

Brain-be 2.0

PILLAR 3

STATE OF THE ART

LAMARTRA Bridging decarbonisation and labour market in sustainability transitions

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Keywords:

Sustainability transitions; labour market; future of work; scenario-building; policy mixes

Introduction

LAMARTRA addresses the interlinkages between transition processes of decarbonisation and 'labour market' - understood more broadly as work and employment. The salience of these interlinkages is increasing as processes of low-carbon transition are progressing beyond their initial stages of pioneering and niche markets (Markard 2018). This salience speaks from the increasing political weight of the 'just transition' discourse promoted jointly by the European Trade Union Confederation and the EU Commission. Much uncertainty remains about the possible directions that these ongoing transition processes may take. In the face of irreducible uncertainty, Jasanoff (2018) calls for a certain *humility*. Various visions and imaginaries are being proposed to make sense of the transition process. Prominent examples are 'just transition', 'future of work', (Ferrerias et al. 2020, Schlogl et al 2021), 'green growth' and 'fourth industrial revolution' (Smith & Fressoli 2021). The proliferation of visions exemplifies the fragmented knowledge development on this topic, however. Whilst highlighting some aspects of the decarbonisation/labour dual transition, the various visions are backgrounding others: The notion of a 'decarbonisation transition' may appear to be all-encompassing, but it remains a partial vision - focusing on physical-environmental-energetic transformations, it pays less attention to shifts in terms of power and political inclusion (Jasanoff & Simmet 2021).

This dual transition poses heavy challenges of accurate diagnosis and careful foresight. Most importantly, it indicates a range of pressing practical challenges. How can it be governed and steered into - by certain normative standards - more desirable directions? Sustainability transitions research has brought forward useful starting points. These transformation processes should be guided by targeted 'policy mixes', i.e. coherent combinations of interventions that address different aspects of the transition process: Both cultivation of the new as well as phase-out of the old, both vertical as well as horizontal modes of governance. LAMARTRA rises to the challenge of elaborating such strategies of systemic, transformative governance for the Belgian context, with particular attention to the scope for federal-level policy. Our research question is a practical question: *How to understand the ongoing and future developments of the low-carbon and labour transitions, and which governance strategies are available in Belgium to ensure the joint pursuit of climate targets and 'just' work and employment?*

State of the art

Societal context

LAMARTRA addresses a practical research question: which policy mixes could meet the objectives of decarbonisation with commitments to 'just' work and employment -this is what we call the "dual transition". This practical question reflects a range of concerns about the direction and the pace of ongoing decarbonisation/work and employment transition processes. These concerns have led to an extensive web of scenarios, visions, policy programs and strategies.

- **Work and employment policies.** With the advent of the welfare state after the Second World War, full employment has emerged as one of the public policy horizons for Western European States. The assumption underlying this model is that employment, economic growth and social protection are mutually reinforcing. The idea of a virtuous circle between social policies and employment is still very widespread in the political world, as evidenced by the federal Government Agreement which set the objective of achieving an employment rate of 80% by 2030: *"Creating jobs is a priority for the Government. The more we increase the employment rate, the more we strengthen our Social Security. All the more so when we know that a quality job is also the best social protection and that it is a vital source of emancipation. The Government will reward hard work, support the most vulnerable groups on the path to employment and aim for an employment rate of at least 80% by 2030"*. With that aim in mind, the Government will develop policy plans in collaboration with the regions and the social partners. The elaboration of employment policies is informed by different types of data, including mid-term economic prospects developed by the Federal and regional statistical agencies and "prospective métier" exercises carried out by employment and training development agencies. In addition to the creation of jobs, the Government intends to

improve well-being at work and the reconciliation of private and professional life while job quality has been decreasing overall over the past years¹.

- **Decarbonisation and energy transition.** For almost ten years, the Belgian federal and regional politico-administrative authorities in charge of energy and climate policy have been developing scenarios, visions, strategies and plans with a view to decarbonizing the economy. In 2012, the Walloon region published its analysis of low-carbon scenarios (Climact 2012). This technico-economic study sketches alternative pathways for reducing regional GHG emissions by 80-95% by 2050. Similar scenario analyses were subsequently commissioned by the Federal Climate Change Service (Climact & Vito 2013) and by Brussels Environment (Climact 2017). The Federal Climate Change Service has recently developed new low-carbon scenarios compatible with the objective of transitioning to climate neutrality by 2050 in Belgium (Climact & Vito 2021). The institutional low-carbon scenarios feed the development of various policy visions, strategies and plans, such as the 2021-2030 National Climate and Energy Plan (NCEP), Belgium's long-term strategy and the Vision for a decarbonized Belgium by 2050 outlined by the Federal Climate Change Service. These initiatives led by the Belgian federal and regional public authorities are shaped by various elements of the international and European climate policy frameworks, starting with the Paris Agreement. This binding international agreement adopted in 2015 aims to limit the risks and impacts of climate change by "*holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels*" (United Nations 2015). In line with the temperature objectives of the Paris Agreement, the European Union (EU) has strengthened its long-term decarbonisation objectives by committing to achieve climate neutrality by 2050. This GHG target was translated into the strategic long-term vision "A clean Planet for all" (European Commission 2018) and operationalized through a number of policy actions provided for the European Green Deal (European Commission, 2019). This growth strategy aims to "*transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use.*" (European Commission 2019:2). Besides the scenarios, visions and roadmaps elaborated by public authorities, many civil society organisations develop their own visions of the low-/zero-carbon society and of the pathways for making such transition happen. Among them, we find the energy vision for Belgium elaborated by FEB/VBO (2017), the study "Energy Transition in Belgium: Choices and Costs" commissioned by Febeliec (EnergyVille 2017), and the scenario "Our Energy Future" developed by WWF, Greenpeace, BBL, IEW (3E 2016).
- **Just Transition and SDGs.** The notion of "just transition" initially emerged in the 1980s within international trade union organisations as a mobilising term to promote the creation of "green" jobs and to support workers affected by the dismantling of fossil fuel intensive economic activities. Such a vision was notably developed in the Guidelines for a just transition towards environmentally sustainable economies and societies for all presented by ILO in 2016. The notion of just transition has percolated from the trade union world to the political sphere, taking more and more place in the discourses and documents of climate mitigation policy. At the international level, it is found in the Paris Agreement which underlines the need of "*Taking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs*" (United Nations 2015). These imperatives of just transition were reaffirmed, deepened and widened in 2018 at the Katowice Climate Conference with the adoption of the Solidarity and Just Transition Silesia Declaration. The ambition to articulate social and environmental objectives is also found in the 2030 Agenda for Sustainable Development adopted in 2015 by the United Nation, which consists of 17 Sustainable Development Goals (SDGs), including 'promoting decent work for all' (SDG8) and 'taking urgent action to combat climate change' (SDG13). At the EU level, the necessity to guarantee a just transition to a climate neutral society is emphasized in the long-term strategy "A clean planet for all" and in the Green Deal mentioned above. The Green Deal intends to "*leave no one behind*" with the Just Transition Mechanism which, among other things, strives to protect the most vulnerable workers by providing access to re-skilling

