensation measures (Government Offices of Sweden, 2018). Climate policies that target the industrial sectors, in Sweden and the rest of the EU, continue to rely almost exclusively on the price signal imposed through the EU Emission Trading System (EU ETS). As the steel sector accounts for 10% of Swedish greenhouse gas emissions, the Climate Act basically does not allow business-as-usual for the steel sector. Primary steel production (from iron ore) is the main source of greenhouse gas emissions in steelmaking, which is concentrated in just two production sites both operated by SSAB: the sites in Oxelösund and in Luleå. In addition, the company operates another primary site in Raahelampi, Finland, and two additional sites for downstream metal working in Borlänge (Sweden) and Hämeenlinna (Finland). Successful reduction of carbon dioxide emissions in the steel industry is thus contingent on reducing the emissions at these sites, and necessary to reach the national climate targets.

SSAB responded to this challenge by initiating the HYBRIT initiative. In April 2016, a joint collaboration was announced by SSAB and the state-owned mining company LKAB and energy company Vattenfall, the purpose of which is to develop a fossil-free value chain for steel in Sweden and Finland. The initiative strives to achieve this by producing steel from iron ore and renewable hydrogen, instead of coke as it is done today. To achieve this large parts of the existing plants have to be replaced by different technologies, such as direct reduction and EAF plants. Producing with renewable hydrogen means the aspired process will require large amounts

of renewable electricity. Further technical novelties include large-scale storage of hydrogen, and fossil-free production of iron ore pellets at the sites of LKAB.

The HYBRIT project initially published a pre-feasibility study (HYBRIT, 2018a, 2018b), which was followed up by a research programme that involves several Swedish universities and research institutes. Following the plans laid out in the pre-feasibility study as well as the sectoral roadmap, the sites in Oxelösund, Luleå, Raabe as well as Borlänge and Hämeenlinna will undergo significant changes in the upcoming decades. The large demand for renewable electricity foregrounds the need for additional generation capacity and a timely transition depends on the successful issuance of environmental permits for both energy infrastructure as well as modifications in the steel plant. Oxelösund is the first site to be converted to electricity-based steelmaking. The ageing coke oven and the two blast furnaces is planned to be decommissioned and replaced by an electrical arc furnace in the period 2025-2027. The conversion of the sites in Raabe and Luleå as well as the pelletising at LKAB will follow in the late 2030s and early 2040s. Already today two pilot plants are being constructed to test hydrogen steelmaking and fossil-free pelletising. These will be followed by demonstration plants from 2025 onwards to test the new processes under industrial conditions.

4.2 The social dimension of the Swedish steel transition

Here we outline some of the potential social effects the planned changes to the technological system in the Swedish steel industry. We attempt this by focussing on four main themes that arise from the desktop and interview studies: (1) jobs and skills, (2) energy system and environmental permitting, (3) wider transition effects as well as (4) the uncertainty inherent in a project of this size.

Large-scale technological change necessarily both creates and destroys jobs. This is not different in the present case. In Table 1 we summarise the potential sources for job gains or losses. The summary should be seen as an indication of which activities will have an effect on jobs since, at this early stage the effects of the potential change on each plant are difficult to predict. Yet, a more thorough exploration of the effects on the workforce, e.g. which skills will be required, where new jobs will be located and, finally, to which extent the current workforce will be able to take on these tasks, will be an important part of the restructuring. One central question is the need for competence development, which one interviewee perceived as insufficient and too narrowly confined to allow workers to adjust to new professions. Instead, the interviews showed that competence development today is practiced with a narrow focus on the present work tasks.

A second domain of social impacts relates to the necessary expansion of the power grid to secure supply of renewable electricity. The construction of wind power and power grids requires predictable processes of environmental permitting. One interview revealed that the regional administration has already increased the number of employees to speed up the permitting processes. As part of the consultation phase local residents and land owners will be involved in

the planning, and potential conflicts of interests might occur. The construction of large wind parks in Northern Sweden to supply future steel mills with electricity might conflict with existing land-uses activities, e.g., with reindeer herding if the same land is claimed for both activities (Larsen, Raitio, Stinnerbom, & Wik-Karlsson, 2017). Additionally, municipalities might be affected by changes to local energy supply such as a lack of steel off-gases for district heating as well as the construction of the LNG terminal in Oxelösund.

