Growing Inequality:
a Novel Integration of transformations research

January 2025

D8.3

Policy Toolkit to use EU policies for addressing structural challenges in the labour market

Authors:
Cinzia Alcidi and Laura Nurski, CEPS
Associate Work Package:
WP8
Lead Beneficiary:
CEPS, WP8 partners
WP leader:
Cinzia Alcidi (CEPS)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 101004494

WP8 (Policy recommendations to reduce inequality)

GI-NI contributes to an inclusive Europe of shared prosperity by providing a better understanding of the changes and joint impact of three major transformations: technological progress, globalisation and migration; and offering policy and governance solutions to better equip citizens and companies for future challenges, securing more equal opportunities and outcomes. The project team uses a multidisciplinary research approach with international stakeholder engagement throughout the project.

The contents of this publication are the sole responsibility of the GI-NI project Consortium and do not necessarily reflect the opinion of the European Union.

Document Summary

Document type:	*Report*
Title:	*D8.3 Policy Toolkit to use EU policies for addressing structural challenges in the labour market*
Author/s:	*Cinzia Alcidi and Laura Nurski*
Reviewer/s:	*Steven Dhondt, Gerben Hulsegge*
Date:	*4-1-2025*
Document status:	*FINAL*
Keywords:	*Policy toolkit; transformations, jobs, labour market, EU regions, economic sectors, EU funds, EU regulatory framework*
Version:	*1.0*
Document level:	*Public*

Contents

1	**Introduction**		**5**
	1.1	Aim and Scope	5
	1.2	Who is this for?	5
	1.3	Why do we need a policy toolkit?	5
	1.4	Sectoral and regional focus	6
	1.5	Four policy levers	7
2	**A summary overview of the toolkit**		**8**
3	**Major transformations**		**12**
4	**How the transformations impact labour markets: Types of changes in jobs**		**16**
	Four main changes in jobs		16
5	**Types of challenges raised by changes in jobs**		**19**
	5.1	Unemployment and inactivity	20
	5.2	Skills mismatch	21
	5.3	Labour market shortages	22
	5.4	Low-quality jobs	23
	5.5	Inequalities	24
	5.6	Poverty	25
6	**Which policy tools for addressing labour market challenges**		**26**
	6.1	The actors	26
	6.2	EU Policies: levers and actions	27
	6.3	Leveraging synergies	29
	6.4	The sectoral-regional intersection	31
	6.5	Stakeholder engagement and cooperation	33
Annexe			**35**
	A1.	Sectoral labour market impacts	35
	A2.	EU normative framework and guidance (soft tools)	39
	A3.	EU regulatory framework: Directives	41
	A4.	EU funds for labour market challenges	43
	A5.	EU Industrial policy	45

1. Introduction

1.1 Aim and Scope

This toolkit aims to help stakeholders address structural challenges in the labour market in the context of four main transformations, namely the technological and green transitions, shifts in globalisation and migration. It is based on research conducted in the GI-NI project and extends the three original GI-NI transformations with the green transition. The toolkit explores the impacts of the transformations on the labour market and proposes potential preventive and adaptive responses based on the wide range of existing EU policy instruments. It provides guidance on strategic planning by suggesting how to choose such instruments and who should be involved. It closely builds on the EU perspective and frameworks defined in the European Pillar of Social Rights, the European Green Deal, and the Pact for Skills.

1.2 Who is this for?

This toolkit primarily aims to assist EU, national, and regional policymakers in implementing policies targeting workers, directly or indirectly. Furthermore, it informs various specific actors, including social partners, education and training providers, public employment services, careers guidance and counselling organisations and NGOs, who implement such policies and, through their actions, can contribute to mitigating negative labour market impacts. This toolkit is not a “how-to” manual; it provides a framework for action, offers guidance on issues linked to structural labour market changes, and serves as a repository of existing EU policies.

1.3 Why do we need a policy toolkit?

The digital transformation, driven by new technologies in production systems and workplaces, along with the shift towards alternative energy sources, is disrupting labour markets by destroying, creating, and transforming jobs. Companies and workers need to adapt by acquiring new skills and transforming safety nets. Skills will be required to develop, use, and monitor technologies, address climate change, and respond to AI-driven changes. This includes updating curricula, acquiring technical skills, and strengthening ‘soft skills’.

Geopolitical shifts, such as the US-China trade tensions, the conflict in Ukraine, and rising protectionism, could disrupt EU labour markets. Sectors like automotive, machinery, and electronics, reliant on global supply chains, may face slowdowns, job losses, or wage stagnation. At the same time, reshoring industries—like semiconductors, pharmaceuticals, and green technologies—could create high-skill jobs, though retraining workers quickly will remain a challenge, particularly in less industrialised regions. Stricter migration policies could further reduce skilled and unskilled labour flows, impacting labour-intensive sectors such as construction, agriculture, and caregiving.

These structural challenges necessitate investments in people, the establishment of robust safety nets, and effective management of the twin transition. This policy toolkit addresses these needs by focusing on critical areas such as identifying evolving skills demands, supporting workers through transitions, preventing labour market detachment, and mitigating the risks of rising inequality and poverty.

1.4 Sectoral and regional focus

The toolkit includes a sectoral and regional focus to ensure relevance across diverse EU territories. Rather than exclusively targeting broad upskilling, reskilling or compensation mechanisms, it integrates a regional and sectoral perspective into a broader framework that connects different policy areas and the need to create new, accessible opportunities for people. It emphasises the growing significance of digital and green skills and broad, inclusive strategies aligning territorial, industry and people development with recent EU initiatives beyond Cohesion Policy, such as Next Generation EU and the EU Industrial Strategy, whose scope goes beyond the labour market.

The toolkit highlights areas where labour market actors, particularly workers, face the most pressing and acute challenges. These challenges are identified through a detailed mapping of the multiple impacts of sectoral transformations. The premise is that these transformations affect sectors at varying speeds and in heterogeneous ways, with profound implications for places heavily reliant on a single sector. Such transformational changes in the labour market can give rise to structural challenges, including high unemployment, skills mismatches, labour shortages, low-quality jobs, inequalities, and the risk of poverty.

As these challenges manifest differently depending on the specific context and location, they require tailored responses at the local level. While labour and social policies remain primarily within the competence of Member States, existing EU policy tools can play a critical supporting role. These tools help mitigate risks through legislative frameworks, address ex-post negative impacts via compensation mechanisms, prepare workers for new economic realities through investments in skills, and facilitate the development of coherent, strategic approaches to structural labour market changes.

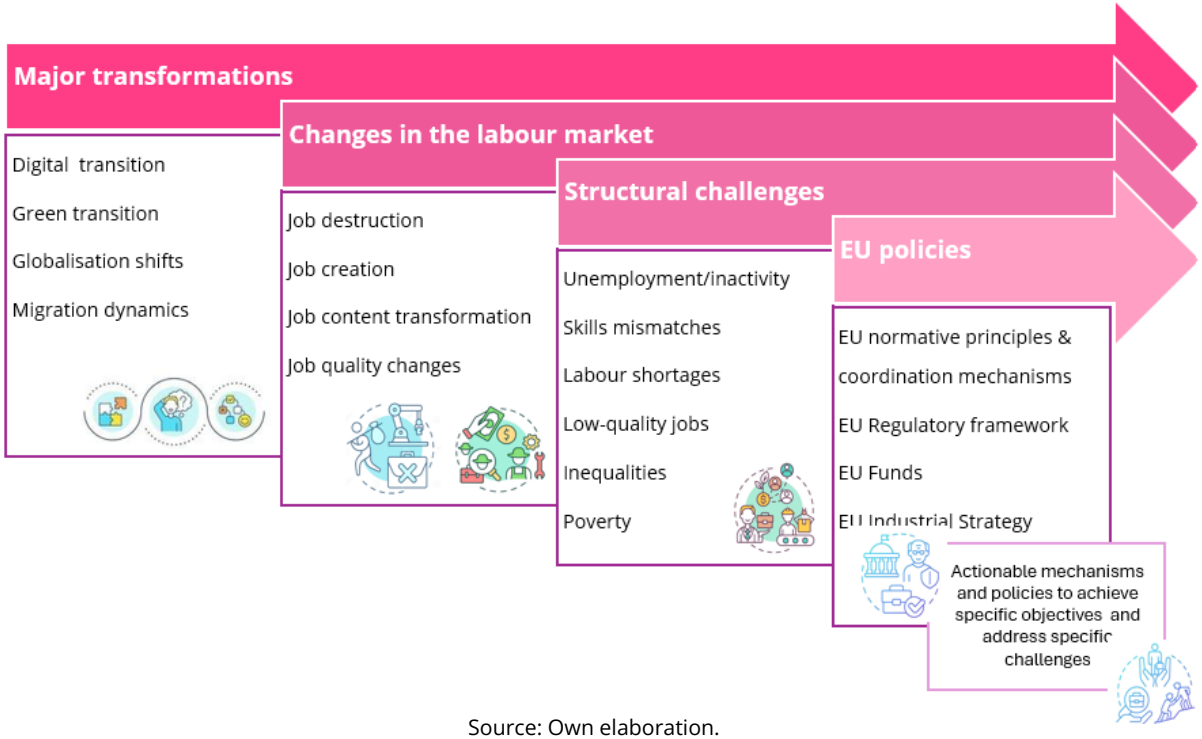
1.5 Four policy levers

The toolkit builds around four EU existing policy levers that embed actionable mechanisms and specific policies, providing opportunities for tailored responses to structural labour market challenges: EU normative principles and coordination mechanisms, its regulatory frameworks, EU funds, and last but not least, the EU industrial strategy and its initiatives (see Annex for a detailed description of each of these policy levers).

2. A summary overview of the toolkit

The toolkit outlines how various transformative forces - particularly the digital and green transition, globalisation (and its shifts), and migration impact the labour market and can lead to structural challenges and problems. It then outlines EU policy tools and strategies to mitigate negative outcomes or enhance positive impacts. It connects the transformations to their impacts on the labour market, the associated economic and social challenges, and the policies designed to address them. Figure 1 gives a breakdown of the key components of this process.

Figure 1. The analytical framework of the policy toolkit



Source: Own elaboration.