¹ <https://ec.europa.eu/eurostat/web/labour-market/quality-of-employment>

programs and jobs in new economic sectors. The imperatives of a just transition are also present in the main documents of the Belgian climate mitigation policy previously mentioned. However, there is currently no clear institutional vision nor political strategies to ensure a just transition. In order to initiate and fuel the public debate on just transition, the Federal Climate Change Service and the Walloon Air and Climate Agency (AWAC) have each launched a prospective study on jobs and skills in the context of the transition to climate neutrality by 2050. The proposal of a Job Guarantee (Tcherneva 2020) is central to meeting those needs of the planet that no individual consumer will pay for. In countries with high-level of social expenditure for unemployment benefits, calls to support job creations funded by the State are increasingly considered sound policy-making: the example of the 60 cases of experimentation around "Territoires Zéro Chômeurs de Longue Durée" in France is getting lots of attention. In Belgium, Dulbea-Solvay-ULB issued a report to show that the average cost for public expenditure is 35,000 euros/year for one unemployed person. The needs of the transition are high: that amount could be activated for all those people who want to work and find themselves desperate because of social irrelevance. In France, 40% of the jobs created in the TZCLD are devoted to care to people and 40% to care for the planet.

- **Other ongoing transitions.** The transition to a climate neutral society is part of a bundle of interlinked socio-technical transitions which involve major transformations of the labour market. One of them is the digital transition. The digitization of the economy relates to the generalization of digital information and computing tools in every areas of the economy: while the industrial sector has a long history of automatization and robotisation, the service sector, which represents nowadays the main growth driver of the Belgian economy, started to digitalized in the 1980s with the introduction of debit cards in the banking sector, Belgium being a pioneer with the "Mister Cash" technology. The generalization of the use of the Internet in the 2000s and 2010s induces a rise in the use of digital tools to better reach the consumers and propose a wider array of goods and services calibrated on more and more specific needs. However, the impact of digitalisation on the global productivity of the economy has not yet been proven: There remains a strong uncertainty on the impact of digital tools and data on economic growth, especially as the digital infrastructure of the global economy is dominated by a US oligopoly composed by Google, Amazon, Facebook, Apple and Microsoft that all together lead its evolution. Therefore, the current promotion of digital tools, data and services by many governments is not based on in-depth analysis of the power of those technologies to foster economic development but as a result of an intense lobbying led by this oligopoly as well as a by a latent and undiscussed promethean ideology and a European will to counterbalance the power of this US monopoly on the digital economy. The above-mentioned European Green Deal should be considered in this context: When the European Commission states that "*Europe must leverage the potential of the digital transformation, which is a key enabler for reaching the Green Deal objectives.*", this should be analysed as a proposal to the European digital sector to take an important part in the development of a new economic model for Europe and, by the same token, to counter the power of the US economy in this field as well as the rising strong power of China in the digital economic arena.

In order to support this 'twin transition' to a green and digital economy, the EU Commission has adopted the European Industrial Strategy in March 2020. Note that this vision of the digital transition in the service of decarbonisation is not unanimous, several researchers and civil society organizations considering the development of digital technologies as a threat to ecological transition and advocating a form of digital sobriety. The Belgian federal and regional politico-administrative authorities are also pursuing this digital agenda, notably through the strengthening of the Digital Belgium Action Plan provided for the federal Government Agreement adopted in 2020. Inasmuch as the deployment of digital technologies is bringing about profound changes, both quantitative and qualitative, in terms of employment, studies exploring the implications of digital transition on the labour market are flourishing. In Belgium, such studies have been carried out by Agoria in collaboration with the regional employment offices (Agoria 2018) and by IWEPS for the Walloon Government (Albessart et al. 2017). The research project SEAD² funded by Belspo since 2020 also aims to explore the challenges and opportunities that arise with

