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Recommendation for a

COUNCIL RECOMMENDATION

on human capital in the European Union

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THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 148(4) thereof,

Having regard to the opinion of the Employment Committee,

Whereas:

(1) The European Pillar of Social Rights, proclaimed by the European Parliament, the Council and the Commission in 2017[1], provides a compass for upward convergence in working and living conditions in the EU. Its first principle affirms that "*Everyone has the right to quality and inclusive education, training and life-long learning in order to maintain and acquire skills that enable them to participate fully in society and manage successfully transitions in the labour market*".

(2) The Competitiveness Compass[2], adopted by the Commission in January 2025, sets out a roadmap for restoring the EU's economic dynamism and boosting growth. The promotion of skills is identified as a critical enabler, recognising that a highly skilled workforce is the backbone of the European economy, a driver of productivity, innovation and quality jobs, and an enabler of a fair green and digital transition. In March 2025, the Commission adopted a Communication on the Union of Skills[3], highlighting the crucial role of human capital and future-oriented skills in enhancing the Union's competitiveness and strategic autonomy, strengthening preparedness and supporting sustainable prosperity. In 2025, the Commission also published two Communications on Artificial Intelligence (AI), in which people and skills are highlighted as playing a crucial role[4] [5].

(3) As recognised in the Union of Skills[6], the integrated approach to policy coordination and enhanced multilateral surveillance within the European Semester provides the framework to guide the necessary structural reforms of labour markets, education and training systems and investments in human capital development, also taking intergenerational fairness into account. This recommendation on human capital is

[1] OJ C 428, 13.12.2017, p. 10

[2] Communication of the Commission of 29 January 2025 'A Competitiveness Compass for the EU' (COM/2025/30 final).

[3] Communication of the Commission of 5 March 2025 'The Union of Skills' (COM(2025) 90 final).

[4] Communication of the Commission of 9 April 2025 'AI Continent Action Plan' (COM(2025) 165 final)

[5] Communication of the Commission of 8 October 2025 'Apply AI Strategy' (COM(2025) 723 final), which puts forward sectorial and cross-sectorial actions, including on AI literacy, upskilling and reskilling and skills intelligence, to increase the adoption of AI in key industries and the public sector.

[6] In line with the Council Resolution on education and training in the European Semester: ensuring informed debates on reforms and investments 2020/C 64/01.

therefore designed to complement the Guidelines for the Employment Policies of the Member States. It identifies areas of common concern for the EU. Where relevant in the context of each Member State, these areas will be later analysed in the country reports and may be addressed in the country-specific recommendations issued as part of the European Semester cycle. These concerns have also an important territorial dimension, with significant territorial differences across Europe in skills and human capital endowment.

(4) Member States examine each year within the Employment Committee under Article 150 TFEU, in light of the joint annual report on the employment situation in the Union and on the implementation of the Guidelines for employment (Article 148(5) TFEU) and considering the information received from Member States through their Annual Progress Reports (which also serve the purposes of Article 148(3) TFEU), all aspects related to employment outcomes in the EU.

(5) The EU faces a persistent shortage of workers and skills. They are sizeable across Member States, regions, sectors and affect companies of all sizes. The EU job vacancy rate, a proxy for measuring labour shortages remains elevated and close to its pre-pandemic level at 2.2% (Q1-2025)[7]. The lack of skilled labour also hampers investment and innovation: 68% of medium-sized companies reported skills shortages as a serious issue in 2023[8], and 77% of companies indicated that skills shortages were barriers to long-term investment in 2024[9].