Table 1: Technical changes of the transition to fossil-free steel with potential impacts on jobs.

at plant	<ul style="list-style-type: none"> - coke oven - coke and coal handling and transport - blast furnace - converter + electric arc furnace + direct reduction plant (not necessarily located at the existing sites) + electrolyser and hydrogen storage (co-located with DR plant) + pilot and demo plant (construction, technicians, operation) + reheating furnace
locally	<ul style="list-style-type: none"> - district heating + scrap handling and transport (e.g. road construction) + LNG terminal and LNG transport + regional administration for environmental permitting (Länstyrelsen) + co-located companies (e.g. related to steel scrap)
wider energy system	<ul style="list-style-type: none"> - coking coal supply + biofuels production + renewable electricity generation + power grid construction
other	<ul style="list-style-type: none"> + R&D in HYBRIT

Thirdly, wider distributional effects might be caused through changed prices of steel and energy. It is likely that the new production process will result in a higher price of steel compared to today, which could have knock-on effects throughout the value chain. The large amount of renewable electricity required by the new production process might in a similar manner influence the electricity price, which affects low-income households to a larger degree. As the profitability of steelmaking will be highly sensitive to the electricity price (Vogl, Åhman, & Nilsson, 2018) special treatments for industry as is commonly practiced today could increase consumer electricity prices. Finally, wider reforms as part of the climate transition are known to disproportionately impact specific communities or regions and exacerbate already existing divides, e.g. that between rural and urban communities. The issue of gasoline taxes was named by several interviewees, which puts rural regions at a disadvantage, who, notably, might be the very same segments of society already affected through heavy industry transitions.

The uncertainty about the magnitude of these effects is still large. The geographical placement of the upcoming investments is yet undecided and will have large effects on regional employment. For the local trade union chapters this is a question of great importance:

“... the HYBRIT project – we have fought a lot to have the [pilot] plant in Luleå”

Several interviews revealed that although planning of technical change is underway it is yet unclear which effects this will entail in terms of jobs and skills. Throughout the interviews there was a general sense that it was yet too early to know which jobs will be affected, as the technical details of the future plant are not yet known. Furthermore, the environmental permitting process for the conversion of the Oxelösund plant was not yet completed at the time of the study. Consequently, no assessment of the job and skill requirements of the transition has been attempted yet, which leaves the trade union in a passive position where it needs to await managerial decisions and further technical details before it can act itself. One interviewee also felt that locally the trade union is not able to sufficiently engage with the transition as the local organisation is small and lacks resources.

4.3 Role of the trade union in the transition

In this section we describe how, in our case study, IF Metall is involved in the transition. We structure this into three parts: channels of collaboration, trade union expertise, and local union priorities.

The three organisational levels, which were represented in the interviews (the confederation, the trade union headquarter and the local representatives) engage in a wide range of national and international collaborations. Confederation and headquarter tend to focus on policy and also take part in research projects, while the local representatives engage in practical services for members as well as internal company decision making. Typical policy fields the trade union is involved in, other than labour market policy, are energy, innovation and trade, but to an increasing extent it also engages in climate policy, which it tries to incorporate in its traditional policy foci. The engagement of the trade union in policy matters is well institutionalised and the interviewees deemed their degree of involvement sufficient and generally high. International collaboration is practiced on all three organisational levels. While for the local chapters international collaboration mainly takes the character of bilateral (Sweden-Finland) company-wide meetings, the union headquarter and the confederation frequently engage with their respective global and European federations (e.g. IndustriAll, ITUC), in which they perceive their position as a leader with regards to the climate transition. The local union representations are part of the company board. They have strong cooperation with the local white collar unions (Unionen and Ledarna), as well as some ties to the municipal administration as some union officials are also politically active. However, the extent to which the union is involved in planning and decision making processes largely depends on the plant manager's willingness to involve them.

A notable effort with respect to information sharing and engagement with the local community was a newspaper-like publication called *Klimatsteget* (eng.: “the climate step”) (SSAB and Oxelösunds Hamn, 2019). The publication is prepared by the project group for the conversion of the Oxelösund plant in cooperation with the local harbour holding company and was distributed in the local community. The project group is in charge of the conversion of the plant to secondary steelmaking and contains ten to twelve sub-projects dealing with different parts of the plant, which are set to undergo change. The first edition of the newspaper (a second one is planned) focusses on the technical changes of the Oxelösund plant and its surrounding infrastructure (e.g. LNG terminal, electricity grid, biogas). It aims to communicate information related to safety issues to the local population and thereby create legitimacy for the planned undertaking.