² <https://sead.be>

the ongoing process of digitalization in the Belgian labour market. With its objective of anticipating the skill and competences needed on the Walloon labour market as part of the transitions to a green and digital economy, a project launched by le Forem in 2021 adds an additional level of analysis to such reflections. Beside decarbonisation and digital transition, another political agenda takes an increasingly important place in the visions, policy programs and strategies, i.e. the circular economy transition. The development of a circular economy is one of the axes of the European Green Deal. This axis is developed in greater depth in the new Circular Economy Action Plan adopted by the European Commission in March 2020, which "*provides a future-oriented agenda for achieving a cleaner and more competitive Europe*". At the Belgian level, both the federal and regional public authorities are developing their programs and strategies for fostering the circular economy transition. The Federal Action Plan for the Circular Economy 2021-2024, which is currently under development, should soon succeed the set of measures in favor of the circular economy adopted in 2016 by the federal government. Just like decarbonisation and digitization, the transition to a circular economy involves major changes in the labour market. The impact on employment of the transition to a circular economy has been analysed at the levels of Europe (Cambridge Econometrics et al. 2018), Belgium (PWC et al 2016; Fondation Roi Baudouin, 2019) and Flanders (Willeghems & Bachus 2018; 2019). By modelling the impact of a circular holistic economy on the labour market and lifelong learning in Flanders, the research project MICHELLE funded by FWO since 2020 aims to enrich this data corpus.

- **Post-COVID Relance.** Since March 2020, the global COVID-19 pandemic has severely affected the economy and the labour market, reinforcing the vulnerabilities and the social inequalities. This disaster constitutes a turning point that makes the evolution of the ongoing transition processes all the more uncertain. The answers proposed to face the COVID crisis are multiple and question, to varying degrees, the functioning of the society which prevailed before it. In the IWEPS Foresight Brief "COVID-19: four post-crisis scenarios", the author explains that "*The crisis we are going through is a moment of reconfiguration where a society exposes and calls into question the major orientations it sets for itself*" (Claisse 2020:13). This scenario exercise identifies four contrasting visions of the Post-COVID world that coexist in the public debate: Transformation, a return to normal, resilience or collapse. While many researchers (Laurent 2020; Ferreras et al. 2020; cf. www.DemocratizingWork.org) have articulated the well-known but less practiced principles key to build a better future that is both sustainable and democratic, they were joined by civil society organizations (Greenpeace 2020) considering that the COVID crisis reveals the limits of an unsustainable system based on economic growth and call to rethink it fundamentally by giving priority to human and planetary well-being, the institutional responses to COVID crisis rather tend to position in favor of economic recovery and resilience building. To face the economic and social consequences of the Covid-19 pandemic, the European Commission has adopted in December 2020 the Next Generation EU recovery instrument, which aims to "*to create jobs and repair the immediate damage caused by the COVID-19 pandemic, whilst supporting the EU's green and digital priorities*".³ In June 2021, the federal government published the Belgian Recovery and Resilience Plan, whose main objective is to "*accelerate our country's transition to more sustainable, resilient and inclusive growth*" (Belgian Government 2021: 11). This need for increased resilience is underlined in the 'relance' vision unfolded by the platform of companies FEB/VBO (2020): Digital transition and a more liberalized, dynamic labour market are underlined as key pillars of economic recovery.

Research questions and Hypothesis

The decarbonisation/labour 'twin' transition summarizes a maze of concerns. The future projections offered by Belgian political actors provide a significant degree of insight and foothold. On the other hand they also reveal the fragmented state of knowledge and strategizing on this topic. They display a mixture of utopian and dystopian perspectives, or 'regimes of promise and of fear' (Audétat 2015). Furthermore they display different understandings of primary and

³ <https://www.consilium.europa.eu/en/policies/the-eu-budget/long-term-eu-budget-2021-2027/>

secondary effects, and equally different ideas about the appropriate governance arrangements, policy instruments and distributions of responsibility. Hence our dual research question.

- ***How to understand the ongoing and future developments of the low-carbon and labour transitions?***
- ***Which governance strategies could be envisaged in Belgium to ensure the joint pursuit of climate targets and 'just' work and employment?***

The associated hypothesis - or better said, *working assumption* - is that we need 1) an integrative understanding of the 'twin transition' that in turn 2) also informs integrative policy i.e. policy mixes that guide the transitioning in a desirable (sustainable and just) direction.

Main findings

LAMARTRA aims for an integrative understanding and governance perspective on the 'twin transition'. An important starting point is that there is in principle an abundance of insights to work with: The project unfolds in a societal context of intensive knowledge production on the topic (see above). In academic research there is a similar abundance, comprising both the contemporary analyses of transition processes as well as the longstanding research traditions on issues of sustainable development, work and employment, and economic transformation. The state of the art provides an encouraging range of relevant insights and preliminary answers to our research questions.