(6) Some sectors and occupations face high EU-wide labour and skills shortages. In 2024, the most widespread shortage occupations in the EU concerned technical profiles in manufacturing and construction (including welders and flame cutters, building and related electricians, plumbers and pipe fitters, metal sheet workers), health professions (nursing professionals, generalist and specialist medical practitioners, healthcare assistants and physiotherapists, with an estimated shortage of 1.2 million doctors, nurses and midwives in 2022 for OECD countries[10]). At the same time, only 12% of EU farmers are under 40, potentially putting the EU's food security at risk. The transport sector likewise faces widespread labour shortages of trained professionals across all transport modes (heavy truck, lorry, bus and tram drivers, as well as seafarers, in particular officers)[11,12]. There are also widespread shortages for ICT specialists, civil engineers and teaching staff. ICT specialists were just 4.8% of the workforce, far below the Digital Decade target 2030 of 10%, with significant gender imbalances. In relation to the green transition, 24 shortage occupations have been identified across multiple Member States, including insulation workers, civil engineers and air conditioning and refrigeration mechanics (in 14 Member States), civil engineering technicians (in 12 Member States) and roofers (in 11 Member States). Europe will need to develop capacity in core circular tasks that need to adapt from linear to circular systems and markets. These skills are at all levels, from architects and engineers to waste collectors and sorters.

(7) Technological advancements and the green and digital transitions will increase further the demand for new skills and exacerbate existing shortages and mismatches. Driven

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7 The average job vacancy rate between 2013 and 2019 amounted to 1.7%.
8 Eurobarometer no. 537 11/2023.
9 EIB Investment Survey 2024: European Union Overview.
10 European Commission/OECD Report on Health at a Glance in Europe 2024.
11 EURES_Report_on_labour_shortages_and_surpluses_2024.
12 Seafarers - Mobility and Transport - European Commission.

by the rise of AI, renewable energy technologies, biotech, defence, space and security needs, as well as complex data analytics, the demand for science, technology, engineering and mathematics (STEM) professionals is growing.

(8) The State of the Digital Decade 2025 (SDD25) highlights that the gap between labour market demand and available talent continues to widen, especially in fields such as AI, cybersecurity, data analysis and semiconductor technologies. The EU will need between 6.2 and 7 million AI-related workers by 2027, with around 60% of the workforce requiring AI skills[13]. In cybersecurity, a gap of some 300 000 specialists has been identified, while in semiconductors a gap of close to 100 000 new professionals will need to be addressed, under current trends. Member States' national roadmaps show increasing focus on digital education and lifelong learning, but efforts remain fragmented and uneven, with limited outreach to the low-skilled and underrepresented groups. Projections indicate that, without stronger joint action and sustained investment, the EU will not reach the digital skills targets[14].

(9) Since 2023, restructuring events and planned job reductions have gradually increased. Different restructuring events and short-term changes have contributed to an increasing awareness that urgent action is required. In 2024, planned job reductions amounted to approximately 65 000 across the EU which are concentrated in specific sectors and regions[15]. The automotive industry, telecommunications and postal services were most affected. Between 2019 and 2024, the automotive manufacturing sector lost approximately 240 000 jobs across the EU[16]. The European steel sector is also facing increasing pressure, with 18 000 jobs being cut in 2024, while the chemical sector has reduced jobs by approximately 15 000 in 2023 and 2024. This is particularly concerning given the sector's critical role in the production of defence and space capabilities. Overall, the disruption of trade flows, weakened global demand and higher energy costs negatively impact the labour market.

(10) The transition towards climate neutrality, which already affects employment growth, is expected to create between 1 and 2.5 million additional jobs by 2030, if accompanied by effective policies. The Net-Zero Industry Act[17] estimates an increase of 350 000 manufacturing jobs in net zero industries by 2030. Moreover, to deliver on the EU 2030 targets for wind and solar energy, approximately 130 000 to 145 000 additional skilled workers and an associated investment in skills of EUR 1.1 to 1.4 billion by 2030 are needed. In the context of building renovations 7 million construction job openings are expected by 2035[18]. Also, the armed forces and the defence industry are expected to increase employment numbers significantly, in particular for persons with a STEM and Vocational Education and Training (VET) background.