The toolkit focuses on four major transformations that are reshaping the economic and labour landscape:

- **Digital transition:** The rise of automation, AI, and digitalisation is transforming traditional jobs and industries while creating demand for new technological skills.

- **Green transition:** Efforts to decarbonise the economy and embrace sustainable energy systems are creating sectoral shifts, with renewable energy industries expanding while fossil fuel-related sectors decline. Energy efficiency building and circular economy mechanisms create demand for green skills while changing production systems.

- **Globalisation shifts:** Shifts in globalisation, including near-shoring, reshoring, protectionism or reorganisation of supply chains, alter how industries operate and trade internationally.

- **Migration:** Fluctuating migration flows driven by increasing conflicts and climate change, combined with changing domestic politics, are impacting labour availability and diversity in specific sectors, posing both opportunities and challenges.

Given the broad nature of the transformative forces, their impact on the labour market is likely to result in:

- **Job destruction:** Industries unable to adapt to new technologies or green mandates will likely face downsizing or even closure, leading to job losses and/or worker displacement.

- **Job creation:** Emerging sectors such as renewable energy, tech innovation, and circular economies (like waste management and recycling) generate new employment opportunities.

- **Job content transformation:** Workers require reskilling or upskilling to adapt to new technologies and sustainable practices.

- **Job quality changes:** With the rise of non-standard forms of employment (e.g., platform work), there is a heightened risk of precarious jobs with inadequate labour protection.

These changes, which manifest differently across sectors, can lead to a range of economic and social challenges and negative social outcomes that can be clustered under six categories:

- **Unemployment and inactivity:** Specific industries, such as coal mining or traditional manufacturing, face sharp declines, leading to job insecurity, unemployment, potentially raising inactivity, and regional disparities.

- **Skills mismatch:** The growing demand for new skills and job transformations raises the risk of the growing disconnect between the skills workers possess and those demanded by industries.

- **Labour shortages:** As some sectors expand rapidly (e.g., green construction or digital technologies) or working conditions deteriorate in others, an acute shortage of qualified professionals may materialise.

- **Low-quality jobs:** The proliferation of precarious work, particularly in the gig economy or under non-standard contracts, exacerbates income instability.

- **Inequalities**: Transformations can widen economic, social, and regional disparities, with some socio-economic groups or regions struggling to adapt more than others.

- **Poverty:** Long-term unemployment, inactivity but also low work intensity can dramatically increase the risk of poverty.

To address these challenges and ensure that labour market transformations yield inclusive and sustainable outcomes, the diagram points to four EU policy levers that embed actional mechanisms and policies EU, national and regional actors can rely on:

- **EU normative principles and coordination mechanisms:** These high-level principles guide policies in line with EU values. They are non-binding guidelines and frameworks that help Member States align with EU objectives in addressing labour market challenges, particularly in line with the European Pillar of Social Rights.

[3] There is a 60% rank-order correlation between poverty rate of migrants and host-country perception of the economic impact or migrants (the higher percentage of poverty of migrants, the less the host countries see migrants as having a positive economic impact). We used data from OECD/European Commission (2023), Figures 1.5 and 5.5. We excluded the Eastern-EU countries because of their low number of migrants.

- **Regulatory framework:** These are binding measures, laws and directives that ensure consistent labour policies across the single market. They include directives on minimum wages, platform work, and gender pay transparency, which aim to improve labour standards and reduce inequalities.

- **EU Funds:** Financial resources to support national and regional initiatives. Instruments like the Just Transition Fund (JTF), European Social Fund Plus (ESF+), and European Globalization Adjustment Fund (EGF) provide financial resources to support workforce reskilling, promote social inclusion, and assist regions transitioning to green and digital economies.

- **EU Industrial Strategy:** This strategy underpins efforts to support industrial modernisation, foster innovation, and ensure that Europe remains competitive in emerging green and digital sectors while creating high-quality employment.

One complication from a policy perspective is that the outlined transformations are interdependent; for instance, technological advancements are both a driver and an enabler of the green transition. Similarly, globalisation trends influence migration patterns and labour market opportunities. The policy response should, therefore, be holistic, combining financial instruments, regulatory reforms, and strategic guidance to address immediate and long-term labour market challenges. Reskilling workers for the green and digital economy, mitigating regional disparities, and ensuring decent work conditions are central to fostering an equitable and sustainable labour transition.

Note to the reader
For those seeking a general overview, the information provided so far offers a concise summary and those readers may skip to chapter 6 for relevant EU policies. Readers with a deeper interest are invited to continue for further detail and analysis. In the sections below, we will move through the above-mentioned analytical levels in more detail one by one: from the global transformations (chapter 3) to labour market changes (chapter 4), to the resulting social challenges (chapter 5) and finally, EU policies that can help address them (chapter 6).

3. Major transformations

The four major transformations are reshaping economies and societies, creating both opportunities and challenges that demand adaptation at multiple levels. The labour market is one of the primary arenas where these transformations drive significant change (see Figure 2). Given their complexity and broad scope, it is important to clarify the concepts and provide illustrative examples of how they unfold to enhance understanding.

Source: AI-generated

Digital transition: refers to the process of adopting and integrating digital technologies into all areas of an organisation, economy, or society. It involves leveraging digital tools and platforms to enhance processes, services, and communication, often emphasising data-driven technologies and automation. Key drivers of digital transition include technologies such as cloud computing, artificial intelligence (AI), big data, the Internet of Things (IoT), and digital communication tools. While primarily aimed at improving efficiency, productivity, and user experience, digital transition tends to be a gradual, step-by-step integration rather than a radical overhaul. Notably, digitalisation has been a significant enabler of globalisation by breaking down barriers to trade and communication. Examples of digital transition include digital banking, e-commerce platforms, and e-government services. Digital transition differs from—but is closely related to—technological transformation, which refers to broader changes driven by the adoption of various types of new technologies. Technological

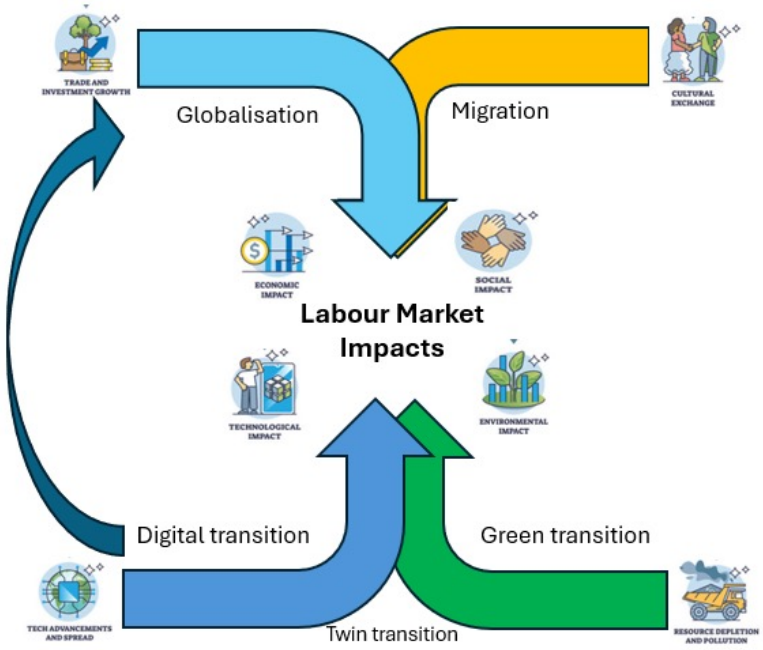
transformation involves reshaping processes, industries, and societies through innovation across multiple technological domains, including mechanical, electrical, biological, and digital technologies. Unlike digital transition, technological transformation often entails radical, long-term shifts that can disrupt entire economies, industries, and labour markets. Examples include the Industrial Revolution (mechanical and steam technologies), the green energy transformation (renewable energy technologies), and medical advancements (biotechnology and genetic engineering). The toolkit focuses on the digital transition and its societal and social impacts.

Green transition: refers to the process of shifting economies, industries, and societies toward environmental sustainability by reducing carbon emissions, conserving natural resources, and promoting environmentally friendly technologies. Its primary goals include combating climate change, promoting renewable energy, fostering a circular economy, and reducing environmental degradation through sustainable practices. This can be achieved by achieving carbon neutrality (net-zero emissions), transitioning from fossil fuels to renewable energy sources (solar, wind, hydro), promoting sustainable production and consumption (circular economy), preserving biodiversity and protecting ecosystems and reducing waste and pollution through improved environmental management. The achievement of the green transition goals depends largely on technological transformation. The concept of twin transition captures the interconnected and mutually reinforcing nature of the green and digital transitions. It refers to the simultaneous pursuit of environmental sustainability (green transition) and the adoption of digital technologies (digital transition). Digital tools, such as big data, artificial intelligence, and IoT, are increasingly crucial for advancing green objectives (e.g., optimising energy efficiency or monitoring carbon footprints) while ensuring that digital transformation itself is environmentally sustainable (e.g., reducing the energy consumption of data centres). In the European Union's policy agenda, the "Twin Transition" is a key pillar of the EU's European Green Deal and Digital Strategy.

Globalisation is a complex and multifaceted process characterised by the increasing interconnectedness and interdependence of the world's economies but also societies and political systems. It involves the integration of markets, technologies, communication networks, and governance structures across national borders. Globalisation has been propelled by advancements in transportation, communication technologies, and international trade policies, creating a more interconnected global environment. For this policy toolkit globalisation is intended in its economic dimension as the expansion of international trade, investment, and financial flows which have led to the creation of global markets and production networks, hence transforming production systems. Multinational corporations, global supply chains, and international financial institutions play a central role in the globalisation process. Recent shifts in the geopolitical landscape are reshaping the dynamics of globalisation, moving it toward a less open and more security-driven paradigm. Factors such as rising protectionism, trade restrictions, and a reassessment of value chains and production systems contribute to increased uncertainty about the implications for the EU labour markets.