The following six research strands provide important insights on the 'labour'/low-carbon' transition interlinkages:

1. **Sustainable development and ecological economics.** Scientifically, the topic of the 'twin transition' is not entirely new. Abundant scientific insight already exists on the systemic linkages between environment and economy. The discussions of 'strong' and 'weak' sustainability (Ayres et al. 2001), reconsiderations of economic growth (Jackson 2016; Cassiers et al. 2017) and analyses of environmental politics provide firm underpinnings for current visions of 'just' and sustainable societal transformations (Coolsaet 2020). Fundamental are the insights from ecological economics, and the idea of the economy as a subsystem of a finite global ecosystem (Daly 1973). This earlier work may not have theorized the work and employment aspects in much detail, but the general insights into the embeddedness of the economy provide crucial foundations. By extension, recent studies have charted how the world of work is intrinsically connected to the environment. Typical examples are the analyses of how environmental degradation negatively impacts the world of work (Montt et al. 2018): Jobs in many sectors rely directly on the extraction of natural resources, depend greatly on natural processes ('ecosystem services') and are vulnerable to environmental hazards (e.g. storms or excessive heat). Also very relevant are the analyses of distributed risks: The hazards of environmental degradation affect women and vulnerable workers the most - they generate, exacerbate and perpetuate inequality (ILO 2018a).
2. **Sustainability transitions and socio--technical innovation.** Particularly relevant for LAMARTRA is the innovation---theoretical research on socio--technical transitions. Transitions are long--term processes of structural change at the level of functional subsystems like energy, mobility, water management or agriculture. Transitions are shifts in socio-technical 'regimes', i.e. the dominant rules that guide the development of societal systems. Transitions in 'regimes' result from co-evolution between technological, institutional, cultural and infrastructural changes and innovations (Grin et al. 2010). The interdisciplinary field of sustainability transitions research (Markard et al. 2012; Köhler et al. 2019) has specified underlying mechanisms and process dynamics (Geels & Schot 2007), patterns of innovation trajectories and pathways (Foxon et al. 2013), and governance strategies through which to steer/influence transition processes (Smith et al. 2005; Loorbach 2007). The analysis of path dependent socio--technical 'regimes' (Geels 2005) specifies how unsustainable practices are entrenched in society. Frameworks like strategic niche management (SNM) (Kemp et al. 1998) and Technological Innovation Systems (TIS) (Bergek et al. 2008) describe how sustainable alternatives can be supported in their uphill struggles against vested interests,

resistance to change, and dominant technological designs. Focusing on the (sustainability) benefits of radical, disruptive innovation, the implications in terms of economic losses, unemployment and working conditions have long remained side shows in transitions research. It has featured mainly in analyses of the politics of transitions (Meadowcroft 2009; Avelino et al. 2016; Feola 2020), and in the various historical accounts of contested, 'disruptive', technological shifts: A typical example is van Driel & Schot (2005) on the introduction of the floating grain elevator. Meanwhile, various recently emerging strands of transition research are addressing relevant aspects of the 'twin transition': A rich literature has developed in recent years on business model innovation (Bolton & Hannon 2016), on socio-economic transitions in social enterprise (Pel & Bauler 2017) and sharing economy (Frenken & Schor 2017), and on 'deep', transversal transitions and waves of industrial development that cut across transition processes in different societal sectors (Schot & Kanger 2018; Kanger & Sillak 2020; Kern et al. 2020). Yet the most important development is the recognition that various processes of sustainability transition are going into a next phase of broad institutionalization, beyond the experimentation phase (Markard 2018). This also comes with a greater recognition of the shadow sides of creative destruction: These issues of downfall and vulnerability are recently gaining attention through the work on destabilization, decline, phasing-out and 'exnovation' (Stegmaier et al. 2014; David 2017; Rosenbloom & Rinscheid 2020; Callorda Fossati et al. *forthcoming*). The key idea is that transitions governance should be rethought, to comprise more comprehensive and coherent 'policy mixes' (Kivimaa & Kern 2016; Rogge & Reichardt 2016; Hebinck et al. 2022): Beyond the existing approaches geared towards the cultivation of sustainable 'niche' innovations (and the associated 'green jobs'), broader governance repertoires should also contain measures to soften, redirect, slow down, democratize, or mediate, processes of decline and phasing-out.

3. **Just transition and environmental justice.** Within sustainability transitions research, issues of justice have long formed an undercurrent. They are often discussed in terms of transitions directionality (Stirling 2011): Transition *where to* (Røpke 2012), *why* (Schlaile et al. 2017), and *for whom* (Smith & Stirling 2010)? The particular attention to justice dimensions of sustainability transitions is growing in recent years (Köhler et al. 2019), as witnessed by elaborations of political economy (Newell & Mulvaney 2013), capitalism (Feola 2020), global North/South inequalities (Hansen et al. 2018), or energy justice (Jenkins et al. 2018). Meanwhile, a 'just transition' literature has developed. Focusing less on the transformations of socio-technical systems, it identifies climate, energy, and environmental injustices and develops remedial strategies (McCauley & Heffron 2018). Not incidentally, the earliest formulations of the 'just transition' concept stem from the global trade union movement (Abraham 2017), responding (since the 1970's in the USA) to unanticipated industrial restructurations and massive job losses. The "climate vs jobs" framing has since then been refined into more proactive (Stavis & Felli 2014) and diversified strategies (Prinz & Pegels 2018). This literature has brought forward elements of dedicated policy mixes, involving principles of slow and gradual transition, social dialogue, active labour transition management and engagement in industrial and regional development (Galgóczi 2019). The 'just transitions' literature highlights the differences across industries and across countries (Heyen et al. 2020). Preoccupied with the political requirements of 'low carbon transition', it tends to focus on the emblematic carbon intensive industries, however. This limited empirical scope mirrors the infatuation with emerging 'green' niches that prevails in sustainability transitions studies.
4. **Labour economics, macroeconomics and 'labour market transition'.** Focusing on particular emblematic cases, the 'sustainability transition' and 'just transition' perspectives tend to lack a comprehensive understanding of the transitioning of labour (market). Dedicated 'labour market transition' research is conducted largely in parallel, focusing for example on the employment effects of certain 'megatrends' (higher energy prices; digitalization; demographic shifts). Methodologically, this has involved macroeconomic general equilibrium models forecasting overall employment trends (Climact 2016) is a Belgian example). While macro--models tend to report small positive net employment effects of low--carbon transition (García-García 2020), they are not informative at the micro---level and are not helpful to understand distributional aspects. Other research has focused on the profile of workers in 'green jobs' such as the circular economy (Consoli et al. 2016; Bachus 2019; Burger et al. 2019), concluding that these tend to require higher levels of cognitive and interpersonal skills than non-green jobs. This approach focuses