(11) The sizeable labour and skills shortages in the aforementioned sectors and in regions across the EU are likely to intensify in the coming years, driven by an ageing of the

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13 Shaping and strengthening European AI talent, 2025.

14 The State of the Digital Decade 2024 report estimated that without further action, only 59.8% of the adult population would have at least basic digital skills by 2030, far below the 80% target.

15 European Commission: Directorate-General for Employment, Social Affairs and Inclusion, Labour market and wage developments in Europe – Annual review 2025, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2767/1810636.

16 Eurostat, [lfsa_egan22d] Employed persons by detailed economic activity (NACE Rev. 2 two-digit level) (2008-2026).

17 Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724.

18 The greening of the EU construction sector | CEDEFOP

population and growing demand for workforce in sectors of strategic importance for the EU, namely i) advanced digital technologies; ii) clean transition and industrial decarbonisation, including circular economy; iii) health and biotech, agriculture and fisheries-aquaculture, and bioeconomy; and iv) defence industry and space. These challenges will place significant pressure on economies and labour markets, underscoring the urgent need to act proactively. It is therefore critical to sustain and enhance the EU's human capital today through targeted and agile policies and investments in education, upskilling and reskilling. By fostering a workforce equipped to embrace technological advancements, adapt to evolving industry needs, and capitalise on emerging opportunities, the EU can not only mitigate current and future labour gaps but also strengthen its long-term economic resilience and global competitiveness. In addition, access to affordable housing can also ease labour and educational mobility and underpin the development of human capital and competitiveness.

(12) European education and training systems face challenges in providing all learners, in particular those with a disadvantaged socio-economic background, migrants, persons with disabilities and Roma people, with solid skills foundations that enable them to actively participate in the labour market. Performance in mathematics, reading and science has declined in recent decades, with around 30% of 15-year-olds underachieving in mathematics and 25% in reading and science in 2022[19]. Only 16% of disadvantaged students performed well in reading, mathematics or science in 2022, declining from 21% in 2015. Students with a migrant background are twice as likely to leave the education and training system with low or no qualifications[20]. These challenges are further exacerbated by disparities in access to quality and inclusive education and training in less developed regions and disadvantaged, rural and remote areas. Over 40% of eight-graders lack basic digital skills[21]. Difficulties in childhood also transfer into adulthood: one in five adults struggles to read and write. Education and training have a key role to play in preparing learners to become active citizens, participate in democratic life, discern misinformation and engage safely, responsibly and sustainably with digital technologies. 73% of young people (15-30) declared that their education had equipped them with the necessary level of skills to identify disinformation.

(13) Despite the high employment rate of recent VET graduates (four in five in 2024), VET and apprenticeships continue to face challenges in terms of its attractiveness, with many vocational programmes suffering from stereotypes and overall limited esteem. In 2023, 3.75 million VET students across the EU were enrolled in STEM programmes, which represents 36.3% of all medium-level VET pupils. This is still far from the proposed EU-level target of at least 45% by 2030, which – at current enrolment levels – would correspond to having an additional 900 000 VET pupils moving into a STEM field. In medium-level VET, female students are significantly underrepresented in STEM fields.

(14) At tertiary education level, despite the high demand in many STEM fields, about half of the Member States recorded a decline in STEM enrolment between 2015 and 2023, currently standing at 26.9% of students, far from the 2030 target of having at least 32% of students in STEM fields at tertiary level. Compared with other advanced economies, the EU has the second lowest ratio of STEM tertiary graduates per

19 See OECD's Programme for International Student Assessment (PISA).
20 See OECD's Programme for International Student Assessment (PISA).
21 See International Computer and Information Literacy Study (ICILS).

thousand young people (14.3%). At doctoral level, nearly four in ten students are enrolled in STEM fields, but only a very small share in ICT. Underrepresentation of women in STEM exacerbates the problem. ICT is the field with the lowest female participation among all education fields, with only one in five students being female. Drop-out from higher education remains a concern, particularly at bachelor level, with only 63% of tertiary students completing a STEM degree within three years of the theoretical end.