Migration: refers to the movement of people across geographical boundaries, whether within a country (internal migration) or across international borders (international migration, or EU mobility when it occurs within the EU). This movement is driven by a range of economic, social, political, and environmental factors. Migration has become increasingly central to global debates due to its scale, complexity, and far-reaching impacts on societies, economies, and cultures. It is deeply interconnected with globalisation, which has accelerated migration by fostering an interconnected world where goods, services, information, and people move more freely. Reduced barriers to international travel, along with expanded opportunities for work, education, and improved living conditions, have further spurred migration flows. Digital connectivity, such as the internet and social media, has amplified this trend by providing access to information on migration opportunities, job markets, and living conditions abroad, thereby influencing both migration intentions and actual migration patterns. Today, migration reflects a highly complex process shaped by factors such as shifts in economic globalisation, conflicts, climate change, divergent demographic trends, and increasingly nationalistic politics in destination countries.

Figure 2. The transformations



Source: Own elaboration

Further reading

Readers with a deeper interest in the topic can explore the European Commission's Competence Centre on Foresight. Launched in 2018 as part of the EU Policy Lab, it strengthens anticipatory policymaking by embedding foresight into the EU's strategic framework. In its Megatrends Hub, 14 megatrends are listed and documented, including technological change, climate change and resource scarcity.

For an academic reading of the past technological revolutions, see Perez, C. (2002) Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages. Cheltenham, UK: Edward Elgar.

4. How the transformations impact labour markets: Types of changes in jobs

These ongoing transformations - digital and green transitions, shifts in globalisation, and migration - are driving transformative changes in labour demand, employment structures, and skill requirements, with impacts materialising at different speeds and intensities across sectors countries and regions. While some areas and industries adapt quickly, others face significant challenges, leading to uneven outcomes. Urban areas and highly digitalised sectors, such as finance and technology, are benefiting the most, while rural and carbon-intensive regions - often reliant on traditional industries - are grappling with economic disruption and rising unemployment. Sectors like agriculture and construction, though slower to adapt, are under growing pressure to modernise through innovations such as precision farming, green buildings, and digital tools.

Four main changes in jobs

Source: AI-generated

The transformations operate multiple, heterogeneous changes that will be largely visible at the sectoral level. These changes result in a variety of impacts on the labour market that can be synthesised into four categories of changes applied to jobs. Table 9 in Annex A1 offers a detailed overview of the expected changes in the production system at sectoral level and their expected impact on labour. The actual impacts will depend on the policy and the regional/territorial context.

1. Job losses and worker displacement

The reduction or elimination of roles in certain sectors, industries, or regions due to automation, decarbonisation, or shifts in economic activity can lead to job destruction or displacement. Decarbonisation policies, for instance, drive job losses in traditional industries such as fossil fuel production. Similarly, automation replaces routine tasks in manufacturing, retail, and transportation sectors, reducing demand for low-skilled roles and contributing to worker displacement.

2. Job creation

The transformations, often driven by technological advancements, the shift to greener economies, or changing societal and economic needs, can lead to new job roles or sectors. The green transition, in particular, is fuelling demand for roles in renewable energy, the circular economy, and sustainable infrastructure. Likewise, demographic changes and evolving societal needs drive growth in social sectors like healthcare, education, and care services. However, despite this growth, many roles—especially in social sectors—remain low-paid, raising concerns about job quality.

3. Job content transformation

Transformations are reshaping the skillsets required across the economy. The evolution of existing job roles due to changes in required skills, technologies, or processes is transforming job profiles. This often involves a shift in competencies, combining traditional knowledge with new expertise. With reference to skills Digital Skills: Demand for digital skills has surged across all sectors due to automation, digitalisation, and AI integration. While industries such as IT, finance, and professional services require advanced technological expertise, even manufacturing and retail are adopting automation tools, altering job profiles. Green Skills: The green transition is creating a demand for skills in renewable energy, energy-efficient construction, and electrification of transportation. Workers in traditional sectors such as oil, coal, and heavy industry are particularly vulnerable to displacement and require reskilling to transition into emerging green industries.

4. Job quality changes

Transformations reshape how jobs are performed, affecting working environments, contracts, and job quality. These shifts present economic opportunities but also risks, including exacerbating structural labour market challenges and polarizing working conditions. Precarious employment, such as gig work driven by platform economies and automation, often lacks social protections and job security. Medium-skilled workers displaced from traditional industries frequently move into low-wage service jobs with limited upward mobility, while highly skilled workers may benefit from better

pay and reduced working hours. Global competition has intensified cost-cutting through outsourcing and reliance on flexible, low-wage labour, eroding job quality in sectors like manufacturing, logistics, and low-skilled services. Migrant workers often fill lower-paid, precarious roles in agriculture, construction, hospitality, and care services. While migration helps address labour shortages, integration challenges reinforce segmentation, concentrating some groups in low-quality jobs.
Table 1 offers examples of how each of the transformations can lead to job changes. By creating or reinforcing barriers to access opportunities, disparities in outcomes, or imbalances in job quality, they contribute to economic and social challenges to which policies are designed to respond.

Table 1. Transformation and sectoral labour market impacts - Examples synthesis

Type	Job losses and worker displacement	Job creation	Job profiles transformation	Job quality changes
Digital transformation	Automation and AI replace routine roles in manufacturing, retail, and administration.	Increased demand for AI, cybersecurity, fintech, and software development roles.	Financial advisors incorporate digital tools and data analytics into their roles.	Rise of platform-based gig work, increasing flexibility but also precariousness.
Green transition	Job losses in fossil fuel industries, coal mining, and other carbon-intensive sectors	Creation of jobs in renewable energy, sustainable construction, circular economy, and climate risk assessment	Construction workers requiring skills in energy-efficient building techniques and renewable energy systems	Jobs in renewable energy often involve remote or hazardous locations, requiring better safety standards
Globalisation	Outsourcing and offshoring of tasks leading to job displacement in low- and medium-skilled manufacturing	Growth in roles linked to global supply chain management, export facilitation, and financial hubs in emerging markets	Roles in trade and logistics adapting to regional trade blocks and sustainability requirements	Intense competition in global markets leads to cost-cutting measures such as short-term contracts or lower wages in some sectors
Migration	Displacement of domestic workers in some sectors due to competition or preference for migrant labour in low-wage roles	New opportunities in care services, agriculture, and hospitality to address labour shortages.	Cross-cultural communication and multilingual abilities becoming essential in customer-facing roles	Migrant workers often take on roles with poor working conditions, limited protections, or high physical demands

5. Types of challenges raised by changes in jobs

Job changes unfold at sectoral and spatial levels, interact with local context and policies and can lead to six broad key socio-economic challenges: unemployment and inactivity, labour shortages, skills mismatches, low-quality jobs, inequalities, and poverty. These challenges do not exist in isolation; rather, they are interconnected and can manifest in various ways depending on regional and sector-specific dynamics. In practice, each of those challenges can materialise into more specific sub-challenges, which may vary in intensity and impact across different labour markets and demographic groups. For instance, unemployment and inactivity may take the form of long-term unemployment, youth unemployment, or underemployment, each requiring tailored policy interventions. Similarly, labour shortages may result from demographic changes, evolving skill demands, or geographic imbalances in job availability. To provide a clearer understanding, Tables 2 to 7 below map, define and exemplify the sub-challenges offering insights into their economic and social impacts. This detailed framework aims to support policymakers and stakeholders in diagnosing and anticipating labour market challenges and potential negative social outcomes. Such an approach is essential not only for understanding the complexity of these issues but also for designing and implementing effective policy responses that address both immediate needs and long-term structural changes.

Source: AI-generated

5.1 Unemployment and inactivity

Unemployment refers to the situation where individuals who are actively seeking work are unable to find employment. Inactivity refers to individuals outside the labour force who are neither employed nor actively seeking work (e.g. retirees, students who are not working, and individuals unable to work due to health, caregiving duties, or discouragement from job searching). They are not counted in unemployment statistics since they are not seeking employment. The digital and green transitions can exacerbate unemployment and inactivity, particularly among workers with low skills, in declining industries, or in vulnerable regions. Similarly, globalisation further amplifies these challenges by exposing labour markets to international competition, causing job displacement, and increasing inequalities.

Table 2. Typology of unemployment and inactivity

Type	Definition	Example	Impact
Unemployment	People (15-74) without work during the reference week, available to start work within two weeks and actively seeking employment during the last four weeks.	A factory worker is laid off and actively applying for jobs.	Reduced economic productivity, loss of income, and increased social welfare costs.
Short-term Unemployment	Unemployment lasting less than 12 months.	A recent graduate looking for their first job for three months.	Transitional, with minimal long-term impact if addressed quickly; may slow consumption temporarily.
Long-term Unemployment	Unemployment lasting 12 months or more.	A steel industry worker cannot find work for over a year after a factory closure.	Skill erosion, social exclusion, and long-term income loss; significant burden on welfare systems.
Underemployment	Employed persons who wish to work additional hours and are available to do so.	A part-time delivery driver seeking a full-time job.	Underutilisation of labour reduces productivity and income, leading to economic inefficiency.
Inactivity	Individuals not in employment who are neither unemployed nor actively seeking work.	A stay-at-home parent not currently looking for work.	Decreased labour supply, particularly in sectors experiencing shortages, and slower economic growth.

5.2 Skills mismatch

Skills mismatch occurs when there is a discrepancy between the skills possessed by workers and the skills demanded by employers in the labour market. This misalignment can hinder productivity, limit economic growth, and reduce individual job satisfaction. It can happen when workers are: i) Overqualified or underqualified for their roles (vertical mismatch, or related to skills 'depth'), ii) Working in occupations that do not match their acquired skills (horizontal mismatch, or related to skills 'breadth'), and iii) Unable to access adequate training or education to align with evolving labour market needs (future-oriented mismatched, or related to skills 'preparedness'). The digital and green transitions by putting pressure on skills, making current ones outdated and requiring new skills, are likely to result in larger and multiple forms of mismatches.