The expertise of workers and local trade union officials is crucial in the assessment of the transition effects on the plant-level. Trade union competence is often asked for at the highest decision-making level in the company due to the profound knowledge the workers have of the plant and its processes. Beyond immediate decisions the local trade union chapter uses their expertise to adjust to and shape work with regards to long-term industrial trends such as digitalisation.

The trade union clearly wants to proactively shape their future work environment. Their first priority is securing investments in order to guarantee the existence of future jobs for its members. Beyond this, the local chapters strive to be involved in discussions that could affect the nature of work tasks and safety in the future. They try to use their expertise and the established cooperation with other unions as well as the company to work proactively, rather than use their weight to resist decisions or even strike. In one interview, the local officials did not perceive themselves as able to drive decisions or engage with long-term issues, but as occupied with their everyday business such as unemployment insurance. However, they expressed the desire for more proactive work and to create a common position among their members.

5 Analysis

5.1 Just transition through job security

The respondents describe the scope of the union’s interests as relatively narrow, with a focus on occupational issues rather than larger social issues. Job security through guaranteeing a competitive workplace and the profitability of new technologies is foregrounded, while the interviewees were more hesitant towards larger reforms (e.g. green tax reform, Green New Deal) that could threaten the company’s or the industry’s competitive position. This is in line with previous studies of IF Metall’s response to the threat of climate change: “IF Metall, partly due to their historical power, maintain a narrower ideological view, in which they are focused on maintaining a partnership with industry and of protecting their existing membership/institutional power” (Gingrich, 2013, pp.224). The just transition concept is assigned a narrow meaning in the

Swedish steel transition. In their recent climate programme (IF Metall, 2019b), IF Metall does not list a *just transition* among their demands. However, LO's environmental and climate programme (LO, 2018), which IF Metall was involved in preparing, grants the just transition a larger role: A just transition is analogous to job security in the long run, which will be brought about by becoming a global technological leader and thereby achieve competitiveness in a global economy where most countries have less ambitious climate policy strategies and cheaper labour. Morena et al. (2018) characterizes this as the status quo approach to just transitions, which is concerned with greening capitalism through economic growth and whereby the government prepares the playing field, which in our case means public investments into R&D and the creation of exclusive markets for environmentally-friendly products through state intervention.

The focus on competitiveness also means that IF Metall tends to be positive towards new technology and change. One of the representatives expressed it thus:

“...our interest is basically our members' job security. Our point of departure is not job security in terms of the Employment Protection Act or that you get a nice unemployment insurance, but rather that their workplaces is strong in a global competition, which is also related to being best on technological transition ...”

The “degree of inclusiveness” (cf. Morena et al., 2018) is rather narrow and particularistic – their demands (e.g. job security) only target a small range of actors. Their response does not deviate from the existing political economic arrangement (cf. Morena et al., 2018; Stevis & Felli, 2015) and they, at this point, seem to be seeking a technological fix rather than broader changes in economic and social relations (cf. Rätzzel & Uzzell, 2011).

Despite this strong focus on competitiveness both IF Metall and LO does not doubt the necessity for climate action, and the pursuit of climate targets are described as central priorities. Throughout the interviews there was a general agreement about the need for an industry climate transition and the interviewees were mostly concerned about how such a transition could materialise. IF Metall's position is characterised by a belief in a win-win situation for both jobs and the environment: climate action must happen, but the technologies to come must be profitable and the transition must not undermine competitiveness. This defines the role assigned to the state, which should create markets for environmentally-friendly products, invest into R&D, and create a global level playing field to even out international differences, e.g. in the stringency of environmental and workplace legislation. Consequentially, climate becomes part of their business as usual, or as one interviewee put it:

“... questions maybe move more from the overarching climate policy domain into others we are more used to engaging with: energy, innovation and tax policy.”