(15) The shortage of qualified teachers across many Member States, regions, cities and remote and rural areas poses a significant risk to the quality of education. In 2024, around one in five teachers[22] worked in schools facing a shortage of qualified teachers, limiting quality instruction. Moreover, an ageing teacher workforce will reduce the number of available teachers in the years to come. In 2023, 25% of classroom teachers from primary to upper-secondary level were 55 years or over (equivalent to more than 1 300 000). Beyond this, the perceived lack of attractiveness of the profession and low earnings (compared to other occupations to which the degree can give access) contribute to teachers' shortages across the EU. The acute lack of STEM teachers contributes to the challenges. The lack of attractiveness of certain territories may also impact the retention of teachers in disadvantaged, rural and remote areas. Teachers' preparedness to deal with pupils with disabilities and/or special educational needs and/or socio-economic disadvantage is an additional concern. Additionally, inconsistent use of technology in schools, lack of digital skills assessment, and varying teachers' preparedness have hampered improvements in young people's digital skills levels, despite increased investments in digital infrastructure and education across Member States and regions.

(16) Aligning curricula with the evolving demand of the labour market remains a challenge for education and training systems across the EU. Sectoral skills academies and similar initiatives, as also called for in the Clean Industrial Deal Communication[23], can play an important role in this[24]. Some Member States have undertaken curricular reforms, however significant gaps persist between the competencies students acquire and those required by employers. As an example, while 90% of jobs require basic digital skills, only 55.6% of adults in the EU possess such skills. This is also a challenge among young people in the EU. With 42.5% of eighth graders having insufficient basic digital skills, a lot of progress is needed to reach the EU target of less than 15%[25]. With the rise of AI, basic digital literacy is increasingly insufficient and more and more new entry-level jobs for young graduates require advanced AI skills and strategic thinking. In this context of mismatch between skills needed by the labour market and the available ones, ensuring labour market relevance of VET curricula is key, also with the active involvement of social partners, and the same holds for higher education. Academic curricula should evolve to foster future-oriented, multidisciplinary and intersectoral skills, which are essential for developing and exploiting new knowledge and technologies. When considering young people, the integration of work-based learning in the curricula generally increases employability

[22] In the 22 participating EU Member States in TALIS 2024. OECD (2025), Results from TALIS 2024: The State of Teaching, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/90df6235-en.

[23] Communication of the Commission of 26 February 2025 'The Clean Industrial Deal: A joint roadmap for competitiveness and decarbonisation' (COM(2025) 85 final).

[24] The annual reports of the Digital Decade programme set out key reforms to be undertaken by Member States to address the challenges in this area.

[25] 2023 International Computer and Information Literacy Study (ICILS), conducted by the International Association for the Evaluation of Educational Achievement (IEA).

of graduates: the employment rate of recent VET graduates who experienced work-based learning stood in 2024 at 84.3% compared to 69.7% for those who have not[26]. Furthermore, only 73% of young people (15-30) declared that their education had equipped them with the necessary level of skills to identify disinformation.

(17) Lifelong learning and upskilling and reskilling are essential for individuals to keep pace with a rapidly changing labour market, including transitioning from declining to growing sectors. Yet, in 2022 only 39.5% of adults participated in learning in the previous year, more than 20 percentage points below the EU headline target of 60% by 2030. Low-skilled adults, who would benefit most from training, participate significantly less (11.3%). Participation is lower in less developed regions and stagnating areas, including rural and remote ones, as well as for vulnerable groups that face additional barriers to access training. Bridging this gap is critical to make lifelong learning a tangible reality for all and requires accelerated and coordinated action by Member States, businesses and social partners. Levels of financial literacy in the EU are currently very low. According to the 2023 Eurobarometer survey, less than one fifth (18%) of EU citizens have a high level of financial literacy.