Table 3. Typology of skills mismatches

Type	Definition	Example	Impact
Skill Shortages	Insufficient supply of workers with the required skills	Shortage of data scientists in the tech sector	Low productivity, wage increase or skills in demand
Vertical mismatch – overqualification or skills underutilisation	Workers with higher qualifications or diplomas that needed for the job	University graduate working as a cashier or in the hospitality sector	Wasted human capital, reduced job satisfaction, and lower productivity.
Vertical mismatch - underqualification	Workers lack the qualifications or skills needed for the job	A technician without certification or licence in advanced roles	Lower productivity, higher error rates, and safety risks.
Horizontal mismatch	Skills are appropriate in level but not in the field	Graduate in physics working as a financial analyst	Inefficient use of specialised education and training investments
Geographical mismatch	Workers' skills are in demand in a different region than where they live	Doctors or teachers needed in rural areas	Labour market imbalances and unmet regional economic needs

5.3 Labour market shortages

Labour market shortages occur when the demand for workers in a specific occupation, sector, or geographic area exceeds the available supply of workers. Three key factors can drive these shortages. First, labour supply-driven quantitative shortages arise when there are simply not enough workers to meet employers' needs, often due to demographic changes such as an ageing population or low labour participation rates. Second, labour supply-driven qualitative shortages occur when workers lack the necessary skills, qualifications, or experience for available jobs, such as in rapidly evolving sectors like technology or healthcare. Finally, labour demand-driven shortages result from unattractive working conditions or wages that fail to draw workers into specific roles, as seen in agriculture or construction. Shortages can be short-term, driven by seasonal demand (e.g., agriculture and tourism), or long-term, influenced by structural changes like depopulation or skills mismatches, potentially disrupting economic activity and leaving key vacancies unfilled.

Table 4. Typology of labour shortages

Type	Definition	Example	Impact
Supply-driven quantitative shortages	Shortages are caused by an insufficient number of workers to meet demand, often due to demographic trends or low participation rates.	An ageing population reducing the workforce in healthcare and elderly care.	Delays in service delivery, increased pressure on existing workers, and rising labour costs.
Supply-driven qualitative shortages	Shortages arise when workers lack the necessary skills, qualifications, or experience required for available jobs.	A lack of software developers with expertise in artificial intelligence and cybersecurity.	Hinders innovation, reduces competitiveness, and increases the need for reskilling and upskilling initiatives.
Demand-driven shortages	Shortages resulting from unattractive working conditions, such as low wages, poor job quality, or unsocial working hours, deterring job seekers.	Vacancies in agriculture and construction due to physically demanding work and low pay.	Leads to unfilled positions, reliance on migrant or temporary labour, and production delays or stagnation in key sectors.

5.4 Low-quality jobs

While many definitions of job quality are in use globally, in the EU policy debate (European Commission, Eurofound, and European Pillar of Social Rights), it typically refers to employment that falls short in seven dimensions across physical working conditions, contractual employment conditions, social environment and job content (see Eurofound's Job Quality framework). Low-quality jobs or quality deterioration of current jobs can emerge from the intensification of the transformations leading to negative, social and economic outcomes.

Table 5. Dimensions of job quality

Dimension	Definition	Example	Impact
Physical Environment	Refers to the working conditions related to physical aspects, including exposure to noise, temperature extremes, and ergonomic risks.	A factory worker operating machinery in a noisy environment.	Poor physical conditions can lead to health issues, reducing productivity and increasing absenteeism.
Work Intensity	Measures the demands of the job, such as workload, time pressure, and the pace of work.	A journalist facing tight deadlines for multiple articles.	High work intensity can cause stress and burnout, negatively affecting employee well-being and performance.
Working Time Quality	Assesses aspects of working hours, including length, scheduling, flexibility, and the balance between work and personal life.	A nurse working irregular night shifts.	Poor working time quality can disrupt work-life balance, decreasing job satisfaction and higher turnover rates.
Social Environment	Encompasses relationships with colleagues and supervisors, social support, and exposure to adverse social behaviours like harassment or discrimination.	An office employee experiencing workplace bullying.	A negative social environment can harm mental health, reducing collaboration and overall workplace morale.
Skills and Discretion	Pertains to the level of skill required for the job and the degree of autonomy and control workers have over their tasks and decisions.	A software developer with the freedom to choose programming tools.	Higher skills and discretion enhance job satisfaction and innovation, contributing to economic growth.
Prospects	Relates to job security, career progression opportunities, and employability, including the likelihood of job loss and availability of advancement.	A retail worker on a temporary contract with no promotion prospects.	Limited prospects can lead to job insecurity, affecting employee motivation and increasing turnover, which disrupts productivity.
Earnings	Concerns about the financial compensation received for work, including wages, salaries, and other monetary benefits, as well as perceptions of fair pay.	A teacher receives a salary below the national average for their profession.	Inadequate earnings can result in financial stress, reducing employee morale and potentially increasing poverty levels.

5.5 Inequalities

Inequalities in the labour market refer to unequal access to employment opportunities, earnings, job quality, and career progression across different groups of people. These disparities often stem from structural factors, discrimination, and unequal access to education or skills development. The intensification of and the interaction among the transformations can amplify existing inequalities or drive new ones.

Table 6. Typology of labour market inequalities

Typology	Definition	Mechanism	Impacts
Gender and racial inequality	Disparities in employment rates, wages, and career opportunities based on gender or race.	Overrepresentation in lower-paying sectors and occupations. Unequal distribution of unpaid labour. Discrimination.	Economic losses, reduced productivity, underutilisation of talent and exclusion.
Age-based inequality	Disparities in employment outcomes due to age, affecting younger and older workers.	Youth are more often in precarious work. Older workers face discrimination in hiring.	Intergenerational inequality, loss of experienced workforce, and social exclusion.
Skills and education inequality	Unequal access to quality education and training.	Workers with lower skills or educational attainment face higher unemployment, lower wages, and less training.	Persistent poverty, unemployment and career stagnation, among low-skilled workers.
Income and wage inequality	Unequal distribution of wages and income among workers	Large wage differences between high- and low-skilled workers. The working-poor are unable to meet basic living standards despite being employed.	Rising income inequality, poverty cycles, and economic instability.
Regional inequality	Disparities in job opportunities and infrastructure across different regions or urban/rural areas.	Urban areas have better job opportunities and infrastructure. Limited mobility prevents workers to access better opportunities.	Uneven development, the brain drain from less-developed areas, and social inequality
Inequality for migrants & refugees	Barriers faced by migrant and refugee workers in accessing employment.	Lack of recognition of qualifications, discrimination in recruitment.	Underutilisation of migrant skills, economic exclusion, and income disparities.
Inequality of opportunity	Unequal access to quality education, employment, and career progression due to socioeconomic or structural barriers	Workers from low-income families face disadvantages in accessing education and job opportunities and lack networks and connections	Reinforcement of poverty cycles and reduced social mobility.

5.6 Poverty

Poverty in the EU is generally defined through a multidimensional approach that captures both income poverty and broader forms of deprivation. The primary measures used are based on concepts such as i) monetary poverty: insufficient income to maintain a standard of living considered acceptable in a specific society; ii) material and social deprivation: inability to afford essential goods and services (e.g., housing, heating, nutrition); and, iii) social exclusion: marginalisation or exclusion from economic, social, and cultural participation in society due to poverty and deprivation. Together, these three dimensions form the basis of the EU's "At Risk of Poverty or Social Exclusion" (AROPE) indicator. The intensification of the digital transition and the green transition, combined with shifts in globalisation and new migration dynamics along with their interplay, can significantly heighten the risk of poverty and social exclusion. Individuals with low skills, those from disadvantaged socio-economic backgrounds, and those with limited capacity to adapt to change are particularly at risk of being left behind as these transformations reshape economies and societies.

Table 7. Typology of labour market inequalities

Type	Definition	Example	Impacts
Monetary poverty	Insufficient income to maintain a standard of living is considered acceptable in a specific society.	A family living below 60% of the national median income struggles to cover basic needs.	Financial stress, reduced access to goods and services, and increased reliance on social welfare systems.
Material and social deprivation	Inability to afford essential goods and services, such as housing, heating, or adequate nutrition.	A household is unable to heat their home during winter or afford a daily nutritious meal.	Poor living conditions, health deterioration, and deepened inequality due to unmet basic needs.
Social exclusion	Marginalisation from economic, social, and cultural participation due to poverty or deprivation.	A long-term unemployed person is unable to access education, social services, or community activities.	Isolation, reduced opportunities for employment or social mobility, and erosion of social cohesion.

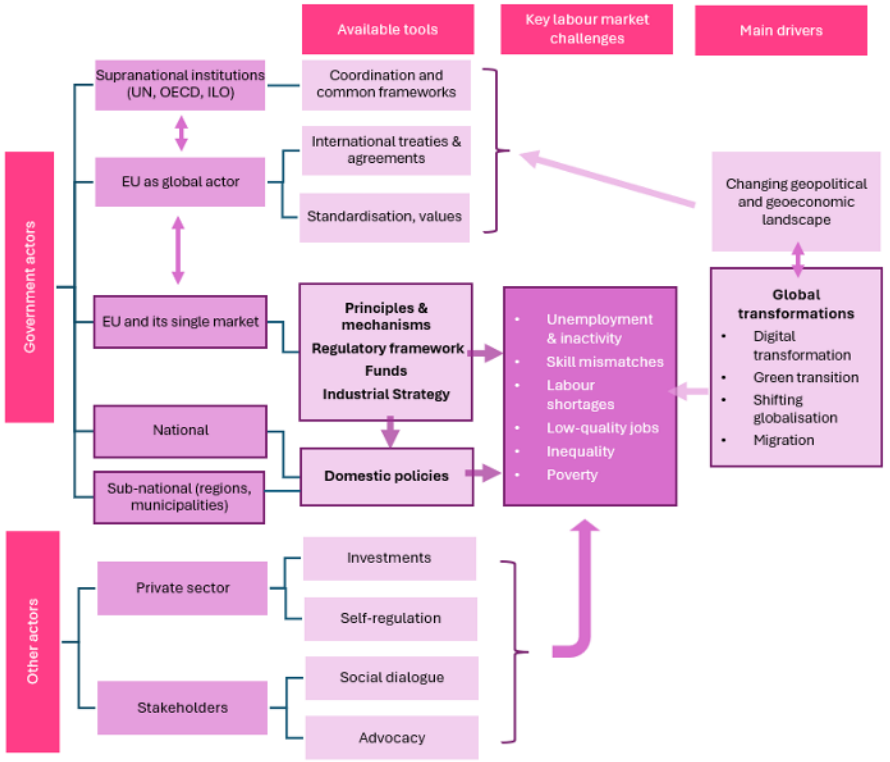
6. Which policy tools for addressing labour market challenges

Addressing the multiple and multifaceted challenges mapped above requires the involvement of the different actors, the knowledge of the potential policy tools available and the identification of the most adequate.

