ETF Working together Learning for life

European Training Foundation

EMPOWERING THE FAIR TRANSITION IN EU NEIGHBOURHOOD AND CENTRAL ASIA

REPORT A: Articulating climate policies with human capital development

THE EU AGENCY SUPPORTING COUNTRIES TO DEVELOP THROUGH LEARNING

This report has been prepared by the European Training Foundation.

Manuscript completed in October 2025.

Authors: Romain Boitard (ETF), Frederick Elliot Gaved and Jan van den Akker (PPMI)

Peer Reviewers: Cristina Mereuta, Outi Kärkkäinen (ETF)

Please cite this publication as: European Training Foundation (2025), *Empowering the Fair Transition in EU Neighbourhood and Central Asia,* Turin, Italy

EXECUTIVE SUMMARY

Achieving the goals of the Paris Agreement – limiting global temperature rise to well below 2°C and pursuing efforts to cap it at 1.5°C – requires an accelerated low-carbon transition. Countries are advancing this shift by expanding renewable energy, electrification and end-use energy efficiency across key sectors: buildings and construction, transport and infrastructure, industry, and agriculture, forestry and land use (AFOLU). In AFOLU, mitigation and adaptation measures are being integrated to an increasing degree.

This transition has profound implications for labour markets and the broader economy. It will reshape entire sectors and disproportionately affect regions where carbon-intensive industries are concentrated. The shift from fossil fuels to clean energy will impact both direct and indirect employment, influencing local economies and community life. It also demands a transformation in the nature of work and the skills required. Workers must adapt to low-carbon technologies and green practices, necessitating targeted upskilling and reskilling. While many emerging green occupations require advanced scientific knowledge, others will be accessible through vocational training and on-the-job learning. In order to ensure a fair transition, evolving skill demands of both existing and replacement jobs must be addressed, and workers' preferences and those of vulnerable groups must be considered, in addition to overcoming policy, institutional and social barriers.

Under the United Nations Framework Convention on Climate Change (UNFCCC), commitments to reduce greenhouse gas (GHG) emissions are operationalised through Nationally Determined Contributions (NDCs) – country-specific climate action plans revised every 5 years. From 2024, Biennial Transparency Reports (BTRs) will support the NDC cycle. While primarily focused on climate mitigation and adaptation, NDCs increasingly serve as instruments for sustainable development, integrating environmental, social and economic dimensions.

This report evaluates the extent to which just transition principles, particularly human capital dimensions such as employment, education, and skills, are integrated into the NDCs of 25 countries across the EU Neighbourhood and Central Asia. The analysis applies a five-tier framework (below baseline, baseline, minimum, fair, good) based on ten criteria covering policy coordination, social dialogue, skills needs and acquisition, education programmes, financing, and inclusivity. Most countries fall within the baseline or minimum categories, indicating partial but fragmented integration of human capital considerations. These elements are rarely neither cohesive nor systematically embedded in national climate strategies.

The report calls for a more robust integration of human capital needs into future NDCs (3.0) and BTRs, framing them as strategic opportunities to advance a fair transition. This entails embedding employment and skills development into climate planning and ensuring inclusive stakeholder engagement – including social partners, civil society, municipalities, training providers, youth and gender representatives. A summary of key findings and policy implications is presented below.

Summary of main findings and policy pointers

Main findings on human capital dimensions inclusion in NDCs	Policy pointers
1. Climate mitigation and adaptation plans across regions show varied ambition levels, yet consistently prioritise certain sectors and measures	1. Cross-sectoral synergies can amplify climate mitigation and adaptation impact while allowing flexibility for context-specific measures in resource-dependent and industrialised economies.
2. Human capital dimensions are present in most countries that submitted NDC documents, but in many cases, integration is fragmented across strategies, actions and budgets. There is a moderate regional trend, but limited	2. Policies should require structured inclusion of human capital (education, training, and dialogue), beyond awareness raising, to support workforce transitions in priority sectors of the green economy. Approaches to filling the gaps in

Main findings on human capital dimensions inclusion in NDCs	Policy pointers
evidence, of how economic, labour market or system performance affects the inclusion of human capital dimensions	alignment with the climate strategy should be identified and implemented.
3. There is a noticeable tendency that partner countries not in the process of EU accession are less likely to develop robust inclusion of human capital dimensions in their climate strategies	3. Understanding the drivers and enablers for better inclusion of human capital components in climate strategies (and NDCs) necessitates further case studies and additional research. One enabler could be the support provided by EU institutions, multilateral or UN organisations in the elaboration of NDC and related documents.
4. There is no standardisation across countries, with a very high degree of variation in what human capital dimensions are included in NDCs. Education and training topics that are frequently mentioned are mostly linked to capacity building of the climate change research and reporting process itself	4. Policies should advocate for clearer international guidance and regional coordination mechanisms to support comprehensive inclusion of education, training, and labour components. Without such frameworks, countries risk fragmented approaches that overlook workforce needs in key mitigation and adaptation sectors.
5. Sectoral or thematic analysis is often missing, and the necessary information systems are lacking	5. a. Partner countries can develop more robust labour market analysis systems, such as job observatories, or bodies such as sector skills councils (energy seems an absolute priority since all countries prioritise this sector), to support the integration of education and training offers with skills needs. 5. b. Partner countries should apply this approach to both potential growth areas – to maximise gains – and also to sectors expected to experience negative effects to mitigate risks and reduce the potential impact of the green transition.
6. Coordination with and involving relevant human capital stakeholders is not commonly seen as an integrated part of the NDC strategy formulation	6. a. Climate strategies should formally embed education, labour, and social affairs ministries or agencies into the design and implementation of NDCs, beyond mere participation in advisory or committee roles. Coordination mechanisms should be strengthened to enable joint planning across climate and human capital domains. 6. b. Climate strategies should explicitly link education and training offers – across general, vocational, and higher education – with sector-specific skill needs to support workforce transitions in the green economy. 6. c. Develop processes that ensure the engagement of vulnerable or underrepresented groups with concrete commitments or options for these stakeholders. Human capital development strategies by countries should address inclusivity awareness and sensitivity.
7. Lack of financing for climate-relevant education and training (in NDCs)	7. a. Partner countries should assess the cost of supporting the human capital dimensions of the green transition, and climate strategies should include dedicated and clearly costed financing plans for education and training to support workforce transitions in the green economy. 7. b. Countries can also use this exercise as a way to approach development finance institutions to support green transition pathways, when there are financing gaps that are not feasible to be filled through current revenue streams