(18) Future proof education and training systems require adequate funding. Inaction is costly: the annual social costs of early school leavers globally will equal to USD 6 trillion by 2030[27]. Declining basic skills levels among young people could reduce long-term multifactor productivity growth by around 3% across OECD countries. Investment in human capital, including in population health and policies supporting it, contributes to higher productivity and sustainable economic growth.

(19) Public spending alone cannot meet the scale of upskilling and reskilling needs given the transformational challenges the EU is facing. For adults, the main form of learning is job-related training (four out of five adult learners in 2022). Such training is predominantly financed by employers (nearly 90% of all job-related adult learning). Still, one out of three companies do not provide courses or other forms of training to any of their staff, with cost being one of the main obstacles cited (along with workload and time constraints). Incentivising effective private spending on skills including by linking public procurement to training commitments encourages companies to take a greater responsibility for developing the skills of their workforce. State aid rules allow support for training, upskilling and reskilling by service providers, including small and medium-sized enterprises, upon fulfilment of the relevant conditions. The Union of Skills Communication calls for an assessment of the relevant provisions, to ensure that they provide better incentives for industry, including the social economy, to invest in upskilling and reskilling of workers. Public-private partnerships can mobilise additional skills investment and promote cooperation and provide better incentives for industry, including the social economy, to invest in upskilling and reskilling of workers and promote cooperation.

(20) Despite substantial public investments in initial education over the past few decades, the quality of education in some Member States and regions has stagnated or deteriorated. To maximise the effectiveness and efficiency of investments in education and skills, impact assessments and evaluations are key, conducted ideally before, during and after implementation, involving all relevant stakeholders, and using timely

[26] Based on European Labour Force Survey, special data extraction.

[27] Brunello, G., Rocco, L., Eck, M., 2024, The price of inaction: the global private, fiscal and social costs of children and youth not learning, UNESCO

and reliable administrative data wherever possible[28]. The establishment of a Social Investment Knowledge Hub and the integration of internationally agreed (UNECE) Satellite Accounts for Education and Training[29] within national accounts can improve policy evaluation and provide a more accurate quantification of the returns on investment in human capital. The Commission has also created the Learning Lab on Investing in Quality Education and Training[30], supporting Member States in carrying out policy evaluations in education to make their public spending on education and training more cost-effective and evidence informed.

(21) Accessible, easily understandable, targeted and up-to-date skills intelligence is essential for effective and future-proof education and training policies. Yet, skills intelligence in the EU remains fragmented, hindering well-informed decision-making. Despite the use of skills forecasting methods across Member States, significant challenges persist, including a diversity of taxonomies, complexity of data sources and methods, and limitations in terms of data reliability and granularity, which can restrict the usability of the information. Predictions of future demand for a given occupation tend to differ substantially, reflecting different assumptions about the extent of task automation and the broader economic and demographic context. Comparing and combining these sources is necessary for a better-informed policy.

(22) Nearly one in three employees in the EU work in jobs that do not match their skills, suggesting a sub-optimal utilisation of labour potential. Overly stringent regulation of certain professions and cumbersome recognition procedures create barriers to entry and reduce labour market mobility, thereby contributing to skills mismatches and labour shortages at both national and EU level.

(23) European employers face difficulties in recruiting workers from outside the EU. Fewer than one in ten small and medium-sized enterprises have recruited workers from third countries in response to skills shortages, and most that have done so found the process difficult. Third-country nationals often encounter fragmented and slow procedures for the recognition of their qualifications and experience issues of overqualification and skills mismatches. Overqualification rates for third-country nationals can be twice as high as for EU nationals.