6.1 The actors

While megatrends and large-scale transformations operate beyond the scope of the EU, various actors at the EU, national, and sub-national levels can take proactive steps to address the structural challenges they pose to labour markets. Figure 3 highlights the different levels of governance (ranging from global to local, government, non-government and private) that can play a role in initiating, activating, or implementing policy actions. The central part of the figure, marked with thicker borders, illustrates the dynamic interaction and intervention points between the EU, national, and sub-national levels.

Figure 3. Actors, tools, challenges and drivers



Source: based on Shamsfakhr and Alcidi (2024) GI-NI D8.1

At the EU level, four key policy levers enable coordination, funding, and regulatory alignment. These provide a framework for addressing labour market challenges comprehensively. National and regional actors complement this by implementing targeted measures tailored to their specific contexts. The EU, through its single market, establishes broad principles, strategies, and regulations that set the foundation for national policies. Member States' governments, which retain full competency in labour and social policies, are responsible for translating these EU guidelines into domestic policies, while regional and local governments adopt and implement them to meet local needs. These localised efforts ensure direct engagement with workers and the effective delivery of programs on the ground.

The EU interfaces with international organisations (upper part of the Figure), contributing to and shaping global norms and standards. This global engagement ensures that EU policies align with international developments and practices. The EU also collaborates with non-governmental and private organisations (lower part of the Figure), which play pivotal roles in influencing the impact of transformations and implementing policies. These partnerships are critical to ensuring the effectiveness and adaptability of labour market interventions.

6.2 EU Policies: levers and actions

This toolkit highlights four key policy levers to tackle the above challenges and ensure that labour market transformations deliver inclusive and sustainable outcomes:

- **EU normative principles and coordination mechanisms:** High-level, non-binding principles that reflect EU values and offer strategic guidance to Member States. These frameworks, such as the European Pillar of Social Rights (EPSR), help align national policies with EU social objectives.

- **Regulatory framework:** Binding measures that ensure harmonised labour policies across the single market. Examples include directives on minimum wages, platform work, and gender pay transparency.

- **EU funds:** Dedicated financial instruments to support national and regional initiatives, such as the Just Transition Fund (JTF), European Social Fund Plus (ESF+), and European Globalisation Adjustment Fund (EGF).

- **EU industrial strategy:** A framework to support industrial modernisation, drive innovation, and maintain Europe's competitiveness in green and digital sectors.

Table 10 through Table 13 in Annexes A2-A5 give a detailed overview of each of them, their purpose and the concrete policy tools (from Directives to specific EU funds, to coordination mechanisms) they embed.

Table 8 provides an overview of how the four EU policy levers can address the six broad categories of challenges identified in the previous section: unemployment and inactivity, skills mismatch, labour market shortages, low-quality jobs, inequalities, and poverty. Each column focuses on one of the four policy types above.

Table 8. Examples of how policy tools address labour market challenges- Heatmap

Policies Challenges	EU Normative principles and coordination mechanisms	EU Regulatory framework	EU Funds	EU Industrial strategy
Unemployment and inactivity	EPSR Principle 4: Active support to employment; Youth Guarantee; Quality Framework for Traineeships.	Work-Life Balance Directive promotes inclusion in the labour market.	ESF+ funds for job creation and retraining; EGF for displaced workers; JTF for job preservation	Just Transition Mechanism for reemployment in green sectors.
Skills mismatch	EPSR Principle 1: Lifelong learning; European Skills Agenda: Pact for Skills; ILA & Microcredentials Framework	Limited regulatory focus	ESF+ and JTF for training, up- and reskilling	Net-Zero Academies provide dedicated training for net-zero industries. European Battery Alliance
Labour market shortages	EPSR Principle 5: Secure and adaptable employment; European Labour Migration Platform.	Several Directives improve job quality (see below), reducing demand-driven shortages.	ESF+ for addressing shortages in critical sectors; Skills and Talent Package attracts non-EU talent.	Nothing
Low-quality jobs	EPSR Principles 6-10: e.g. Principle 10: Healthy, safe work environments; Principle 6: Fair wages.	Directives on Occupational Health and Safety, Minimum wage, Working time and Predictable working conditions.	Limited funding focus	Just Transition Mechanism incentivises quality green jobs.
Inequalities	EPSR Principles 2: Gender equality; Principle 3: Equal opportunities;	Directives on Gender Pay Gap, Work-Life Balance and Temporary Agency Work	ESF+ programmes target excluded groups (youth, migrants).	Focus on regional inequalities
Poverty	EPSR Principles 11-20 on social protection and inclusion.	EU Minimum Wages Directive	ESF+ targets poverty alleviation and material deprivation.	Limited direct impact but fosters long-term economic opportunities.

Source: Own elaboration

Note: The darker the colour, the stronger the matching between the purposes of the policy tool and the challenge

The cells exemplify specific policy tools or initiatives that can respond to each of these challenges, demonstrating where policies are most impactful (darker shades) and where gaps remain (lighter to no shade).

The table reveals several notable patterns. EU normative principles and guidelines, particularly the EPSR, play a foundational role across most challenges, offering overarching principles for employment support, inclusion and fair working conditions. Regulatory frameworks focus heavily on improving job quality and reducing inequalities through health, safety, and fair pay directives.
EU funds, such as the European Social Fund Plus (ESF+) and the Just Transition Fund (JTF), are particularly aimed at addressing unemployment, reskilling (hence supporting activation policies and inclusion), and poverty alleviation. However, industrial strategies appear highly targeted to excelling in training for emerging green industries and compensation mechanisms for impacted industries but show gaps in addressing labour market shortages and inequalities more broadly. This highlights the need for a more comprehensive industrial approach to tackle shortages and inequalities, but also the potential for powerful synergies.

6.3 Leveraging synergies

Making the most of the EU policy tools requires not only levering each of them in their core impact areas but also creating synergies among the different tools. Coordinating across governance levels, tools, policy areas and challenges will maximise the impact on the social challenges to be addressed.

- **Alignment across policy actors:** While the EU regulatory framework has a straightforward mechanism for transposing EU directives to national laws, this is less the case for the other EU policy tools described in this toolkit. Aligning EU funds, mechanisms and strategies with national and regional ones would maximise their joint impact and avoid wasteful redundancies.
Example: Skill anticipation or forecasting exercises occur both at the EU level (e.g., through Cedefop) and regional levels. Regional actors, with better data on local skill supply and demand, can provide inputs to enhance EU-level models, ensuring forecasts reflect real labour market needs.

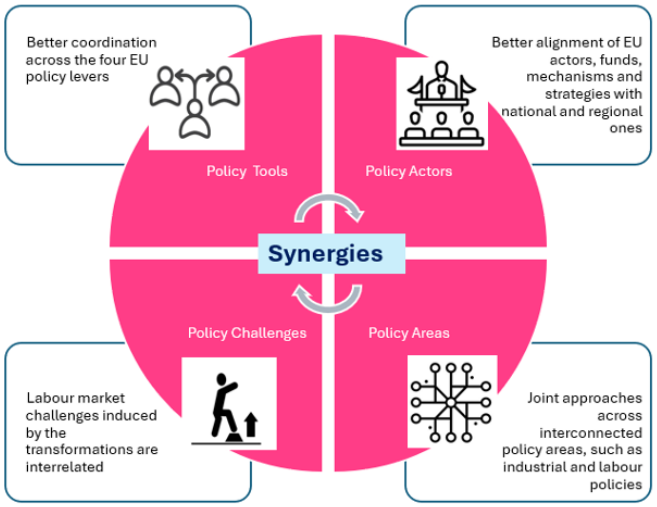
- **Alignment across policy tools:** Table 7 highlights several opportunities for better coordination across the four types of policy instruments. One notable gap is the limited use of EU funds (such as the ESF+) for raising job quality. While the regulatory framework addresses mainly physical and contractual working conditions (such as wages, working time, and safety), the EU funds could be used to raise the other dimensions of job quality (outlined in Table 4) such as work intensity, skills and discretion and the social environment (including leadership practices and culture).

Example: The ESF+ programme in Flanders funds projects to redesign both organisational structures (allocation and coordination of work) and individual jobs with the explicit goal of creating more sustainable, high-quality work. This can serve as a model for other regions to enhance job quality across multiple dimensions.

- **Alignment across social challenges:** Many of the labour market challenges induced by the megatrends are interrelated. Labour shortages, for instance, can be caused by insufficient job quality making people unwilling to work under poor working conditions. Another example is the relationship between poverty and inactivity or unemployment: while employment is the best protection against poverty, accessing employment is challenging for the poor due to factors such as transport poverty (not having a car or access to public transport) and childcare poverty (not having access to affordable childcare).
Example: In France, regional transport initiatives like discounted public transport cards for low-income individuals (or even completely free public transport in some cities) facilitate access to jobs for economically disadvantaged workers. In Sweden, equal allocation of parental leave to mothers and fathers, as well as publicly funded childcare programmes, improve labour market participation for women.

- **Alignment across policy areas:** Addressing labour market challenges requires joint approaches across interconnected policy areas, such as industrial and labour policies. While often seen as separate policy targets (raising employment and supporting industries), they cannot reach their respective goals without each other: firms need workers to produce, and workers need firms to access employment. Coordinating these areas ensures that economic growth and competitiveness goals align with social outcomes.
Example: Social conditionalities in public procurement (or socially responsible public procurement) have been implemented in several Member States to improve employment, job quality and inclusion. For instance, contracts for infrastructure projects may require companies to employ a minimum percentage of apprentices, long-term unemployed, or workers from disadvantaged groups. Similar social or labour conditionalities could be made in industrial policies aimed at strategic autonomy or green and digital goals.

Figure 4. Cross-cutting synergies



Source: Authors' elaboration. *Icon sourced from Vecteezy*

6.4 The sectoral-regional intersection

Sectors and regions will face uneven adaptation and outcomes. Rural and carbon-intensive regions reliant on traditional industries will increasingly experience economic disruption, rising unemployment, and outmigration, creating significant regional imbalances. These will be amplified by pressure on sectors like agriculture, construction and energy to modernise while facing resource, skills and capacity constraints to adopt precision farming, green building practices, and digital technologies. New required skills (e.g., digital literacy, green construction techniques) may not yet be widespread in lagging regions or sectors, while workers in traditional industries need reskilling or upskilling to remain employable in a rapidly evolving labour market. Persist disparities may exacerbate regional inequalities and social tensions, undermining EU objectives of cohesion and inclusive growth.