CONTENTS

1 INTRODUCTION

1.1 Context

1.1.1 Nationally Determined Contribution

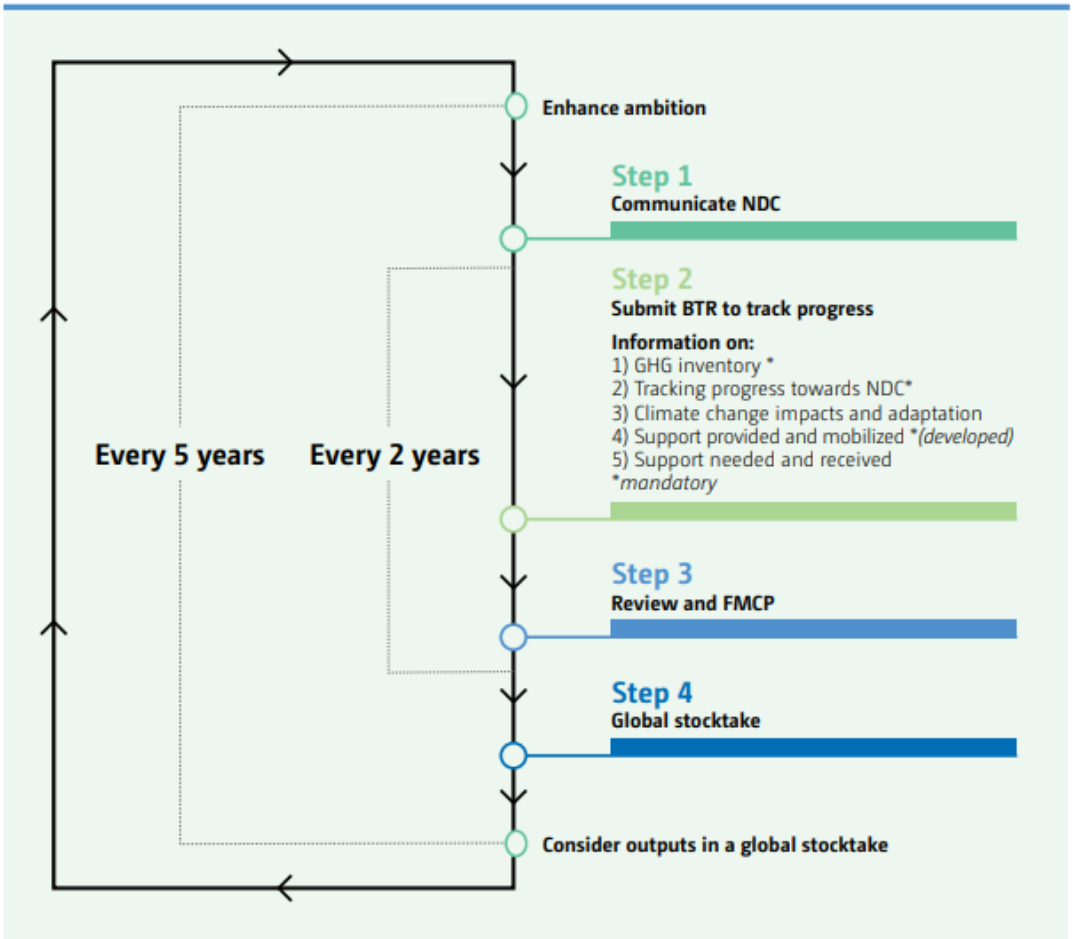
Nationally Determined Contribution Climate change is one of the defining global challenges of the 21st century, requiring deep transformations in energy systems, production, consumption, and labour markets. The Paris Agreement, adopted under the United Nations Framework Convention on Climate Change (UNFCCC) in 2015, provides the international framework for coordinated climate action. Its central mechanism, Nationally Determined Contributions (NDCs), obliges parties to submit climate action plans outlining mitigation and adaptation strategies.

While NDCs have expanded in ambition, recent UNFCCC assessments reveal a continued emphasis on technological and infrastructural measures, with limited integration of human capital and labour market considerations[1]. This omission presents a strategic risk. The energy transition depends not only on deploying clean technologies but also on cultivating a workforce capable of implementing and sustaining them. Skills shortages and mismatches – already reported in several EU and neighbouring countries – can delay progress toward NDC targets. The International Labour Organization (ILO) has warned that neglecting the skills dimension undermines both the speed and inclusivity of climate action. The UNFCCC has, to an increasing extent, acknowledged these interlinkages. The Marrakech Partnership (2016) introduced just transition and workforce readiness as key themes, while COP26 and COP27 reinforced the need to align climate ambition with social and economic development.

In Europe, the Green Deal and related instruments explicitly connect climate and skills agendas. The Council Recommendation on Learning for the Green Transition and the European Sustainability Competence Framework (GreenComp) by means of the Union for Skills initiative through large-scale upskilling and reskilling programmes in industrial ecosystems central to decarbonisation. Despite these advances, references to education, training and labour market measures in NDCs remain sparse and often peripheral. This report addresses that gap by triangulating NDC content with labour market evidence and education system performance. It assesses the extent to which climate commitments are supported by human capital systems, highlighting both strengths and vulnerabilities in partner countries' readiness for the green transition.

[1] Beyond the scope of this analysis, the reader should be aware that despite the European Union's formal commitment to the Paris Agreement, recent assessments reveal a significant gap between stated ambitions and actual policy trajectories. According to the Climate Action Tracker (2025), none of the current Nationally Determined Contributions (NDCs) submitted by EU Member States or neighbouring countries are aligned with the Paris Agreement's central objective of limiting global warming to 1.5°C. The analysis categorises these NDCs as either 'Insufficient' or 'Highly Insufficient', indicating that, even if fully implemented, they would lead to temperature increases well above the Paris threshold. This underscores a persistent misalignment between national climate strategies and the global mitigation targets agreed upon in 2015.

Figure 1: Nationally Determined Contribution under Article 4 of the Paris Agreement



Source: UNFCCC (2021).

Under the UNFCCC, countries submit National Communications every 4 years, detailing GHG inventories, mitigation measures, and climate impacts. Non-Annex I Parties also submit Biennial Update Reports (BURs), while all parties to the Paris Agreement are required to submit Biennial Transparency Reports (BTRs) from 2024 onward. These reports include updates on emissions, progress toward NDCs, and needs in terms of support. NDCs are revised every 5 years, with the next round (NDC 3.0) due by 2025. As of September 2025, 27 countries have submitted their updated NDCs, while 170 remain pending.

The second generation of NDCs (2020–2021) projected a global temperature reduction of approximately 2.7°C. NDC 3.0 is expected to introduce more stringent targets, aiming to align more closely with the 1.5 °C goal. The Enhanced Transparency Framework, supported by BTRs, will play a key role in tracking progress and ensuring accountability.

1.1.2 Low-carbon just transitions and regional cooperation

In relation to the countries covered in this study, the European Union's approach to external cooperation promotes the green transition and the decoupling of economic growth from emissions. The European Green Deal (EGD) serves as an internal compass guiding global engagement on climate action (European Commission, undated). For most non-EU Neighbourhood countries included in this report, High-Level Dialogues are the primary instruments for climate and technical cooperation. Morocco benefits from an additional Green Partnership (European Commission, 2022), while Türkiye participates in two operational working groups on climate action.

Accession countries are required to align their legal frameworks with EU climate legislation, including the climate acquis. Several ETF partner countries are also members of the Energy Community; an international organisation that brings together the EU and nine neighbouring and candidate countries, including those in the Western Balkans, Ukraine, Moldova and Georgia. The Energy Community aims to establish an integrated regional energy market based on a legally binding framework.

1.1.3 Employment losses and gains in the transition

IRENA (2023b) estimates employment impacts under two scenarios: Planned Energy (PES), based on current national targets, and 1.5°C, aligned with the Paris Agreement. Under the 1.5°C pathway, economy-wide employment would average 1.7% higher than PES between 2023 and 2050, with gains of 1.8% up to 2040 and 1.5% thereafter. Energy sector jobs would rise from 167 million in 2020 to 134 million by 2030 in the 1.5°C scenario and 101 million in PES. Losses of about 12 million fossil fuel jobs would be offset by 45 million new positions, including 11 million jobs in renewables. Renewable energy employment would grow from 14 million in 2020 to 25 million by 2030 (20 million in PES) and to 40 million by 2050 (22 million in PES).

The ILO (2018a) projects a net positive employment effect from climate action in energy, transport, and construction under a 2°C scenario, with 41% emission reductions by 2030. This includes 18 million additional jobs globally by 2030 compared to business-as-usual, notably 4 million in manufacturing and 9 million in renewables and construction. Renewable-based electricity would create 2.5 million jobs, offsetting losses of 400,000 in fossil fuel generation, driven by higher labour intensity and value chain requirements.

Circular economy strategies – shifting from linear models to reuse, repair, and recycling – will increase employment in waste sorting, resource recovery, and reprocessing, while reducing jobs in mining and primary manufacturing (WB, 2022b; WB, 2022c; UNDP-ILO, 2022). A sustained 5% annual rise in recycling rates could generate 8 million net jobs under the 2°C scenario, with 92 million gains in recycling and reuse offset by 84 million losses in mining and manufacturing (ILO, 2018a).

Agriculture presents mixed outcomes. Sustainable practices such as conservation and organic farming reduce emissions but may lower yields, raising concerns about land use amid rising food, feed, and biofuel demand (ILO, 2018a). Overall, employment may decline due to reduced labour intensity, disproportionately affecting poorer workers and smallholders.