The need for additional investments into industry during the period until the climate targets have been reached is the central demand of both IF Metall's and LO's climate programmes (IF Metall, 2019b; LO, 2018). The costs, which mainly arise in the form of R&D funding and scale-up support, are to be shared "fairly" between the public and private spheres, and the hope is that returns will come in the long run through global technological leadership, which will result in good and safe jobs. This strong concern about job security does not, however, stretch to questions of the distribution of the potential gains and benefits, for example on the grounds of intellectual property rights, and thus could turn out to socialise risks while privatising returns, and an unequal distribution of benefits from the transition (Mazzucato, 2018).

This is an understandable position given their history and position in the political economy. Sectors such as steel production are under intense global competition and were hit hard by the 2008 crisis and the subsequent global excess of production capacity. Europe has seen several plants closed and thousands of steel jobs lost during the last decade. Consequently, the Swedish steel industry specialised by selling niche products to export markets. One interviewee illustrated this for one of the plants:

"We were 5,400 in 1974. Today we have 1,100 and we produce more qualities than you could ever have dreamt of."

One of the interviewees pointed out that it is difficult to directly compare trade unions in sectors such as basic materials production with unions typically covered in the just transition literature, namely those in the coal sector. The fundamental difference is that while the sector of coal mining and power generation from coal needs to be completely phased-out, basic materials will play a large role in the transition and therefore current production processes must be discontinued but reinvented in a climate-neutral manner. Due to the magnitude of change required in these sectors (e.g. steel, cement and chemicals) this can be seen as a discontinuation – current production processes, and some of the existing skills and competencies, must be phased out - although the industries as such will continue to exist.

5.2 Union-employer relation

The interviewees' views of the union's role and position in the sustainability transition tend to be relatively closely aligned with the changing role and leverage of trade unions in the political economy. Trade unions in Sweden have faced similar challenges as their counterparts in many other western European countries, e.g.; a weakening and fragmentation of the traditional national-industrial organizational base (Munck, 2010); a less supportive, sometimes hostile, political context (Elvander, 2002; Hyman, 2001); and the dilemmas associated with economic globalization, accelerated mobility of capital, the geographic dispersion of production and the expansion of trade (P. Evans, 2010). Despite the relative strength of IF Metall and its local chapters with regards to their position in the political economy and in at the workplace, in terms of unionisation rates and political leverage, these megatrends resonate in the interviews.

Comparative studies of industrial relations show how, even in the face of the same megatrends, both union organization and strategy, and the institutions, rules and practices that govern tripartite (employer/worker/state) relations in a particular country tend to be deeply rooted in historical events and traditions and therefore vary considerably even between countries that exhibit many other similarities (Elvander, 2002; Hyman, 2001).

Both the representatives from the local union chapters and the more centrally placed union representatives painted a picture of relatively highly formalized and institutionalised union-employer relations at the workplace, and tripartite relations at the national level. This is a picture of rules and procedures of collective bargaining and conflict resolution regulated in the Industrial Agreement; of statutory employee representation on the decision-making boards of larger companies; and of a relatively well-oiled machinery for collectively handling the effects of structural changes – backed up by, what still remains, a relatively strong social security net. In the interviews, union-employer relations and decision-making processes are in other words generally characterized by cooperation and consensus (a word frequently used in the interviews) rather than conflict.

When analysing the interview material it is difficult to ignore the marks that being on the defense for decades has left in the participants' interpretation of the identity and functions of the union today. To be clear, this observation is by no means meant as judgemental. It is difficult to see how the position and priorities of unions in a small export-oriented country like Sweden could remain unaffected by the forces that has put trade unions all over Western Europe on the retreat (Gumbrell-McCormick & Hyman, 2013). The interview proponents describe the union as often getting in a position where it has to react to, and attempts to mitigate the effects of external challenges. In the case of the steel industry, global competitions and productivity increases through process improvements and automation has led to a gradual downsizing of the workforce. In our interpretation, this sense of defensiveness manifests itself in the union-employer relation in, at least, two ways. First, as also expressed by the interviewees, IF Metall's current priorities both centrally and locally, tend to be relatively closely aligned with that of the employers, e.g., to secure economic and legislative conditions and infrastructures (electricity supply and transportation) which can attract investments and ensures competitiveness – and thereby secure existing jobs and provide new job opportunities. Secondly, it can be found in the limited claims for further gains in the industrial relations between union and employer. Trade union officials tend to interpret the key function of the union to revolve primarily around the fundamentals of collective bargaining (Åsard, 1980), i.e. negotiating decent salaries and working conditions, but, with the exemption of union representation on the decision-making board, have limited ambitions in terms of involvement in strategic decision making.