A balanced and integrated policy approach to mitigate the uneven effects of transformative changes can be achieved by leveraging existing policy tools (e.g. Cohesion Policy and, in particular, the ESF+ and the Just Transition Mechanism) while fostering synergies between the digital and green transitions to ensure that no region or sector is left behind. A focus on reskilling, innovation, and targeted investments will be crucial for fostering inclusive growth, reducing regional disparities, and achieving a just and sustainable transition for all.

Local and regional governments play a critical role in addressing the challenges and opportunities arising from transformative changes because of their proximity to communities, businesses, and specific regional dynamics, which enables them to design and implement tailored strategies. Here are key areas where action can be taken at the local and regional level.

- Tailoring policies: Design targeted strategies that align with the region's strengths (e.g., natural resources, industrial base, talent pool) while addressing its vulnerabilities (e.g., carbon-intensive industries, low digital penetration).

    - Smart Specialisation: Build on the EU's Smart Specialisation Strategies (S3) to foster innovation in sectors where the region has a comparative advantage. For example, coastal regions can focus on offshore renewable energy, while agricultural areas can prioritise sustainable farming practices.

- Skills development and training: Partnership with local educational institutions, training centres, and employers to design workforce training programs tailored to regional needs. Examples: digital skills training for workers in traditional sectors like manufacturing and agriculture; green skills programs for jobs in renewable energy, sustainable construction, waste management, and continuous learning programmes for workers of all ages to remain competitive in a rapidly changing labour market.

- Supporting workers and communities in transition Develop local-level plans to support workers and communities impacted by the transition away from carbon-intensive industries. Examples: Job placement services and reskilling programmes; financial support for displaced workers and their families, and investments in alternative industries to replace lost jobs. For example

    - Social safety nets: Strengthen local social protection systems to cushion the impacts of economic disruption, particularly for vulnerable groups like low-skilled workers or migrant communities.

- Infrastructures are key to keeping connections and mitigating isolation and environmental impacts. For example:

    - Invest in high-speed internet and digital infrastructure, particularly in rural and remote areas, to ensure equitable access to digital opportunities.
    - Develop public transport systems, renewable energy facilities, and sustainable urban planning initiatives. Promote energy-efficient buildings and retrofitting programs.
    - Circular economy initiatives to encourage local recycling, waste management, and resource efficiency programmes.

- Leveraging EU funds and partnerships; Local and regional governments are primary beneficiaries of many EU funding programs such as:

    - The JTF for regions heavily reliant on carbon-intensive industries.
    - The European Regional Development Fund (ERDF) and European Social Fund Plus (ESF+) for skills development and economic diversification.
    - Horizon Europe for research and innovation projects tailored to local needs

.

Collaboration with other regions to share best practices, pool resources, and participate in cross-border projects that address shared challenges can be highly beneficial.

6.5 Stakeholder engagement and cooperation

Stakeholder involvement and cooperation are essential for successfully implementing transformative changes at the local and regional levels. Engaging stakeholders ensures that policies are inclusive, grounded in practical realities, and aligned with local needs. Cooperation across sectors and levels of governance helps pool resources, expertise, and knowledge for greater impact. Here are examples of how stakeholder involvement and collaboration can be fostered.

Figure 5

Source: Authors' elaboration.
Icon sourced from Vecteezy

- **Identification of all relevant stakeholders:** Conduct research to determine the key actors in the region, government, social partners, educational institutions, civil society organisations and citizens.

- Promoting cross-sectoral cooperation in different ways, like:

  - Public-Private Partnerships (PPPs) to establish collaborations between local governments and businesses to fund and implement projects, such as building green infrastructure or expanding digital connectivity.
  - Industry-education collaborations to facilitate partnerships between industries and educational institutions to design training programs that address skills mismatches and prepare the workforce for future demands.
  - NGO-Government synergy to leverage the reach and expertise of NGOs to implement social programs, particularly for marginalised groups or displaced workers.

- Encouraging multi-level governance, for instance:

  - Work with EU institutions to access funding and align local policies with broader EU goals, such as the Green Deal and Digital Strategy.
  - Collaborate with national governments to ensure policy coherence, streamline regulatory frameworks, and secure additional resources.
  - In border regions, engage neighbouring countries to tackle shared challenges, such as migration, infrastructure development, or regional labour market imbalances.

- Building platforms for collaboration, for instance:
    - Establish regular platforms where stakeholders can exchange ideas, share best practices, and co-design initiatives. For example, create a regional green transition task force involving local businesses, trade unions, and environmental groups.
    - Set up councils with representatives from all key stakeholder groups to advise on policy implementation and monitor progress.
    - Use online platforms and digital tools to gather input from various stakeholders, including citizens, through consultations and surveys.

- Enhancing transparency and accountability to keep stakeholders informed about goals, progress, and challenges to build trust and foster a sense of shared responsibility. Let stakeholders, including citizens, have a say in how local funds are allocated to transformative initiatives. Involve stakeholders in monitoring policy impacts and provide feedback mechanisms to ensure continuous improvement.

Annexe

A1. Sectoral labour market impacts

Table 9. Example of structural changes and labour market consequences

Sector	Change	Specific labour market impact	Broad impact
Food and Agriculture (NACE2 A)	Use of resources: land use, forestry, farming, fishing More sustainable food production: changes across the whole food chain and development of alternative food Development of precision agriculture, organic farming, agroecology, agro-forestry and stricter animal welfare standards Eco-schemes to reward environmental and climate performance	Declining jobs in traditional farming Potential job creation in alternative agri-sectors New jobs in the former farmlands, i.e. organic farming or eco-tourism	Job destruction Job creation
Energy (NACE B/D)	Reducing energy consumption Phasing out coal and gas Decarbonisation Development of the renewable energy sector "Smart infrastructure": deployment of innovative technologies and infrastructure (smart grids, hydrogen networks or carbon capture, storage and utilisation, energy storage and enabling sector integration)	Disappearing jobs in the traditional energy production sectors, i.e. coal mines New jobs/occupations in the renewable energy sector and related services (i.e. production of subparts for wind turbines) The nature of jobs evolves due to changes in technology, maintenance and used materials	Job destruction Job creation New skills
Manufacturing (NACE 2 C)	Increased automation Growth in recycling and reuse Stricter recycling requirements (packaging, vehicles, construction materials, batteries) Extending the recycling chain: reduction and reuse of materials before recycling	Change in the nature of jobs and production processes Potential job creation in environmentally friendly productions Potential job destruction in subcontracting chains	Job destruction Job creation New skills
Water supply; sewerage, waste management, and remediation activities (NACE 2 E)	Enhanced waste management (More waste to be processed within the EU as the export of waste will be stopped) Enhanced water management and water conservation, Climate Services Mitigation of extreme climate events impact (e.g. flood management)	Potential job creation in waste separation and assessment Changes within existing jobs to embrace new waste management technologies Potential job creation weather data analytics, infrastructure management	Job creation High and low-skill jobs New skills

Construction (NACE2 F)	Automation in construction Climate-proof building, "Smart" homes (digitalised, climate-proof) Renovation	Potential job creation/boost for the SMEs and local jobs New skills required by using environmentally friendly materials/ techniques	Job creation and destruction New skills Shortages
Large infrastructures NACE F/H)	Infrastructure for a more integrated and digitalised EU energy sector Infrastructure for multi-modal transport Production and deployment of alternative transport fuels Infrastructure for more efficient waste management	Likely job creation in supporting infrastructure for electric cars: a safe, circular and sustainable battery value chain	Job creation Potential Shortages
Wholesale and retail trade (NACE 2 G)	Further expansion of e-commerce Further expansion of platforms Automation	High risk of job losses for micro SMEs (small shops) unable to compete with e-commerce) Expansion of delivery and logistics activity, but increasingly automated, in the short term but self-driving vehicles will reduce job demand in the longer term	Job destruction But potential shortages in the short term and redundancies later Poor working conditions
Transport and storage (NACE2 H)	Multimodal transport Environmentally friendly transport options (rail, inland waterways) Continuous transition to electric vehicles Automation of logistics and supply chain management Trade disruptions Digital technologies like AI and IoT could redefine logistics, warehousing, and transportation roles.	Change in the nature of jobs and production processes Potential job creation in the environmentally friendly transport options Potential job destruction in subcontracting chains in the automotive sector Potential employment cuts in air and ship transport due to smaller demand induced by increasing prices	Job creation Job destruction New skills
Accommodation and food services (NACE2 I)	Automation and digitalisation of services (e.g. apps for booking, check-in etc) Personalisation through AI and big data Sustainability standards and circularity Volatility in tourism (changes in global travel patterns) Stricter migration policies	New jobs in the former farmlands, i.e. eco-tourism Job reduction in High-Emission Transport Fall in low-skilled hospitality roles replaced by robots and AI-driven scheduling for staff Labour shortage in migrant-dominated sectors low-skilled positions (e;g. cleaning, food preparation). Reliance on seasonal and informal employment	Job destruction Short term shortages Poor working conditions Digital skills