In sum, the evidence indicates that while the green transition will generate substantial net employment gains, these will be uneven across sectors and regions, requiring targeted policies to manage job displacement and ensure a just transition.

1.1.4 Employment and skills development in NDC reporting

The 2024 NDC Synthesis Report (UNFCCC, 2024) identifies workforce development as a key consideration in climate strategies. Thirty-four percent of parties plan to address social and economic impacts through just transition measures, including worker protection laws, job creation strategies, skills development, and social dialogue. Sixty-four percent report actions to advance climate education by updating curricula and integrating climate change into education policies, while 69% highlight training initiatives for capacity building and access to green jobs. However, most capacity-building measures target institutional strengthening rather than workforce development, and only 25% explicitly link training and upskilling to just transition objectives. References to climate education in NDCs often lack specificity regarding labour market skills, requiring cautious interpretation.

Policy guidance studies (GIZ, 2022; ETF, 2023a; EFL, 2024) outline six priorities for aligning human capital strategies with NDC implementation:

1. Integrated frameworks linking net-zero goals with employment and skills policies, based on skills gap assessments;
2. Coordination and inclusion mechanisms to strengthen governance and stakeholder participation;
3. Enhanced labour market data for informed workforce planning;

4. Private sector engagement supported by incentives and funding for green skills development;
5. Integration of informal workers through TVET and socio-economic strategies;
6. Holistic education reforms including centres of excellence, skills intelligence systems, and accessible reskilling programmes.

These frameworks provide a basis for ETF partner countries to embed workforce and skills measures into green transition strategies.

1.2 Purpose, scope and overview of the report

This report provides evidence-based recommendations on integrating human-centred dimensions of the green transition into NDCs, in line with the Paris Agreement. It examines how early investment in skills supports climate adaptation and mitigation, using country-level data on education, skills and employment coverage in EU Neighbourhood climate policies and their coherence with education and labour programmes.

Chapter 2 serves to contextualise the assessment and maps climate targets and GHG reduction commitments across 25 ETF partner countries, alongside socio-economic and education indicators drawn from diverse public datasets. This is followed by various employment and education metrics such as unemployment, education expenditure, skills mismatch, NEET rates and more. A number of examples of workforce integration into climate policies are also collated in this chapter.

A detailed methodology and the assessment of the NDC documents for all ETF partner countries by means of 10 assessment dimensions are provided in Chapter 3, as well as the results of the exercise.

Chapter 4 concludes the report with findings and recommendations for systematically embedding employment, education and skills measures into NDCs and UNFCCC reporting, illustrated with examples from ETF partner countries.

2 OVERVIEW OF CARBON EMISSIONS, CLIMATE COMMITMENTS AND IMPACT ON HUMAN CAPITAL IN NDCs

2.1 Review of GHG emissions, employment and education situation in ETF partner countries

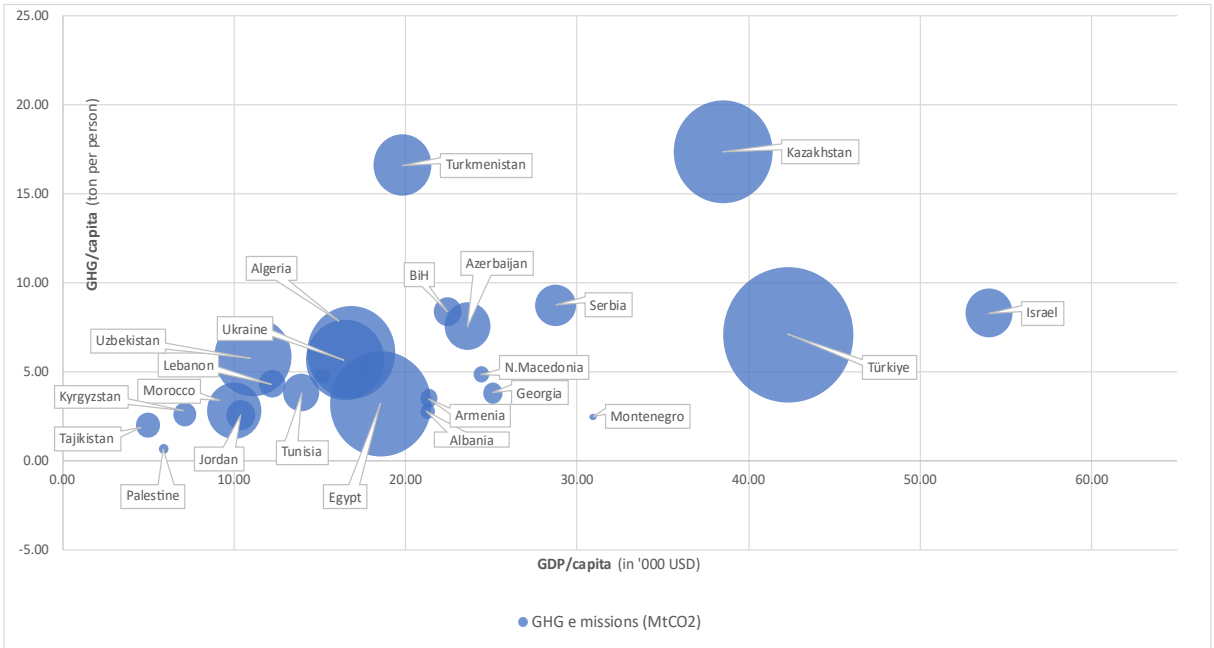
2.1.1 Climate change mitigation targets

Carbon emissions across the ETF partner countries

The countries vary widely in terms of the size of their economy (Türkiye's GDP in PPP of USD 3 611 billion, according to current rates, as compared with Montenegro's USD 19 billion in 2023), population (Egypt's USD 114.5 million as compared to Montenegro's USD 0.6 million) and level of income (Israel's per capita GDP of USD 54,000, in comparison with Tajikistan's per capita GDP of USD 5 000). Correspondingly, countries differ vastly in terms of GHG emissions, as shown in Figure 2.

The largest source of emissions is the energy sector, with differences in share in emissions (excluding FOLU) varying between 93% (Turkmenistan) to 62% (Albania), on average 90.5%, roughly evenly divided between production and demand (see Figure 4). In Figure 2, the relatively large emissions of oil and gas exporters are noticeable (due to the large contribution of fugitive emissions associated with fossil fuel production and transport) in the case of Algeria, Azerbaijan, Kazakhstan and Turkmenistan.

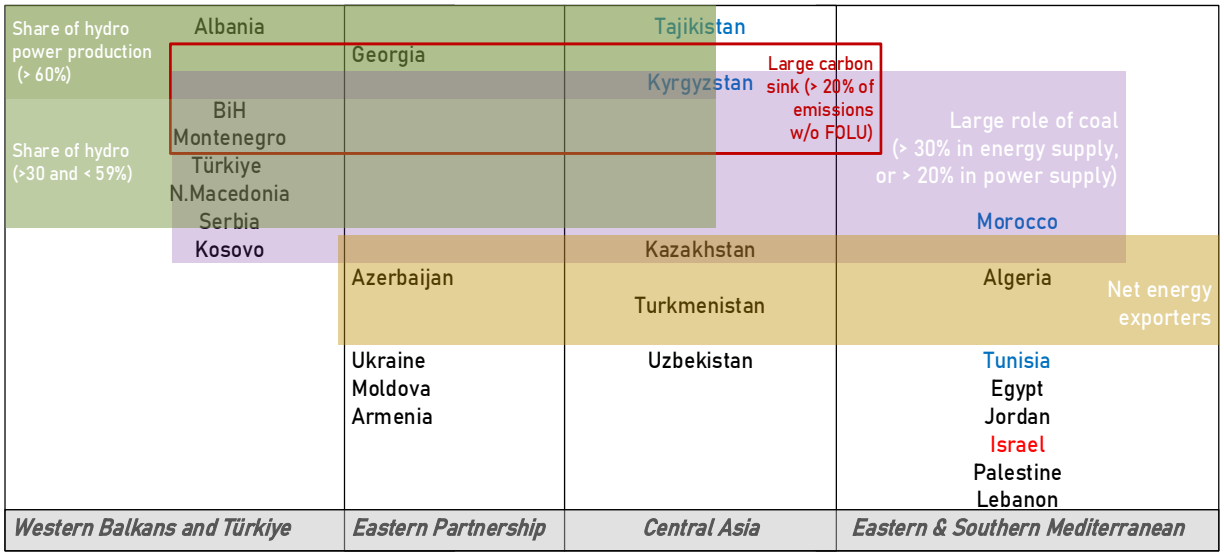
Figure 2: GHG emission by GDP per capita and GHG per capita (2023)



Source: research team/PPMI, using statistical data included in the Annex. For comparison, the average GDP per capita in the EU-27 was USD 59.01 in 2023 and GHG per capita 6.7 tonne per person. Due to the size of the GHG emissions of the EU-27 group as a whole, 3 484 MtCO2 in 2023, the corresponding circle surface cannot be shown in the figure.