The representatives from the two different local union chapters also, independently, describe how the focus on maintaining competitiveness at times tends to become a source of friction and internal rivalry between the sites in Luleå, Oxelösund and Raahe. This is also something that is

mentioned in relation to the forthcoming restructuring toward fossil-free steelmaking. In Oxelösund the decision to replace the existing blast furnace production line with an EAF is met with cautious optimism. The existing capital stock is old, part of the coking plant dates back to the beginning of the 20th century, and the union representatives describe how the plant and the workforce has been under pressure for quite some time. Even without the HYBRIT project the plant in Oxelösund would have required a large investment due to the age of the plant. It is, however, unclear to which extent HYBRIT helped Oxelösund in attracting the investment by making clear that steelmaking has a future in Sweden. Even if it is difficult to foresee the precise effects for the workforce at this stage, the announcement of the new investments provides some sense of security for the employees. In Luleå, where the blast furnace recently underwent a major refurbishment and where the HYBRIT pilot is under construction, there is hope for also attracting forthcoming HYBRIT investments. The interviewees also describe how the incorporation of the Raabe operations into the SSAB group adds to the internal competition for investments.

The fact that the union is represented on the board of directors, both at the plant/subsidiary level and group level, is described in the interviews as a strength which yields insights, if not always influence, over strategic decisions. One of the representatives describes how the degree to which the union have a say in strategic decision tends to vary depending on the current plant manager:

“At the local level, plant managers tend to come and go, and maybe not always have the same long-term view as us on the union side – when it comes to the future direction of development. There have been times when plant managers have tried to push through projects to cut cost in the short-run. We try to have a longer time-perspective. How do we survive in the long run? If it is good ideas, we’re in.”

The local union representatives in Luleå and Oxelösund also stress how a relatively close cooperation between blue and white collar unions, which tends to be strengthened by the fact that blue and white collar unions (Unionen, Akademikerna and Ledarna) offices actually are co-located in both cities, is a strength. The cooperation makes it possible, even if interests are not always aligned, to coordinate and, when possible, to form joint positions in relation to the employer.

In the interviews employer-union relations are depicted as generally built on trust and cooperation and the bargaining processes characterized by a willingness to seek compromises rather than conflict – a relation that falls within the standard model on the Swedish labour markets over the past few decades (Kjellberg, 2016; Peterson, Thörn, & Wahlström, 2018). One of the respondents, contrasting with the situation in Finland where conflicts have been more common also in recent years (Elvander, 2002), describes how this distinguishes Sweden and Swedish trade unions:

“In the period before we bought Rautaruukki there were between ten to twenty strikes in Finland ... the employer placed a bid but there were no negotiations ... to show your strength it was common to announce a half-day strike before the parties sat down to talk. Swedish labour unions are relatively strong and we have a tradition of talking to each other. I think that is important. And that is why I believe it is difficult to compare our situation with the situation in other countries.”

5.3 Worker identity

Questions of cultural identity have so far been neglected in transitions research (Johnstone & Hielscher, 2017). The worker identity as one embodiment of cultural identity is a result of individual and collective identity formation processes through habits, institutions and discourses present at and around the workplace (G. Evans & Phelan, 2016). Identities are socially constructed by a limited group of persons in response to the opportunities and constraints that define their actions (Grant, Shields, Hearn, & Michelson, 2006; Melucci, 1996, p. 70). Factors shaping worker identity can both be external to work (e.g. globalisation, state and outlook of an industry, discourses around a sector) as well as internal (e.g. work environment, material conditions of the factory). “Central to the concept of worker identity are their expectations of the employment relationship and what it is they want out of it” (Grand & Shields, 2006:289).

We argue based on our reading of the interview material that ensuring that technological change is accompanied by social change and that unions and their members are involved in the process would allow workers’ identities to co-evolve with new technologies in a socially manageable pace improving the chances of keep everyone on board. Work gives people a perceived position in society, which comes with certain power relations and which conditions their actions (Räthzel & Uzzell, 2011). The identification with work and the labour movement can be very strong, and can, for better and worse, become a source of pride, belonging and solidarity, as it happened too in the Swedish steel industry during the early post-war era (Byrkjeflot, 2006). As one interviewee puts it:

“... earlier generations who often refer to: ‘that I was a part and built Sweden’, and there was pride in this: ‘from the poor turn of the 19th century towards what we have today’.”