HEREBY RECOMMENDS that Member States act in the period 2026-2027, to:

1. Address skills shortages in strategic sectors

- Steer actions to address skills shortages, with a focus on occupations, notably requiring science, technology, engineering and mathematics (STEM) skills, including ICT and AI, in sectors of strategic importance (digital and clean technology, circular economy and industrial decarbonisation, health and biotech, agriculture and fisheries-aquaculture, bioeconomy, defence industry and space).
- Strengthen fast-track as well as longer-term delivery of future-proof and labour market-relevant skills in areas of strategic importance, by fostering

[28] See Council Conclusions, The role of labour market, skills and social policies for resilient economies, 20 June 2024 and the Voluntary Guiding Principles for EU Member States for evaluating economic effects of reforms and investments in the labour market, skills and social policy domains. June 2024.

[29] Satellite accounts are supplementary frameworks that expand on the core national accounts by providing additional detail on specific areas. Satellite Accounts on Education and Training quantify investment in human capital by measuring expenditure on formal education, vocational training, and non-formal learning.

[30] https://education.ec.europa.eu/focus-topics/improving-quality/learning-lab

partnerships between education and training providers, public employment services, social partners and individual businesses as well as (local) public bodies.

- Reduce barriers to entry to professions and ensure faster recognition of qualifications in strategic sectors for EU and third-country nationals.

2. Strengthen basic skills to build solid foundations for higher competitiveness

- Strengthen the acquisition of numeracy, literacy, science, digital, citizenship and financial literacy skills from early age and throughout all levels of education with particular attention to socio-economically disadvantaged groups and persons with disabilities, to reach the target of less than 15% of 15-year-olds underachieving in basic skills.
- Ensure sufficient incentives for the attractiveness of the teaching profession, especially for STEM subjects.
- Strengthen students' and lifelong learners' digital skills, including Artificial Intelligence (AI) literacy, apply digital testing tools to monitor progress, and train teachers for computer assisted learning.
- Encourage the effective and responsible use of AI. Address the impact of the use of digital devices on academic performance, and mental and physical well-being.

3. Strengthening Vocational Education and Training (VET) for competitiveness

- Boost the quality and attractiveness of VET and apprenticeships, including by tackling negative perceptions, strengthening inclusiveness for disadvantaged groups and addressing gender stereotypes, notably in STEM programmes.
- Create and implement strategies to reach the 2030 targets of at least 45% of initial medium-level VET learners enrolled in STEM fields, at least one out of every five students should be female, and of at least 12% of VET learners participating in learning experience abroad.
- Promote a sufficient supply of STEM teachers and trainers and incentivise work-based learning in cooperation with companies.

4. Improve tertiary education outcomes in STEM

- Increase capacity, relevance and attractiveness for young people of tertiary education STEM programmes (including higher-level vocational programmes), in ICT and AI fields, in areas with major labour gaps and in strategic areas.
- Promote AI literacy and strategic thinking of graduates, foster transdisciplinary approaches and enhance the internationalisation of tertiary level STEM programmes, particularly through the reinforcement of joint transnational degree programmes in engineering and STEM fields.

5. Investment in education and skills

- Promote effective and efficient public spending on education and skills commensurate to the identified challenges and agreed objectives and targets, including by leveraging on cohesion policy funds, including the European Social Fund Plus.

- Promote private investment in upskilling and reskilling and the use of the social investment and skills policy window of InvestEU.
- Regularly monitor and evaluate investments in education and skills at national, regional and local levels, using solid and tailored impact assessment and evaluation methodologies. Rely where considered useful on the Voluntary Guiding Principles endorsed by the Council[31], to inform evidence-based policymaking.
- Increase the use of administrative data to assess the effectiveness and efficiency of public and private spending in education and training.

6. Skills intelligence for mastering labour market transitions

- Develop and apply methodologies for the use of big data and AI, to provide better and timelier skills intelligence, building on and complementing existing quantitative and qualitative skills intelligence sources.
- Further integrate and increase the regular use of skills intelligence in the (re-)design of national, regional and local skills and economic development strategies, in the areas of career guidance, reorientation and job transitions, as well as in future-proofing curricula design and development.

Done at Strasbourg,

For the Council
The President

[31] https://data.consilium.europa.eu/doc/document/ST-10779-2024-INIT/en/pdf