Relatively higher GHG emissions in the energy sector are associated with coal production and demand (e.g. Western Balkan countries, Kazakhstan, Kyrgyzstan, Morocco), while countries blessed with large hydropower resources will have relatively lower GHG emissions in electric energy production (see Figure 3 below).

Figure 3: Intersection of characteristics of location, energy emission and carbon sinks



Countries in red: high-income country (according to World Bank classification), blue: lower-middle income countries, black: upper-middle income countries.

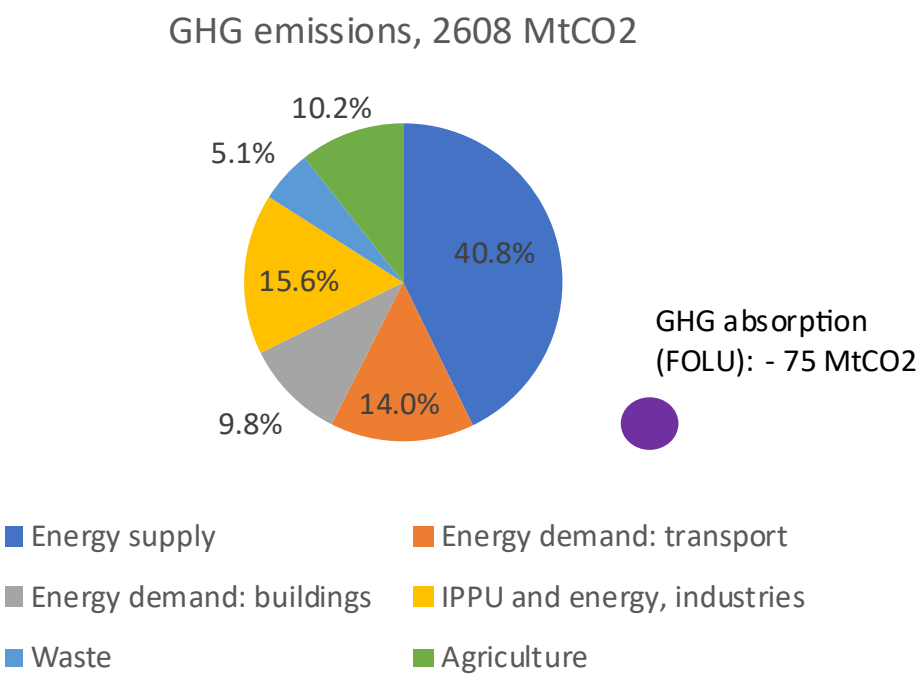
The level of emissions may also reflect the development stage of a country; those with large energy-intensive industries have higher emissions than countries whose economy is based on a large services sector. Therefore, the countries can be grouped according to energy supply characteristics, i.e. a) prominence of exports in the energy balance (most countries are net importers); b) importance of coal in the country's energy and/or electricity supply; c) share of hydropower in electricity production (indicating less dependence on fossil fuels), and the presence of a large carbon sink (indicative of carbon absorption in forests).

Mitigation targets across the ETF partner countries

The table 5.1 in the Annex provides the details for each of 25 ETF partner countries of net (GHG) emissions for 1990, 2020, 2021 and 2023 with a breakdown of net emission per main emitting sector. Regarding energy supply, additional columns provide information on the main sources (hydro, oil or gas, coal, nuclear), status as energy exporter, as well as the current share of renewables (mainly hydropower) in power production.

Among ETF partner countries, the most ambitious NDC target is set by Montenegro, pledging a reduction of 75% below BAU by 2030, while the least ambitious is Algeria, with a commitment of only 9% below BAU. This illustrates the wide disparity in ambition levels across the region. Values vary across NDC submission cycles, and current extremes are likely to change as forthcoming NDC 3.0 updates increase ambition in line with global trends.

Figure 4: Sectoral share in GHG emissions (2021) in ETF partner countries

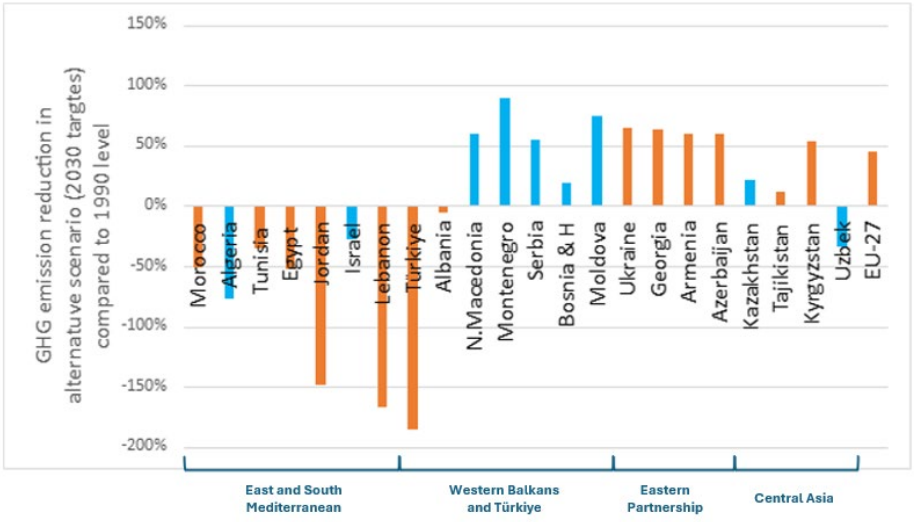


Total net emissions were 2 533 MtCO2 in 2021. Data taken from Annex 5.1. IPPU: industrial processes and product use (manufacturing and construction). FOLU: forestry and land use

Overview of GHG emission reduction targets per country

Countries adopt different reference points for GHG reduction targets to reflect national circumstances, historical emissions and policy choices. While 1990 is widely used (see the figure below), anchored in the UNFCCC process and the EU's 55% reduction target by 2030, it often fails to capture individual trajectories, particularly for economies with rapid growth or those undergoing structural transitions.

Figure 5: GHG emission reduction in alternative scenario

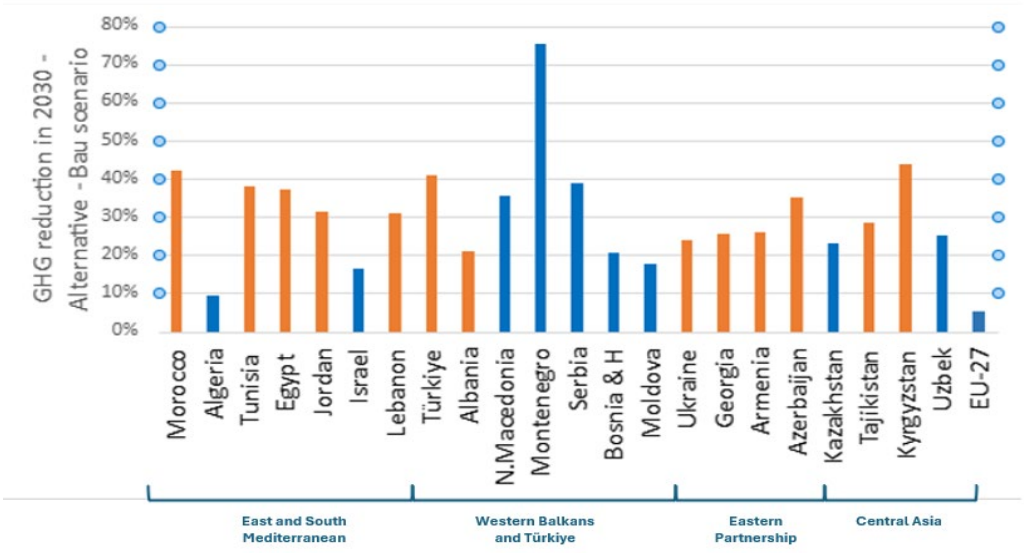


Source: research team/PPM

Many countries therefore prefer scenario-based baselines, comparing projected emissions with additional measures (WAM) against without measures (WOM) or with existing measures (WEM). The gap between WEM and WAM illustrates the expected impact of new policies. Annex 5.1 provides estimates using both approaches, drawing on recent BUR and BTR data for 2030 projections.