Information and Communication (NACE2 J)	Critical enabler to achieve climate neutrality goals Development and deployment of sustainable digital technologies (e.g.; AI, 5G, cloud computing and edge computing)	Important potential for job creation (IT jobs, but also complementary professions and maintenance services)	Job creation
Financial and insurance services (NACE2 K)	Automation and Artificial Intelligence (AI) FinTech and Digital Payment Systems: Cybersecurity and Data Analytics: Sustainable Finance and ESG Climate insurance Competition from emerging markets	Emerging Roles in Digital and Green Finance: Decline in routine roles (e.g. data entry, clerical work, customer service positions, shift away from physical bank branches results in job losses for on-site staff) Need for high-qualified (e.g. advanced technical skills in AI, machine learning) Need for green expertise, soft and cross-disciplinary skills (problem solving) Increased remote work capabilities allow global hiring	Job losses and displacement New skills (digital/green)
Professional, scientific, and technical activities (NACE 2M)	GenAI New technologies, new materials Critical sectors, such as R&D, are witnessing efforts to reshore high-value activities to ensure technological sovereignty Increasing demand for IT consulting, cybersecurity, and digital transformation specialists to guide businesses in adopting technology.	Significant potential for job creation (IT jobs, product, services and processes design etc.) New roles in digital transformation consulting, green auditing, renewable energy system design, and AI-driven professional services. Expansion in advisory roles for ESG Routine administrative and technical tasks are increasingly automated or outsourced, reducing demand for mid-level professionals in traditional sectors. Offshoring of standardised services and the rise of remote and hybrid work models driven by digital tools increased reliance on short-term contracts or freelance work	Job losses and displacement Job profiles - new skills (digital) Working conditions (declining job security and social protection)
Public administration and defence (NACE2 O)	Job losses and displacement Job profiles - new skills (digital) Working conditions (declining job security and social protection)	New roles in digitalisation, such as IT specialists, data analysts, and cybersecurity experts Demand for new administrative capacities, e.g. f green-related positions Outsourcing of non-core functions	Job destruction New skills Pressure on efficiency, Flexible work arrangement

Education (NACE2 P)	Digital transformation (AI for personalised learning, predictive analytics to track student performance, and administrative efficiency) GenAI Sustainability in curricula Global Standards: Increased focus on aligning education systems with global standards to facilitate international mobility for students and workers. Diverse Student Populations	New opportunities like EdTech industry roles (e.g.; platform development), but also professionals teaching green technologies, climate science, and sustainable business practices. Disruptions: Traditional roles, like administrative roles (scheduling, student records etc mean less clerical staff) and routing teaching tasks (like test generation, grading, and basic content delivering) are being phased out due to automation and digital transformation. Fast-evolving skills and responsibilities required: from "knowledge delivery" roles toward mentoring, guiding critical thinking, and fostering creativity and problem-solving skills. Teachers expected to master digital tools and combine expertise in multiple fields Changing working conditions: positive (flexibility in schedule, more efficient) and negative (job insecurity and increasing pressure on competencies) impacts. Uneven access to technology and training could exacerbate disparities between educators in well-resourced and under-resourced institutions.	New skills
Human health and health care (NACE Q)	Digital transformation: remote care, AI and Data-Driven Healthcare, e-health. Acceleration of the ageing population Increased reliance on migrant healthcare workers to address shortages, especially in ageing societies.	New roles in health IT, data analysis, and environmental health specialists. Greater need for healthcare workers trained in digital tools and cross-cultural communication Automation of administrative tasks and storage of information (expertise in data privacy, cybersecurity threats) Increase in informal employment, mostly migrants	Job creation New skills Shortages Job quality concerns Risk of digital and health inequalities
Cultural and Creative Industries (NACE 2 R)	GenAI production AI-generated art, NFT marketplaces, and immersive tech Increase in platform	Opportunities for professionals combining creativity with data (understand audience preferences, optimise content Declining demand for manual or analogue skills AI tools for editing, composing, or designing will reduce demand for traditional roles. Freelance, project-based, or part of the gig economy, with limited job security, benefits, or protections likely to increase. Falling revenues: Platforms (e.g. Spotify, YouTube) provide low returns to creators compared to traditional revenue streams	Tech-driven job opportunities New skills Job precarity Inequality Automation-driven displacement

Source: Authors' elaboration inspired by BusinessEurope 2021.

Note: The sectors' list follows the NACE Rev2 classification. Two sub-sectors were added Energy and Large infrastructure, as impacts are expected to be large

A2. EU normative framework and guidance (soft tools)

Table 10. EU normative framework and guidance

EU tool	Purpose
European Pillar of Social Rights – EPSR (2017)	It provides 20 principles that serve as a guideline for policy reforms in the areas of employment, education, skills, and social protection. The EPSR is not legally binding but creates a benchmark for Member States to strengthen their labour markets and address challenges like technological changes, globalisation, and the twin transitions. The following principles in the EPSR are relevant to labour market challenges: • Principle 1: Education, training, and lifelong learning. Everyone has the right to quality and inclusive education, training, and lifelong learning to acquire and maintain skills relevant to the changing labour market. • Principle 4: Active support to employment. Public authorities should help individuals to transition into employment through reskilling and upskilling programs. • Principle 5: Secure and adaptable employment. Employment relationships should offer fair working conditions and adapt to changing labour market demands. • Principle 6: Fair wages. Workers have the right to adequate wages, contributing to reducing poverty and job quality issues. • Principle 8: Social dialogue and involvement of workers. Strengthening social dialogue to ensure workers' participation in shaping responses to transitions. • Principle 10: Healthy, safe, and well-adapted work environment. Work environments must adapt to changes, particularly digitalisation and automation, to ensure worker safety and well-being. • Principle 12: Social protection. Everyone, including workers in non-standard employment, should have access to social protection systems that mitigate the impacts of labour market shifts.
EU Skills Agenda and the Pact for Skills (2020)	European Skills Agenda is the EU's broad strategy to upskill and reskill the European workforce to meet the demands of the future economy. It aims to: i) Equip workers with skills for the digital and green transitions, ii) Reduce skills mismatches and shortages, iii) Support inclusive and lifelong learning to ensure no one is left behind The Pact for Skills is a central pillar of the European Skills Agenda. It is a shared engagement model where stakeholders from various sectors (public and private) join forces to provide upskilling and reskilling opportunities for workers. The Pact is voluntary and collaborative, encouraging all relevant actors—employers, unions, education and training providers, and public authorities—to work together to bridge skill gaps. It explicitly aims to address the skills gaps exacerbated by technological changes, globalisation, and the twin transitions.
European Employment Strategy (EES) 1997	It promotes employment policies that align with broader EU goals. It addresses labour market challenges by providing Employment Guidelines adopted annually under the framework of the European Semester (which monitors Member States' economic and employment policies to align with EU priorities) to encourage Member States to focus on: • Increasing employment rates (particularly for women and youth). • Adapting skills to technological changes and transitions. • Reducing inequalities and promoting social inclusion through employment policies. • Strengthening active labour market policies (ALMPs) to facilitate employment transitions.
2021-2027 European Digital Strategy and Digital Education Action Plan	Flagship digital education policy initiative of the European Commission. These frameworks aim to address challenges related to the digital transition by ensuring access to digital skills and promoting digital literacy. Initiatives include: • Digital Skills and Jobs Coalition: A partnership for improving digital skills in Europe. • Digital Competence Framework for Citizens (DigComp): Provides guidelines for improving digital skills

Just Transition Mechanism and Platform (2019)	It supports workers and regions most affected by the green transition. It ensures that labour market shifts, such as job losses in carbon-intensive sectors, are mitigated through reskilling, upskilling, and employment support. reflects the principle of ensuring a fair and inclusive transition by leaving no one behind. It is accompanied by the Just Transition Fund (see details below) and a platform, which consists of a single access point and helpdesk for countries and regions to receive comprehensive technical and advisory support.
Social Dialogue and Sectoral Agreements	Social dialogue—between employers, trade unions, and governments—plays a vital role in soft law. Agreements made within specific economic sectors help address: • Skills mismatches due to technological changes, • Employment shifts resulting from globalisation and • fair transitions for workers in industries affected by green policies.

A3. EU regulatory framework: Directives

Several EU directives address emerging labour market challenges, focusing on digitalisation, platform work, and evolving work conditions collectively aim to adapt EU labour policies to technological advancements, demographic shifts, and globalisation pressures, ensuring fair working conditions and sustainable employment frameworks.

Table 11. EU Regulatory framework: Directives

Directive	Purpose
Platform Work Directive (2024)	Aims to regulate working conditions in platform-based jobs, ensuring transparency, fair working terms, and social protection. It includes requirements for digital labour platforms to disclose worker employment status and terms, helping national authorities enforce labour laws effectively.
Gender Pay Gap Directive (Directive (EU) 2023/970	Aims to tackle gender-based wage disparities by enhancing pay transparency and strengthening equal pay enforcement across the EU. It builds on the principle of "equal pay for equal work" outlined in the (TFEU, Article 157).
EU Minimum Wages Directive (Directive (EU) 2022/2041)	Aims to ensure fair wages and reduce in-work poverty across the EU. While it does not set a uniform minimum wage, it establishes a framework for adequate minimum wages and collective bargaining practices in Member States.
Right to disconnect (EP resolution in 2021, but not yet adopted a binding directive) [1]	Aims at addressing changes in the labour market, especially in response to the rise of remote and flexible working models accelerated by digitalisation. It seeks to ensure a balance between work and personal life by allowing employees to disconnect from work-related communications outside working hours.
Directive on Transparent and Predictable Working Conditions (2019/1152)	Strengthens workers' rights by ensuring clear employment terms. It sets minimum labour standards, such as clear employment terms, fair probation periods, and predictable working schedules, particularly relevant for gig and non-standard workers
Work-Life Balance Directive (2019/1158)	Supports parental, paternity, and carers' leave and flexible work arrangements, enhancing labour market participation and equality.
Working Time Directive (2003/88/EC)	Regulates working hours, ensuring minimum rest periods, paid leave, and limiting maximum working time.
Temporary Agency Work Directive (2008/104/EC)	Ensures equal treatment for temporary agency workers regarding basic working and employment conditions, which can apply to some platform work models.
Occupational Health and Safety (OSH) Framework Directive	Establishes general principles for ensuring worker health and safety, including in platform-based and remote work environments

[1] Several EU Member States like France, Italy, Spain, and Belgium have already enacted national laws granting employees the right to disconnect. These national measures set standards for work-life balance by regulating after-hours communication.

Additional EU legislative initiatives aim to address structural labour market challenges linked to demographic shifts, skills shortages, and the green and digital transitions:

European Labour Migration Platform: This initiative facilitates cooperation between EU Member States on managing labour migration from third countries. It supports the EU Talent Pool and Talent Partnerships to address labour shortages, especially in sectors like healthcare and ICT, which are critical for the EU's competitiveness and the green and digital transitions.

Skills and Talent Package: This legislative package includes measures such as the EU Talent Pool and Talent Partnerships with non-EU countries, designed to streamline the recognition of foreign qualifications and attract skilled workers to the EU. It aims to foster continuous learning and mobility.