However, the abrupt disruption of people’s basic institutions such as their collective identity at work or their social position within a community alienates them from society and, if happening on a large scale, can have disastrous social consequences (Polanyi, 1944, pp. 164-165). The size and pace of economic transformation demanded by the threat of climate change risks exactly this, if change is merely imposed on those most affected without their basic institutions being part of the process. Following the call for increased attention for cultural identity in transitions we want to sketch the evolution of today’s steel worker identity in our case of the Swedish

steel industry and discuss opportunities and constraints for its involvement through a just transition.

“We as the worst villains...”

The steel industry today is caught between two antagonistic discourses. On the one hand there is growing public awareness of the detrimental impacts the production steel has for the climate. On the other hand steel is an indispensable material for climate-friendly technologies and the industry is undertaking significant effort to brand steel as a ‘mitigation enabler’ – a material that enables emissions reductions in other sectors such as renewables or light-weight cars. Steel workers too have to negotiate their identities between these discourses, one on side serving a society which needs steel products, but on the other an industry jeopardising the future. The same goes for sectors such as cement or chemicals and plastics, which are targeted by environmental movements with increased frequency as public awareness of their impacts grows. Basic materials, which undoubtedly have been central to the making of modern societies, seem to have lost valuation by society and their availability today is taken for granted. This was not always the case. As we showed above, making steel meant to proudly building the country in earlier days. However, since then and especially during the post-financial-crisis period after 2008 steel markets went through troubling times. A lack of investment, global overcapacity and low steel demand led to layoffs and uncertain jobs in the steel sector, which too influences what it means to be a worker (Olson-Hazboun, 2018). One outcome is less employment security:

“... changes during the last 10 years too. With reduced manpower and plentiful restructuring. So I believe this feeling of ‘doing this until I die’ has broken up a bit.”

The pride of past generations of steel workers has faded - nowadays, “*you go to work, you do your thing*”. One explanation for this is the above illustrated discourse opposition and the cognitive dissonance that results from it. Although steel is still used for ‘building the country’, “... labelling coal, steel, or chemical industries as “dirty” can serve to alienate workers in those sectors from climate change measures, since they feel their identities and pride as workers are threatened” (Räthzel & Uzzell, 2011, p. 1219). Consequently, making steel primarily becomes a means for the end of making a living, rather than the pursuit of a bigger purpose through work. However, throughout the interviews indications for a departure from this undecided situation towards a new steel worker identity were voiced, best put by one of the interviewees:

“... back then when we built up the country and thought that we so to say created welfare and prosperity through work, in this way we could create sustainability”

The idea of steelmaking as an essential building block in a sustainable society is, already today, communicated both internally and externally. Both management and labour within the Swedish

primary steel sector describe themselves as a global leader in efficiency and climate-friendly production, whose processes have comparably low emissions compared to international competitors. While steel companies had difficulties in recruiting in the past, the interviewees described how more recently the interest of young people to work in steel industry has increased. Since its launch, the HYBRIT initiative has been repeatedly referred to as an example of Swedish climate action, government representatives have visited the production sites and the initiative was awarded the Swedish Environmental Protection Agency's (Naturvårdsverket) price for courage and pace. Nevertheless, these visions are yet to be fully embraced on the factory floor. The impression of several interviewees was that many trade union members show a degree of scepticism with regards to the validity of the project and the new production process and that climate change is not a major concern to them. In other words, the steel workers do not (yet) identify as 'creating sustainability', and that the post-crisis period makes them cautious. One reason for this could be that, while technology roadmaps have been published, so far no assessments of the potential social effects have been carried out. It is thus not yet clear which social implications, skills, jobs and their relocation, will be the result of the aspired technological change.

6 Discussion and conclusion

The ambition of this study has been to explore the involvement and the positioning of labour unions both as an agent of change shaping the emerging socio-technical system, as well as an affected stakeholder impacted by these changes. Our contribution revolves around a particular case: the forthcoming restructuring of the major Swedish steel producer toward fossil-free steelmaking. The analysis is based on interviews with union representatives and the parallel reading and synthesis of the interview material, union policy reports, literature on unionism in Sweden and abroad and a small but growing strand of literature devoted to labour unions environmental practices and policies and involvement and conceptualizations of just transitions.