Analysis shows that, based on alternative-baseline scenarios, most ETF partner countries target 20-40% reductions by 2030, with Algeria at the lower end and Montenegro among the most ambitious. Regional averages cluster around 26-30%, except Western Balkans and Türkiye (39%), likely reflecting EU accession dynamics (see figure below). Both conditional actions are considered (those to which a country commits to implement using its own resources) as well as unconditional (undertaken only when countries are in receipt of certain types of international support, financial and/or technical).

Figure 6: GHG reduction in 2030



Source: research team/PPM

When compared to 1990 levels, two patterns emerge:

- Southern and Eastern Mediterranean countries and Türkiye show higher emissions than in 1990, driven by industrial and economic growth;
- Eastern Europe and Central Asia exhibit lower emissions, reflecting the post-1990 restructuring of centrally planned economies.

For context, the EU appears to have a modest 2030 target when expressed against alternative scenarios (–5%), but, in reality, has already achieved a 35% reduction since 1990.

Source: See Annex

When benchmarked against low and middle-income economies (LMICs) globally, the ETF partner countries' mitigation ambition appears broadly in line with the LMIC mainstream. Based on our annexed compilation, their 2030 commitments average ~32% below business as usual (BAU) (with country values spanning ~9-75%, roughly half clustered in the 30-50% band), which compares closely to the BAU relative ranges commonly observed in LMIC NDCs (e.g. Indonesia 29%/41% and Thailand 30%/40% for unconditional/conditional targets, respectively). In other words, the portfolio is neither systematically above nor below the wider LMIC field once expressed on a comparable BAU basis, while also reflecting the typical LMIC reliance on conditional ambition pending external finance and technology support.

The summary table in Annex 5.1 presents a compilation of relative emission reduction targets as mentioned in NDCs (or related documents such as the BTR or BURs), i.e. reduction of emissions achieved by 2030 below BaU level, if the proposed emission reduction actions were implemented.

Priority sectors for mitigation and adaptation

This analysis draws on the most recent submissions from 25 ETF partner countries, including NDC 3.0 where available (for example Montenegro and Moldova), NDC 2.0 (2020-2021), BTR (2024-2025) and the latest BURs (2020-2023), coded according to the standard NDC sector taxonomy: energy supply; energy demand in buildings, transport and industry/IPPU; waste; agriculture; FOLU/AFOLU; and cross cutting systems. Figure 4 shows the share of countries explicitly prioritising each option.

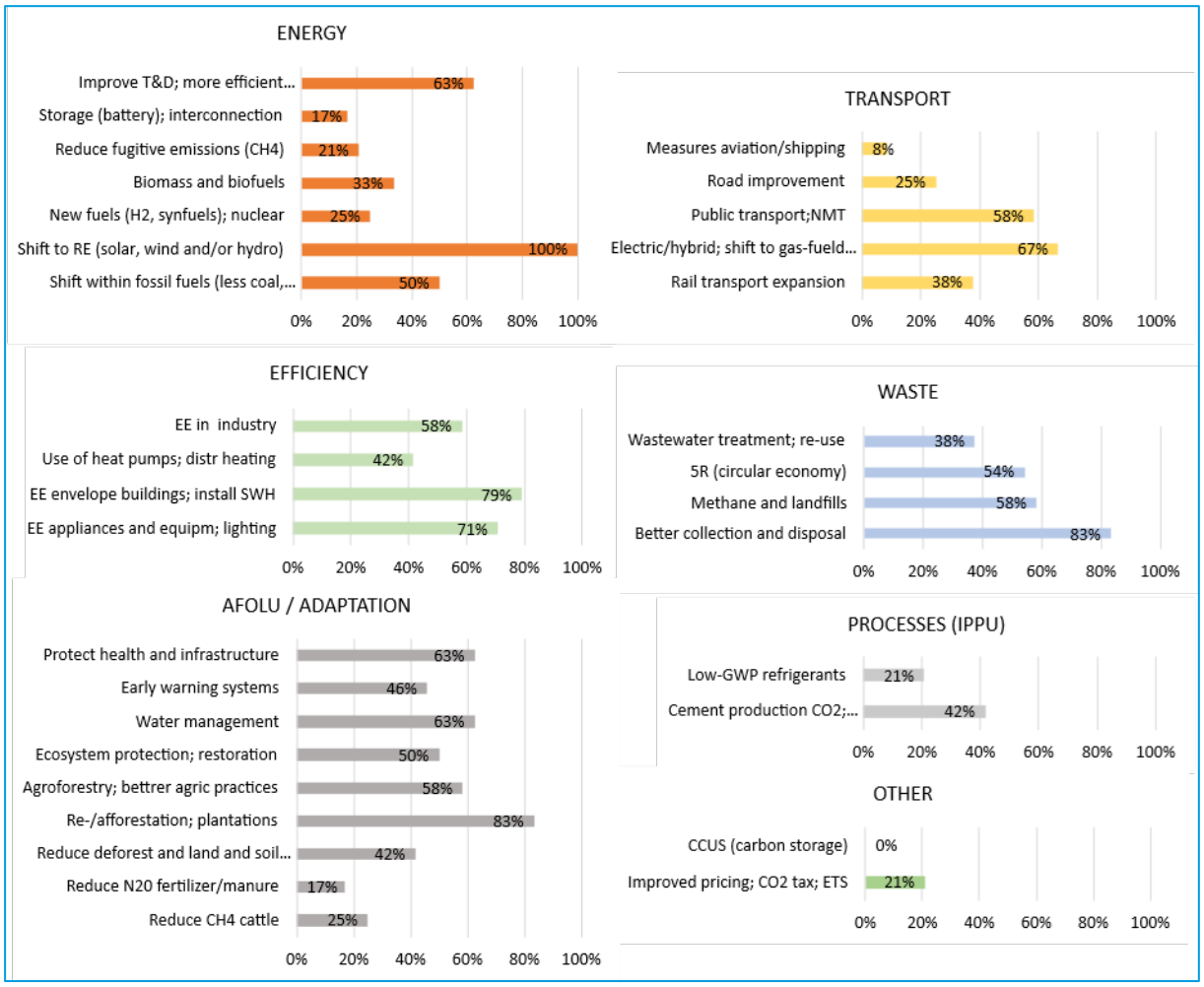
Mitigation strategies are pragmatic and deployment oriented. All countries prioritise grid connected renewables such as solar, wind and hydropower, while about two thirds also reference grid modernisation and system efficiency improvements. A second tier of measures, including biomass and biofuels (around one third), hydrogen and synthetic fuels (one quarter), storage solutions (17%) and fugitive methane abatement (21%), appears more selective due to higher capital intensity and earlier policy readiness. No country includes carbon capture, utilisation and storage (CCUS) in its NDC. Transport measures focus on vehicle electrification and hybrids, often combined with fuel switching to gas as a transitional step, while sustainable mobility through public and non-motorised transport is widely emphasised. Rail development features in some plans, whereas aviation and shipping receive minimal attention. Energy efficiency cuts across all sectors, with the built environment emerging as the most prominent focus, ranging from building retrofits to solar water heating, followed by efficient appliances, industrial process optimisation and, in some cases, heat pumps and district heating. Waste strategies converge on improving collection systems, reducing landfill methane emissions and promoting circular economy practices, while wastewater reuse is less frequently addressed. Overall, the mitigation portfolio reflects a preference for mature, scalable measures that deliver near term abatement, alongside limited but growing interest in emerging technologies such as hydrogen and storage.