on the 'winners' of the low carbon transition, however. Fewer studies examine the profile of workers with carbon-intensive jobs. Although it is often assumed that 'carbon-intensive' jobs are less knowledge intensive and carried out by more vulnerable workers, this has not yet been extensively documented. It may even not be the case in Belgium: carbon-intensive sectors such as the chemical industry employ high as well as lower- educated workers. This line of transitions research thus highlights the important differences across worker profiles and carbon-intensive sectors, and crucial 'just transition' dimensions like re-skilling, labour market mobility, and risks of structural unemployment. Mapping impacts, it evidences the need for dedicated labour policies to support newly emerging groups of vulnerable workers.

5. **Workplace innovation, sociology of work and future of the welfare state.** Research on 'labour market transition' is relatively strong in systematically charting macro-economic and labour market impacts, but it does tend to focus on the measurable dimensions. Meanwhile, significant sociological work is done on the qualitative changes of labour: its organization, its inclusiveness and impacts on vulnerable groups, and the socio-institutional embedding of the labour market via corporate structure and social protection. At the micro-level, workplace governance and organizational and individual culture are determinant on the integration of environmental concerns in the workplace decisions. Yet, the overall biggest factor is the corporate governance structure, and the goals set for the organization by what is standardly referred to as owners. Deepening the movement of democratization of the corporate structure, going beyond the German model of co-determination, and integrating compliance with SDG's in the business strategy, is identified as a crucial step to move ahead (Ferrerias 2019). Social innovation in work conditions and work organisation can have a definitive impact. The literature examines experiments of work social innovation (e.g. Smart cooperative (Charles et al. 2020) or the impact of (service-based) social innovations on satisfaction and well-being at work (Casini et al. 2018). At the macro-level, the future of the welfare state directly connects with the fate of workers and of the planet. In Europe, the Welfare State is being rethought as a socio-ecological state (Laurent 2018; 2020); in the US, there is the 'Green New Deal.' Here tackling the problem of unemployment becomes a key policy priority, supporting both workers and the planet. This is the entire field working on a Job Guarantee Program (Tcherneva 2020). Another prominent topic in this research strand is the 'decommodification of work' (Ferrerias et al. 2020).
6. **Foresight and scenario analyses.** Due to its ability to cope with irreducible uncertainties and high value conflicts associated with complex systemic problems (see Fransolet, 2019a), foresight is a suitable approach for understanding the ongoing and future developments of the low-carbon and labour transitions. However, there are still few foresight studies exploring in depth the interactions between low-carbon and labour transitions. Scenario exercises tend to focus either on decarbonisation trajectories or on the futures of work. Literature reveals an increasing number of analyses envisioning and exploring alternative visions of decarbonized futures as well as transition pathways to reach those futures – i.e.: low-carbon scenario analyses (Miller & al. 2015; Robertson & al. 2017; Torrie & al. 2013; Söderholm & al. 2011; Hughes & Strachan 2010). Even if many authors acknowledge that low-carbon scenarios should embrace the co-evolving nature of technology and society for capturing the socio-technical essence of the decarbonisation (Fransolet 2019a; Li *al.* 2016; Wangel 2011, Hughes & Strachan 2010), most of the low-carbon scenario analyses do not or hardly address social issues. These scenarios are most of the time the outputs of quantitative models which allow analysing the technical and economic implications of such a transition pathways (Fransolet, 2019 a et b; Li & *al.*, 2016; Fortes & *al.*, 2015; Schubert & *al.*, 2015; Miller & *al.*, 2015; Király & *al.*, 2013; Nilsson & *al.*, 2011 ; Söderholm & *al.*, 2011; Wangel 2011; Hughes & Strachan, 2010; Foxon & *al.*, 2010). Scenario analysis exploring the implications of the low-carbon transition on employment are most often based on macroeconomic models (ex.: Climact 2016; VITO et al., 2012). While they enable to quantify the impacts of alternative low-carbon transition pathways on employment, macro-economic analyses do not take into account qualitative dimensions like the quality of the new jobs created or the type of qualification required to access these new jobs. These dimensions, which are crucial in a perspective of just transition, are explored in foresight studies based on multidisciplinary approaches combining qualitative and quantitative methods (ex.: CLIMACT et al. 2015; ICEDD et al. 2018). However, such low-carbon scenario analysis remains quite rare.

Regarding the future of work, employment and training development agencies have developed a longstanding tradition of “prospective metier” (e.g.: le Forem 2020; CEDEFOP, 2019). Such foresight studies identify the professions of the future and provide insight on how to adapt the education and training system to meet the new knowledge and skills needs. This type of analysis is often based on business as usual scenarios and does not take decarbonisation into account, such transition involving major breaks in current trends. With the growing importance of the imperatives of just transition, more and more “prospective metier” exercises are however trying to better articulate the labour market and low-carbon transitions. Finally, both low-carbon scenarios analysis and “prospective metier” exercises have a major limitation: they do not apprehend the co-evolution between the labour market and low-carbon transition. This also reminds of the more general challenge: The ‘twin transition’ requires us to break out from the notorious continuity bias in futures research (Raskin & Swart 2020).