So far, process industries have not been part of the academic just transition debate. One explanation for this lies in the nature of the transformation they are undergoing: While the just transition literature has dealt with sectors that are incompatible with a low carbon future such as coal mining or coal power, many of the process industries will not disappear in the climate transition, but will need to undergo massive changes in their operations. This is not to say that some of these industries might not be retired or their operations be relocated outside Europe during the transition. Since 2008 several steel plants have been closed in Europe (e.g. Florange (France), Teesside (UK)), which is also illustrated by the recent insolvency of British Steel in the UK. Nevertheless, steel will be required in any future, but there need to be significant changes in the manufacturing process if climate targets shall be met, entailing large changes to jobs, skills and social impacts along the value chain and in the wider energy system. In Section 4.2, we illustrate how this could play out based on what can be learned at this early stage of the Swedish transition toward fossil-free steelmaking. However, it is important to remember that the social

effects of the steel transition will vary between sites and depend, among many other aspects, on the demands and visions of the workers at these sites and their representation in trade unions.

Surely, there are numerous examples of trade unions globally aligning themselves with management to preserve polluting industries and thus the jobs and livelihoods of their members (Felli, 2014). But it is also true that trade unions because of their position, have a unique understanding of how the required shift in production will affect the livelihood of their members and their work environment. As described by Bain (1992, pp. 35) and Anxo (2017) the industrial restructuring processes in Sweden in the face of the crises in the 1970s and 2008/9 clearly show the importance and value of a well-developed system of social dialogue and the active involvement of social partners in policy-making in general, and the involvement of unions in particular, in shaping the restructuring strategy. This we believe is an important lesson, for all parties, also when shaping the strategy for the industrial sustainability transition.

Trade unions fill a vital role in sustainability transitions, namely one that cushions the instantaneous impact of change on labour, allowing for the restructuring of regional economies in a socially acceptable pace. They do this using their influence and legitimacy to bargain and to find compromises in the reallocation of social benefits and costs, which will be the result of a sustainability transformation (Lundström, 2017). Their positions and strategies are based on local (plant-level) expertise and a profound understanding of the local transition effects on jobs, skill and work environment. Lundström (2017) outlines three critical challenges for the future climate engagement of Scandinavian trade unions; to engage critically but constructively in the discussion regarding how climate change and climate transitions relate to the ways the economy and production are organized; to be responsive towards the climate engagement and interests of members; and, to make sure the sustainability agenda also incorporate a political vision of social justice

Our case study depicted an industry reorientation based on tripartite cooperation and consensus towards the goal of the transition, competitiveness through global technological leadership. The case chosen for the study, the transformation towards fossil-free steelmaking, is in some ways a special case, were the transformation at least at this early stage is seen as a win-win for all parties. The alignment of interests between the parts smoothens the road ahead, while it makes it unlikely that issues of wider societal transformation (e.g. other forms of organisation of work) might be sparked in the process. However, especially local representatives showed a higher openness to questions of social change, for example a shift in meaning in the steel worker identity. Furthermore, the interviewees expressed a general interest for the trade union to take on a proactive role in the transition. The scope of inclusiveness (Morena et al., 2018) is narrow as the union strongly focusses on the interest of its membership, which makes it likely to focus on measures such as competence development for the workforce. However, the transition may also have more peripheral social effects such as triggered by rising prices for steel and electricity, conflicts of interest around land use, as well as the issue of returning the benefits of the transition

to the public (along socialising risk, privatising returns). An inclusive transition should not turn a blind eye towards these effects.

Finally, this study opens up a series of questions for further research. To build first attempt to joining the just transitions literature with process industries it would be instructive to study different sectors as well as unions with a different take on the meaning of the just transition concept. With respect to the case of the transition of the Swedish steel industry, a more detailed assessment of the impacts on jobs and skills and a discussion on the necessary policy interventions to mitigate these impacts would be valuable. Lastly, a more thorough understanding of the role of work identity in sustainability transitions could inform the work of local trade union chapters and emphasise the social and behavioural dimension of industrial transformations, which are too often only discussed in technical terms.

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