Each NDC outlines mitigation actions by sector to achieve emission reduction targets and provides projected analyses of climate risks and impacts. Adaptation measures address priority sectors such as infrastructure, agriculture, ecosystems, health, water and tourism. These actions are detailed in the Annex (5.5) and compiled from NDC 3.0 (only Montenegro and Moldova), NDC 2.0 (2020-2021), BTRs (2024-2025) and the latest BURs (2020-2023).

Sectoral patterns – renewables first, energy end use efficiency, low carbon transport, waste and methane control, and AFOLU/adaptation – are broadly consistent with priorities in low and middle income economies globally and align with UNDP tracking of NDC 3.0 preparation and global synthesis evidence for 2024-2025.

Adaptation commitments cluster around risk and system level resilience and nature based solutions. About half of the countries highlight health infrastructure protection, early warning systems and integrated water management. Ecosystem protection and restoration, and agroforestry or improved agronomic practices appear slightly less frequently, while afforestation is consistently emphasised. These patterns suggest a pragmatic focus on measures that are institutionally feasible and aligned with budgetary constraints, while more complex or capital intensive options remain marginal.

Figure 7: Share of countries referring to specific mitigation and adaptation actions in their NDC or BTRs



Source: research team/PPMI

The overall configuration of priorities indicates that ETF partner countries are sequencing climate strategies towards options with shorter lead times and lower coordination costs. The absence of CCUS and limited attention to aviation and shipping underscore a deliberate focus on measures deployable within existing institutional and financial frameworks. This approach mirrors patterns observed across low and middle income countries preparing NDC updates for 2024-2025 and aligns with global synthesis evidence.

These sectoral choices translate into immediate and medium term human capital needs which are explained in the next section.

2.1.2 Employment and skills changes

Economy-wide employment effects

The transition will reallocate labour across sectors and over time, generating net gains at the economy level but with uneven distribution. Country modelling illustrates this variation: Egypt is projected to create between 1.44 and 3.78 million net job years under a green energy scenario compared to 2.02 million in a 2050 baseline; Morocco adds 0.57 to 1.01 million versus 0.76 million in the baseline (World Bank 2024). For Türkiye, an ILO-UNDP assessment estimates 370 000 new jobs and 59 000 losses by 2030, underscoring both creation and displacement. Although these studies are limited and methodologically diverse, they consistently show that some sectors more than offset job destruction

while others experience net losses. This reinforces the need for targeted workforce strategies to manage sectoral imbalances and ensure a just transition.

Spatial and temporal asymmetries

Impacts concentrate in locations hosting carbon-intensive activities (e.g. coal basins, oil extraction zones). Job destruction may precede job creation in timing and geography: fossil energy downsizing can occur faster than renewable buildout and associated supply chains, risking regional dislocation absent anticipatory measures (redeployment support, place-based ALMPs and firm-level transition plans) (Hanna et al. 2024).

Sectoral shifts in occupational demand

Energy supply. Rapid expansion of renewables and efficiency measures drives demand for medium skill technicians and installers in solar PV, wind and biomass operations and maintenance, alongside high skill roles in project engineering, systems design, grid planning and manufacturing process engineering. Existing trades such as electricians, plumbers and heating, ventilation and air conditioning technicians require upskilling to new technologies, standards and safety regimes. Value chain needs span planning, manufacturing and assembly, engineering and construction, and operations and maintenance.

Construction and buildings. Mid skill trades including carpenters, plumbers, electricians, roofers, plasterers and building services technicians require competences in deep retrofit, envelope performance, insulation systems and onsite quality assurance. Higher skill roles expand for architects, site managers, energy auditors and energy managers.

Transport. Electrification and alternative fuels create demand for new skills among vehicle mechanics and technicians in electric drivetrain maintenance, battery diagnostics and conversion to compressed natural gas or biofuels. High skill profiles grow in system design, transport economics and multimodal planning for greener urban mobility and rail upgrades.

Manufacturing and mining. Demand rises for eco design, process optimisation, resource efficiency and greener extraction. Mid skill changes focus on waste minimisation and environmental controls, while high skill demand grows in process engineering, quality systems and materials innovation to reduce raw material intensity.

Waste and wastewater. Expansion of collection, sorting, recycling and landfill gas management creates roles in environmental engineering technology, waste to resource operations and monitoring and compliance. High skill demand includes environmental engineers, certification specialists and water and wastewater engineers.

Agriculture, forestry and land use (AFOLU). Existing occupations adapt through organic practices, crop diversification, precision irrigation and agroforestry. Specialist services grow for soil and water conservation, restoration ecology, environmental planning and certification, and water resource management.

Across all sectors, the low carbon transition requires both occupation specific technical skills and transversal competences such as project management, digital literacy, health and safety, quality assurance and problem solving. Many emerging green occupations demand higher skill levels, reflecting substantial scientific and technical knowledge requirements. These patterns underscore the need for proactive skills development policies that integrate reskilling, upskilling and advanced technical education to ensure workforce readiness for the green transition.

Market constraints and enabling opportunities. Barriers to job creation include high technology costs, limited SME access to finance, small market size (constraining local manufacturing/assembly), policy and regulatory uncertainty (including fossil fuel subsidies), and slow permitting, all of which delay projects and reduce local value capture.

Implications for skills systems and labour market policy. The low carbon transition is transforming occupational structures across all major sectors. Energy supply will require rapid growth in technical

roles for renewable installation and maintenance, alongside advanced engineering and grid planning capacities. Construction and building trades must acquire competences in deep retrofit and energy performance, while higher skill profiles expand for architects and energy managers. Transport electrification and alternative fuels create demand for new technical skills in vehicle maintenance and high level expertise in system design and multimodal planning. Manufacturing and mining will shift toward eco design, process optimisation and resource efficiency, while waste and wastewater management expand roles in recycling, environmental engineering and compliance. Agriculture and forestry adapt through precision practices and restoration services. Illustrative examples of these occupations are presented below.

Table 1: Examples of news skills in existing jobs and new jobs alongside current jobs

Job	Emerging skill needs in existing jobs	New job
Electrician	Working on roofs; solar panel installation; certification in both AC and DC; power optimisation	Solar PV technician and installer; Electrotechnician in RE
Plumber	SWH installation	SWH fitter
HVAC	Install heat pumps	Hybrid energy system installer
Onshore wind turbine technician	Marine and aquatic skills for offshore	Wind turbine developer for fishing vessels
Car mechanic	Mechanic able to work on electric batteries and fuel cell technology	Electric and hybrid vehicle technician
Grid system operator	Knowledge of smart grid technology and storage systems; IT and AI skills; smart meters	Smart grid operator
Agricultural specialist	Precision soil conservation; smart and sustainable farming training	Sustainable agriculture specialists
Off-shore oil technician	Off-shore wind technology	Off-shore wind technician
Waste facility operator	Knowledge of waste-to-energy systems	Bioenergy facility manager
Building energy auditor	Knowledge of evolving EE and construction standards and practices	Specialist automated energy management in buildings
Architect	Retrofit design with sustainability knowledge; knowledge of new materials and techniques	Net-zero energy building design specialist
Product designer	Integration of environmental issues	Ecological designer
Oil and gas power plant operators,	Upgraded technology to use hydrogen and other innovative fuels	Clean energy power plant operator

Compiled from World Bank 'Job Creation and Skills Development during the Energy Transition' reports, Morocco (2024), Egypt (2024) and ILO 'Skills for a Greener Future: a Global View' (2019)