Existing gaps in past research

The above six research strands provide significant potentials towards operational transition understandings. Meanwhile this review also shows the difficulty to arrive at the desired integrative understanding of the ‘twin transition’. It reveals how the state-of-the-art is fragmented along a range of conceptual, methodological and normative cleavages:

Analytical fragmentation

- **Analytical focus:** The ‘twin’ transition is seldom taken seriously as such. Analyses tend to focus on one side of the coin: Many of the reviewed analyses take certain measures or projected targets of decarbonisation as the starting point, studying ‘labour’ implications as side-effects or repercussions of those. Other analyses take processes of labour transition as the primary focus. Whilst considering regulatory constraints and environmental parameters as relevant variables that influence the development of work and employment, the environment and ‘decarbonisation’ remain but one variable in an analysis that essentially addresses the future of work. Such strongly labour-oriented studies remind of developments like digitalization, workplace democracy, demographic shifts and reconfigurations of supply chains that tend to be overlooked in ‘low-carbon’ analyses. This fragmentation can be appreciated as an effective division of labour, or as a necessary reduction of complexity. Yet it also leaves us with at least two problems: First of all it obscures the processes of co-evolution between the ‘labour’ and ‘low-carbon’ transitions, and this co-evolution between multiple changes and innovations is arguably essential for an understanding of transition processes (Grin et al. 2010; Vasileiadou & Safarzynska 2010; Pel 2014). Another, second, problem is that the various analyses are addressing overlapping transitions of very different kinds, often lumped together under generic accounts of ‘socio-ecological transition’ that neglect a basic distinction - transition processes can be purposive (the ‘digital transition’ as a policy program), or very emergent (the ‘digital transition’ as a largely autonomous trend, involving multiple transformations and adaptation pressures in both ‘low-carbon’ and ‘labour’ aspects).
- **Development logics - continuity/equilibrium and transformation:** Across the ‘twin transition’ accounts we find fundamental differences in emphases on continuity and transformation. Several analyses follow a binary logic of creative destruction and technological substitution, in which the displacement of the old by the new takes centre stage. Transition research and innovation theory tend to focus on the interplay between innovation and exnovation, for example. On the other hand, there are also the perspectives that highlight the occurrence of qualitative changes and transformation processes that yield historically unprecedented patterns in work & employment, and in environment-society relations.

Methodological fragmentation

- **Levels and units of analysis:** The ‘twin transition’, and its constituent transitions, are studied on various levels of analysis. Where the various policy studies show a certain natural convergence towards national-level studies, the academic literature displays a particular diversity of methodological approaches. Some accounts of

the 'twin transition' conceive of it as general, large-scale transformation, pervading the global economy or 'industrial modernity' (Schot & Kanger 2018) as it has sedimented across countries and sectors. By contrast, other analytical angles are considering the transitioning of specific countries, regions, economic sectors, supply chains, business models, companies or individuals (workers, notably). Apart from the obvious challenges of bridging between micro-meso and macro analyses, there is also the challenge of bridging between the systems analyses of transitions research and the less holistic, more focused analyses of the other research strands discussed.

- **Emblematic cases:** The different analytical foci are reflected in the empirical cases that are selected for in-depth study. Whilst the innovation-oriented work in transitions research typically focuses on emblematic cases of green 'niche' innovations, other angles rather focus on cases of vulnerable sectors and regions, vulnerable groups of workers, and particular arenas of conflict and political deliberation. A key problem is the fragmented evidence base that develops out of the widely celebrated 'frontrunner' companies, the much-discussed sectors-in-trouble, and the renowned 'flagship' projects on the one hand, and on the other hand the less prominent, less accessible and perhaps less dynamic and spectacular contexts in which the 'twin transition' unfolds.

Normative fragmentation

- **Normative yardsticks:** The analytical and methodological fragmentation is significantly deepened by normative fragmentation. This is not surprising, in light of the long research tradition of sustainable development studies and ecological economics (research strand 1): Sustainable development is a layered concept, and the reconciliation of societal, environmental and economic considerations is a recurring task. Still it is striking how the various analytical angles on the 'twin transition' display a broad mixture of evaluation criteria and priorities. They emphasize different dimensions of sustainable development and are informed by different understandings of (procedural, distributional, environmental) justice. This fragmentation - which tends to lurk under the surface of general 'social-ecological transition' slogans - gives rise to several difficulties. Not only is it complicating the understanding of what should count as a partial, full-fledged, succeeded or failed transition, it also underlines the difficulty to arrive at coherent, purposive and appropriate 'policy mixes'.
- **Teleology:** As mentioned earlier, there is a basic confusion in the various accounts of 'transition' about a key issue: Transitions can be envisioned and pursued as purposive transformative processes, yet they can also be considered as largely emergent processes - with ambiguous and largely unintended outcomes. Regarding the 'twin transition' it is not obvious whether it should be treated as a desired future, or a set of transformations that Belgian society somehow needs to respond to. It is also striking how the various imagined futures comprise both utopian as well as dystopian discourses: The imaginations of the 'twin transition' hover between vulnerability and empowerment, opportunity and threat, promise and fear. Finally, it is striking how certain teleological understandings appear to take 'transition' as a future state. This diverges from the basic understanding in transitions research that transitions are processes.