A4. EU funds for labour market challenges

Table 12. The EU Funds

Funding schemes	General purpose/objective	Actions
European Social Fund Plus (ESF+)	EU's main financial instrument for supporting employment, social inclusion, and skills development. It consolidates several previous EU funds, including the European Social Fund (ESF), the Youth Employment Initiative (YEI), the Fund for European Aid to the Most Deprived (FEAD), and the EU Programme for Employment and Social Innovation (EaSI).	Employment Support: • Funds initiatives that promote job creation, especially for disadvantaged groups such as youth, long-term unemployed, and persons with disabilities. • Supports entrepreneurship and social innovation projects to stimulate economic activity. • Education and Skills Development: • Finances training programs, vocational education, and apprenticeships. • Focuses on upskilling and reskilling workers to adapt to changes brought by digitalisation, automation, and the green transition. Social Inclusion and Poverty Reduction: • Combats poverty and social exclusion through targeted assistance for vulnerable populations. • Funds services like housing, healthcare, and social welfare programs. • Addressing Structural Challenges: • Supports reforms in labour market institutions and social systems to improve resilience. • Provides funds for modernizing public employment services and lifelong learning systems. Crisis Response: It helps manage the socio-economic impact of crises (as during the COVID-19 pandemic) by supporting income protection schemes and emergency social services.
European Globalization Adjustment Fund (EGF)	EU financial instrument designed to provide support to workers who lose their jobs due to large-scale economic disruptions caused by globalisation or significant structural changes, including economic crises, trade shifts, or technological advancements. Its primary goal is to help displaced workers reintegrate into the labour market through targeted assistance.	Support for Jobseekers: • Provides personalised job search assistance, career guidance, and coaching. • Funds training, reskilling, and upskilling programs tailored to market needs. Financial Aid: • Offers allowances such as mobility and relocation grants, and subsistence allowances during retraining periods. • Business Creation Support: • Encourages entrepreneurship by funding start-up assistance and advisory services. • Supports self-employment initiatives for affected workers. Tailored Assistance for Vulnerable Groups: • Prioritises support for disadvantaged jobseekers such as older workers, low-skilled individuals, and those in declining industries. Response to Crisis Situations: • The EGF can respond to sudden disruptions like economic downturns or large-scale layoffs, ensuring rapid reemployment efforts.

Just Transition Fund	Support regions most affected by the transition toward a climate-neutral economy, especially those reliant on fossil fuels and carbon-intensive industries. Its main goal is to alleviate the socio-economic impacts of the green transition	Job Preservation and Creation: • Supports businesses transitioning to sustainable models. • Promotes job creation in green sectors such as renewable energy, sustainable transport, and energy efficiency. • Reskilling and Upskilling Workers: • Funds training and education programs for workers from affected industries to help them transition to new, sustainable jobs. • Encourages lifelong learning initiatives in line with future labour market demands. • Economic Diversification: • Encourages entrepreneurship and supports SMEs to develop new economic activities. • Funds innovation-driven projects to create new business opportunities. • Social Support Measures: • Provides aid for workers affected by plant closures or industrial restructuring. • Supports access to job search assistance and relocation services. • Infrastructure Development: • Invests in public infrastructure projects to improve regional attractiveness and long-term job prospects
Recovery and Resilience Facility (RRF)	Part of Next Generation EU (it ends in 2026)	A central component of the EU strategy to mitigate the economic and social impacts of the COVID-19 pandemic. Focusing on labour markets, the RRF offers grants (and loans) to Member States to support initiatives and policies aiming to enhance employment support, modernise labour market institutions, and promote inclusive and resilient societies. More specifically: • Employment support to transitions to new sectors and job types, by implementing hiring incentives, job transition programs, and support for self-employment to boost employment opportunities. • Modernisation of labour market institutions to improve the efficiency of regulations and institutions, including public employment services, by enhancing activation support for job seekers and increasing the participation of underrepresented groups, such as women and vulnerable populations. • Skills development and training to enhance employability by facilitating equal access to education and training and by investing in vocational education and training (VET) programmes to equip individuals with the skills needed for the evolving labour market. Promotion of inclusive labour markets focussing on groups with lower participation rates, including marginalised communities.

A5. EU Industrial policy

Table 13. EU Industrial Strategy[2]

	Initiative	Purpose
Overall strategy	New Industrial Strategy for Europe (2020 and 2021 update)	It aims to position European industry as a global leader in innovation, sustainability, and resilience, while ensuring that the benefits of the green and digital transitions are widely shared. To achieve it the following objectives are to be pursued: • Climate neutrality to align European industry with the EU's goal of becoming climate-neutral by 2050 under the European Green Deal. • Driving the Digital Transformation to accelerate the adoption of digital technologies in industry to increase productivity, foster innovation, and strengthen digital sovereignty. • enhance industrial resilience and competitiveness to reduce the EU's dependence on critical materials and technologies from non-EU countries to secure supply chains. • Support SMEs to adapt to new market realities, including the twin green and digital transitions. • Enhance open strategic autonomy to balance the EU's trade openness with greater control over critical industries and technologies.
Strategic autonomy	Critical Raw Materials Act (2024)	It aims to ensure EU access to a secure and sustainable supply of critical raw materials essential for strategic sectors such as renewable energy, digital technologies, aerospace, and defence. To achieve it focuses on five areas of action • enhancing domestic capacities • diversifying imports: • streamlining permitting processes • promoting sustainability and circularity • strengthening international partnerships
	European Chips Act (2023)	It aims to strengthen the EU's semiconductor ecosystem to ensure EU technological sovereignty and secure its supply of critical chips. It was developed in response to global chip shortages and the EU's heavy dependence on non-EU suppliers, especially for advanced semiconductors

[2] https://www.consilium.europa.eu/en/policies/eu-industrial-policy

Green transition	European Green Deal (2019) Supporting policies and legislation: Fit for 55 package: a set of legislative proposals to ensure the EU meets its 2030 climate targets. Carbon border adjustment mechanism (CBAM): a tariff on carbon-intensive imports to prevent carbon leakage. EU emissions trading system (ETS): strengthened to include more sectors and raise the price of carbon.	It is the EU flagship policy framework, introduced in 2019, to make Europe the first climate-neutral continent by 2050. It provides a comprehensive roadmap for transforming the EU's economy, society, and industries to achieve sustainability, climate neutrality, and environmental protection while fostering innovation and economic growth. Its key objectives are: • Achieving climate neutrality by 2050: reduce net greenhouse gas emissions by at least 55% by 2030 (compared to 1990 levels) and achieve net zero emissions by 2050. • Transforming the EU's economy into a circular economy: transition from a linear "take-make-dispose" model to a circular economy where resources are reused and recycled. • Boosting renewable energy and energy efficiency: reduce dependence on fossil fuels and increase the share of renewables in the energy mix. • Promoting sustainable and smart mobility: reduce emissions from transport, which accounts for about 25% of EU emissions. • Protecting biodiversity and ecosystems; goal: halt biodiversity loss and restore natural ecosystems. • Greening agriculture through the farm-to-fork strategy: make food systems more sustainable and reduce their environmental footprint. • Ensuring a just transition: support regions and workers most affected by the green transition, especially in carbon-intensive sectors.
	Net Zero Industry Act (2023)	Aims to enhance skills for net-zero technologies by setting up dedicated training programmes through Net-Zero Academies and facilitating the portability of qualifications in regulated professions. The academies, each focusing on one net-zero industry technology, such as hydrogen and solar technologies, will aim to train 100,000 learners each within three years of establishment.
	Electricity market reform	It aims at transforming the electricity sector to ensure a secure, affordable, and sustainable energy supply. In the European Union (EU), recent reforms have focused on mitigating price volatility and promoting the integration of renewable energy sources
Digital transition	Europe's Digital Decade (introduced in 2021, to accelerate the EU's digital transformation by 2030)	Its purpose is to foster digital innovation, ensure Europe's global competitiveness, and empower citizens and businesses to benefit from the digital age, while maintaining the EU's core values of inclusivity, sustainability, and resilience. Its objectives are: • Achieving Digital Sovereignty: Reduce the EU's reliance on non-European digital technologies and infrastructures. • Empowering People with Digital Skills: Ensure that Europeans have the necessary skills to thrive in the digital economy and society. • Modernizing Digital Infrastructure: Build robust and sustainable digital infrastructure across the EU. • Transforming Businesses: Enable European businesses, especially small and medium-sized enterprises (SMEs), to adopt digital technologies. • Digitalization of Public Services: Ensure accessible, efficient, and secure digital public services for all citizens. • Sustainability and Green Transition: Align digital transformation with the European Green Deal.

Resilience of the single market	Internal Market Emergency and Resilience Act, IMERA, (Adopted in 2024, with implementation set for 2026)	legislative initiative by the EU to ensure the seamless functioning of the internal market during crises. It aims to anticipate, prepare for, and respond to emergencies that could disrupt the free movement of goods, services, and people within the EU. Key objectives: • Crisis preparedness and response: establish a comprehensive framework to handle potential crises affecting the internal market. • Ensuring free movement during crises: maintain the uninterrupted flow of essential goods, services, and persons across the EU during emergencies. • Safeguarding critical supply chains: protect and ensure the availability of critical goods and services during emergencies. • Coordinated governance: enhance coordination between EU institutions and member states in crisis situations.

Project Identity

Project name
Growing Inequality:
a Novel Integration of transformation research — GI-NI

Coordinator
Nederlandse Organisatie Voor Toegepast
Natuurwetenschappelijk Onderzoek TNO, Netherlands

Consortium
CNAM – CEET, Centre d`études de l´emploi et du travail (France)
University of Groningen (Netherlands)
Centre for European Policy Studies (Belgium)
University of Adger (Norway)
Centre for Economic and Regional Studies (Hungary)
Utrecht University (Netherlands)
Europa-Universität Flensburg (Germany)
University of the Basque Country (Spain)

Duration
2021 – 2025

Funding Scheme
Grant Agreement nº 101004494 — GI-NI — H2020-programme

Website
https://www.gini-research.org

For more information
steven.dhondt@tno.nl

Growing Inequality:
a Novel Integration of
transformations research

www.gini-research.org