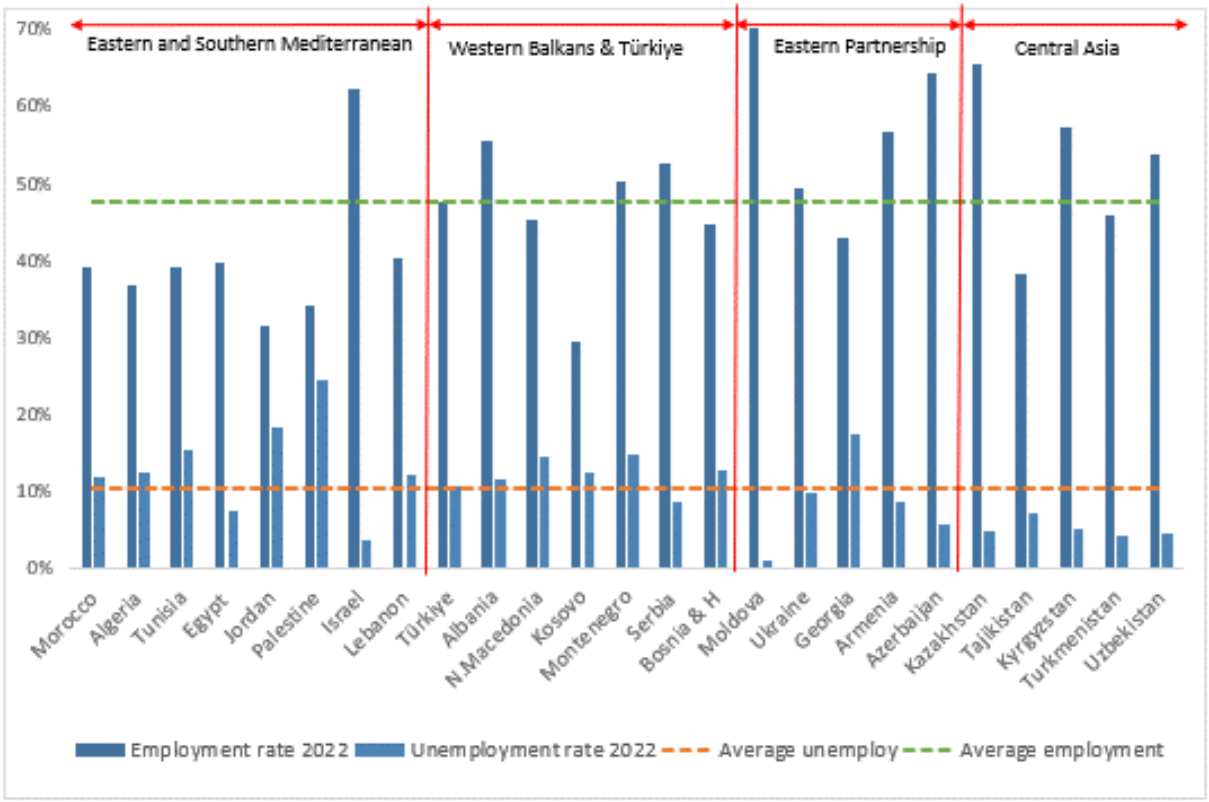
2.1.3 Employment and unemployment

Employment and unemployment patterns across ETF partner countries show significant variation, reflecting structural and regional differences. Figure 6 illustrates that several countries exceed the portfolio average employment rate, while others fall well below it, often accompanied by higher unemployment. Mediterranean countries generally combine lower employment with higher unemployment, whereas parts of Central Asia and the Caucasus display stronger labour market

participation. The Western Balkans and Türkiye present mixed outcomes, with some countries above and others below the portfolio average. These disparities highlight uneven labour market resilience and exposure to transition risks. Addressing these imbalances requires skills development policies that combine reskilling, upskilling and inclusive labour market measures to ensure equitable participation in the green transition.

The analysis introduces a 'just transition friction' signal for indicating potential labour reallocation challenges in decarbonisation pathways. Although harmonised, country-level employment data for carbon-intensive sectors were not available, structural characteristics allow for reasonable inference. Fossil fuel exporters such as Algeria, Azerbaijan and Kazakhstan, alongside coal-reliant systems including Bosnia and Herzegovina, Kosovo and North Macedonia, are likely to face higher reallocation costs per unit of emissions reduction. These economies exhibit concentrated employment and value chains in extractive and heavy industrial activities, amplifying the social and economic adjustments required to implement NDC targets. This underscores the importance of targeted skills development, social protection measures and sectoral diversification strategies to mitigate transition risks and ensure equitable outcomes.

Figure 8: Employment/unemployment rate (%, 2022)



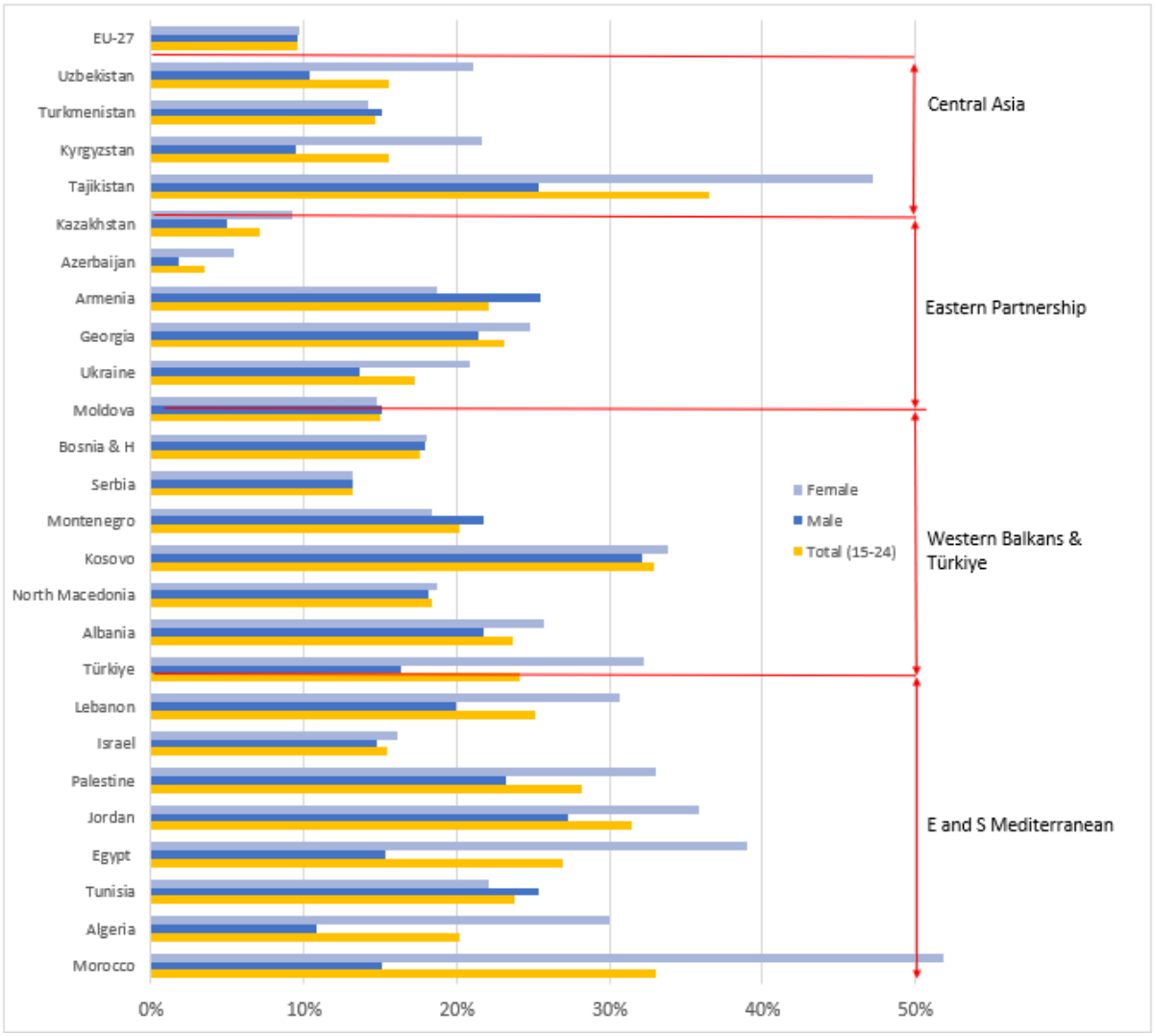
Source: KIESE (see Annex 5.3)