New research contribution and expected policy recommendations

The critical review of the state-of-the-art has specified it: The first new research contribution of LAMARTRA will consist in an integrative understanding of the 'labour'/'carbon' twin transition. It will clarify the possible directions it may take, the dynamics that drive the transition, and the kinds of shifts in work and employment it entails. The second research contribution consists in the elaboration of the governance implications. As indicated, this is not a matter of 'translating into practice' or of dissemination of research results - it is a matter of providing solid answers to the second part of our governance-related research question - *how to develop appropriate 'policy mixes' to steer the twin transition into a just and sustainable direction?*

The key idea derived from the current state-of-the-art is that the governance of these complex transition processes should take the shape of broad 'policy mixes'. This idea is of course well-known in public administration research and in

environmental policy-making: All policy instruments have their limits, and broader packages of instruments can be developed in which several instruments reinforce each other (the 'carrot' and the 'stick', for example). In the context of transition challenges, this concept of 'policy mixes' has gained a specific importance, however. The governance of transitions is aimed to support long-term processes of structural change (Smith et al. 2005; Voß et al. 2009). The idea is to reach beyond incremental tinkering, and bring about structural changes in socio-technical 'regimes' (Grin et al. 2010). Encompassing change is sought in technologies, consumer cultures, infrastructures, expertise, business models and administrative routines (Loorbach 2007). Transition governance is not oriented towards particular innovations, but towards system innovation i.e. innovation on the level of the relations between markets, states, civil society and knowledge production (Rotmans 2005). This implies a radically networked kind of governance, in which state actors are not necessarily leading (Johnstone & Newell 2018). Moreover, transitions are complex processes of societal evolution that as such cannot be implemented, 'managed', or controlled (Rip 2006; Walker & Shove 2007; Stirling 2016). Transitions can be imagined and pursued, but even purposive transitions are to a large extent emergent, i.e. resulting from the largely autonomous interactions between institutions, technologies, cultures and infrastructures (Smith et al. 2005). This is why transition governance has been aptly described as 'goal-oriented modulation' (Kemp et al. 2007): it is a matter of seeking to influence and synchronize (Pel et al. 2020) the transformation processes through a multitude of relatively 'light' interventions.

These ideas about broad, systemic governance have become snowed under a bit by the wide obsession with innovation. Transition governance has often been reduced to the cultivation of emergent sustainable technologies and practices - frameworks like transition management (Loorbach 2007), strategic niche management (Kemp et al. 1998) and technological innovation systems (Bergek et al. 2008) have led the way. Yet in recent years it has become clear that the experimentation with innovative 'niches' is not enough (this awareness is also present in FEB/VBO (2021) and in the follow-up of the Brussels regional plan circular economy). These cultivation policies do not guarantee that the old, unsustainable development paths will be abandoned; the 'regime' structures supporting coal-fired energy production, internal combustion engine cars in place are too resilient (David 2017). What is more, significant governance challenges of 'after-care' (Stegmaier et al. 2014) arise when old structures are in fact discontinued, especially as it leaves sectors, regions, and individuals vulnerable. These issues of downfall and vulnerability are recently gaining attention through the work on destabilization, decline, phasing--out and 'exnovation' (Rosenbloom & Rinscheid 2020; Brauers et al. 2020). Especially this attention to the flipside of creative destruction has led to a rethinking of transitions governance. More comprehensive 'policy mixes' are needed (Kivimaa & Kern 2016; Rogge & Reichardt 2016): Beyond the existing approaches geared towards the cultivation of sustainable 'niche' innovations (and the associated 'green jobs'), broader governance repertoires should also contain measures to soften, redirect, slow down, democratize, or mediate, processes of decline and phasing--out.

The key new research contribution of LAMARTRA resides in the elaboration of these strategic insights for the 'twin transition' in Belgium. Broad, multi-level, multi-dimensional, 'policy mixes' will be needed. Still, much remains to be done to develop these insights beyond the rather abstract level at which they are developed now (Callorda Fossati et al. *forthcoming*). Research on transition (governance) processes is still often 'out of sync' with day-to-day decision making in political and enterprise contexts (Turnheim et al. 2020). LAMARTRA rises to the challenge of developing more operational 'policy mixes'. These will be developed through an interdisciplinary approach that reaches across the different pockets of insights and analytical angles that exist on the topic (Cf. state of the art). Figure 7 shows how the LAMARTRA policy mixes will be developed through four theoretical perspectives - providing mutually complementary insights into the 'twin transition' through empirical research on four salient sectors:

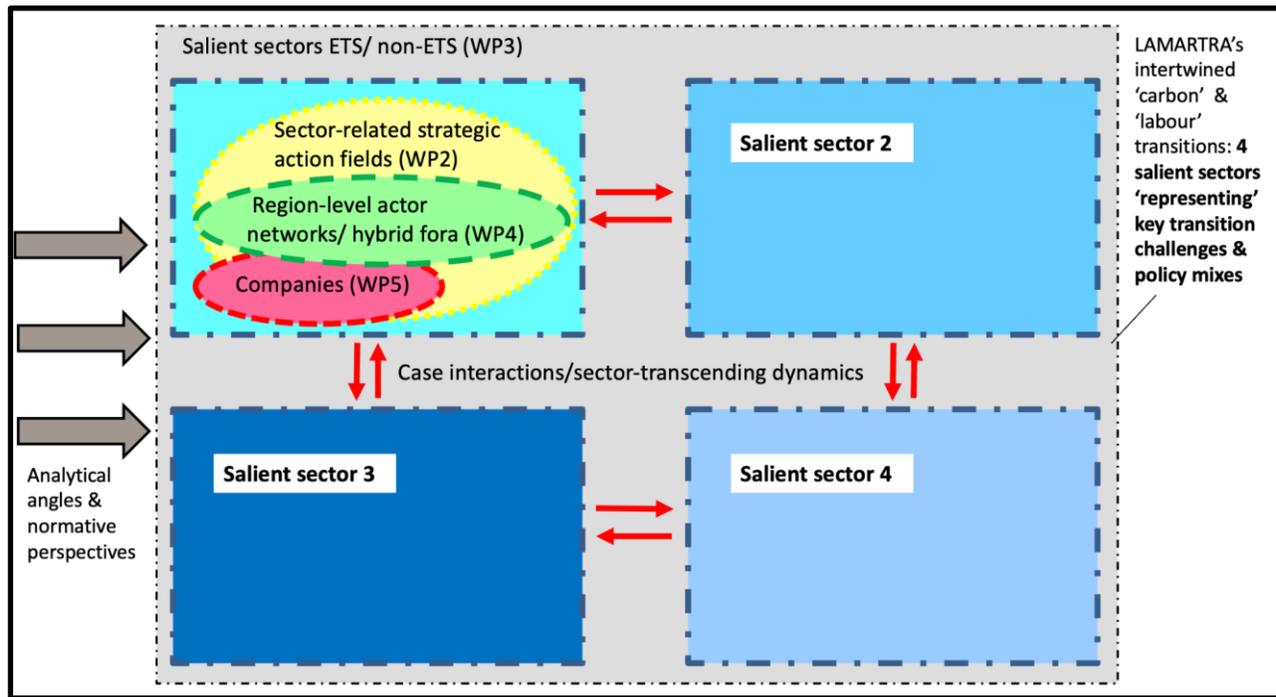


Figure 1: Interdisciplinary empirical investigations on salient sectors for the 'twin transition'

The figure shows how the twin transition will be studied through in-depth studies in 'salient sectors'. These areas of empirical investigation are spanning the primary-secondary-tertiary and quaternary sectors. The four theoretical perspectives conduct parallel empirical investigations, examining the cases along different units and levels of analysis: Sector-level analyses (including the interactions between cases) are complemented by analyses of action fields, hybrid fora, companies and individuals that are embedded within them. This yields four tracks of investigation, each with particular inputs for the LAMARTRA policy mixes:

1. **WP2. Towards integrative theory and comprehensive transitions policy mixes.** The processes of 'low--carbon/labour transition' will be studied as governance processes. They are emergent outcomes of actions of public, private and civil society actors in strategic action fields. The process analyses will therefore identify the challenges experienced by the governance actors and stakeholders involved, and analyze the policies, business strategies and governance arrangements through which these networks of actors seek to influence the transitioning process.
2. **WP3. Mapping the impact of the low--carbon transition on workers.** This analysis is empirical, aiming to quantify the impact of the low-carbon transition on workers, and in doing so, paying particular attention to vulnerable workers such as the low-educated, women and workers with a migrant background. This analysis combines a top-down approach with a bottom-up approach to describe the profiles of the 'winners' and the 'losers' of these transitions and to model how the Belgian labour market will evolve.
3. **WP4. Anticipating low--carbon/labour pathways in salient selected sectors.** The aim of this Work Package is to develop desirable low-carbon/labour futures and the pathways to reach them, for each of the four cases of the LAMARTRA project, through the conceptualization and the setting up (and its management) of a foresight exercise. The ambition of this foresight exercise is to move beyond continuity-based (Raskin & Swart, 2020), business-as-usual exercises focusing on either the environmental or the labour aspects and expert-dominated, 'technocratic' foresight that ignores situated experiences, fears and hopes of transitions. By contrast, the foresight exercise as we see it encompasses both the environmental and labour aspects of transitions and includes both expert and non-expert knowledge. It also seeks to bridge quantitative (WP3) and qualitative data

(WP4), and to inform consistent and comprehensive transitions strategies and federal-level policies (cross-sectorial, multi-level governance, short- and long-term).

4. **WP5. Engaging with transition politics at the workplace.** This WP will zoom in onto specific organizational processes within each of the four LAMARTRA cases on economic sectors. The in-depth case studies will investigate 4 cases, selected along a “best in class” rationale: these cases will constitute examples where the interests of workers and of the environment appear to be reconciled in innovative ways. This focus on critical, ‘positive examples’ helps to explore the particular conditions under which both kinds of interests have been supported. It is safe to hypothesize that workers in these organizations must have had access to many useful resources in navigating the firm-level transition processes. The analytical framework will be based on the work of Amartya Sen (2001) focusing on individuals’ resource mobilization, their generation of capabilities towards desired change, and on their involvement in the development of collective capabilities (Ferreras 2012). Then, the four cases will be analysed in a comparative light in order to identify regularities in the strategies that bring together workers, trade unions, and employers, and more broadly stakeholders, governmental actors, NGOs potentially, in seeking to steer and cope with low-carbon/labour transitioning, and hopefully succeed in the dual transition.

These different analytical foci come with different narratives of change and steering philosophies: The hybrid fora and transitions governance analyses highlight the scope for network governance, the analyses of the democratization of the firm address the roles of companies, workers and stakeholders, and the analyses of vulnerable workers and sectors address the scope for governmental support policies and concertation of the economy). Important reality checks and practical grounding are provided through continuous valorization activities (workshops and symposia), through ethnographic and transition governance analysis of transition processes, through transdisciplinary foresight study, and through regular exchanges with the diverse and experienced follow-up committee.

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