Employment in renewable energy: small share, rapid growth ahead

Despite its strategic importance, the renewable energy sector currently accounts for a modest share of total employment. Globally, energy-related jobs represent approximately 1.84% of the labour force (IEA, 2023), with renewables comprising only a fraction of this figure. ETF partner countries show even lower proportions. Based on IRENA data, employment in renewables remains below the global average across the region. In a relative sense, Jordan is a leader, likely due to its rapid expansion in renewables – from 1% of the energy mix in 2014 to 20% by 2019 – supported by its National Energy Strategy (IRENA, 2020). Albania and North Macedonia follow, while Israel and Türkiye also indicate slightly higher shares. These figures underscore a critical point: while current employment in renewables is limited, the sector is poised for accelerated growth. As countries scale up renewable capacity and implement enabling policies, job creation is expected to rise significantly – particularly in installation, maintenance, grid integration and manufacturing (ILO, 2022). Strategic investment in skills development and labour market intelligence will be essential to ensure readiness for this shift.

*Estimate based on IEA (2024), Irena (2021) and databases: IRENA (accessed 2025) and KIESE (see Annex 5.3).

Figure 9: NEET percentages as total of population aged 15-24 and percentages of NEETs disaggregated by gender



Source: KIESE database (see Annex 5.3)

2.1.4 NEETs

A useful indicator for targeting green skills initiatives is the share of young people not in employment, education, or training (NEET). While NEETs are a vulnerable group at risk of exclusion, they also represent a potential talent pool that could benefit from emerging opportunities in green sectors – particularly in regions where renewable energy projects, building retrofits, sustainable transport, or circular economy activities are taking shape. Figure 9 reports NEET rates for ETF partner countries, disaggregated by gender. As with headline employment, variation is substantial and not cleanly regional: Kazakhstan and Azerbaijan register totals below 10%, while Kosovo, Jordan, Morocco and Tajikistan exceed 30%, signalling very different baseline capacities for mobilising youth for NDC delivery.

In the SEMED subregion, levels are often higher still: Tunisia exceeds 40% (total) and Palestine is above 30%. Gender gaps are pronounced almost everywhere – female NEET surpasses 50% in Morocco and 40% in Tajikistan – while a small set of countries (e.g. Armenia, Montenegro, Turkmenistan, Tunisia) record higher NEET for males. These patterns underscore the need for gender responsive measures within NDC implementation (targeted outreach, care-sensitive activation and safe training pathways).

From an analytical perspective, NEET rates should be viewed as a leading indicator of implementation risk and social inclusion, rather than a factor that determines the ambition of climate targets. High NEET levels signal greater challenges in converting NDC commitments into jobs and skills quickly, and, when NDCs lack strong workforce or just transition measures, heighten the risk of delays and unequal outcomes. In such contexts, countries may need to prioritise early activation measures and vocational or active labour market programmes (e.g. apprenticeships in construction and energy, short-cycle micro credentials for renewable energy operations and public transport). These efforts should be complemented by income support and career guidance to help young women and men access green opportunities. Conversely, systems with low NEET rates can generally scale more easily, provided training supply aligns with sectoral priorities and local labour demand.

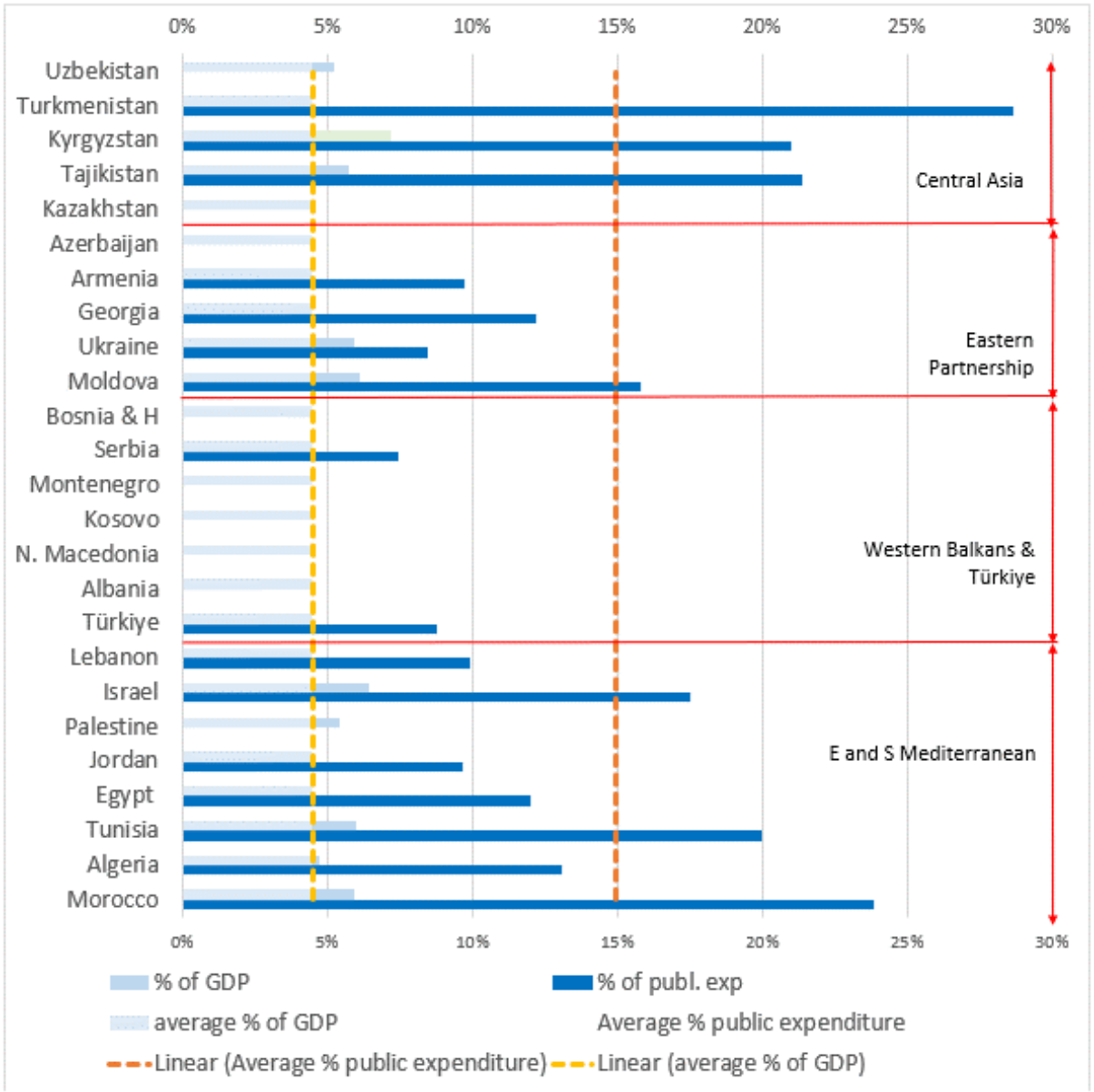
2.2 Training and education metrics in ETF partner countries

This section provides an overview of national metrics on training and education dimensions in ETF partner countries.

2.2.1 Expenditure on vocational education and training (VET) and general education

Understanding national expenditure on education and vocational education and training (VET) is essential for assessing investment in human capital and the resources available for green skills development. Figure 8 below shows wide variation among ETF partner countries: some allocate over 20 percent of public spending to education, while others remain below 10 percent. Participation in VET among 15 to 24-year-olds also differs significantly, with certain regions reporting high enrolment and others below 5 percent. Definitions of VET vary across systems, therefore these figures provide only a baseline for capacity to integrate training aligned with green transition needs.

Figure 10: National education expenditure (2022)



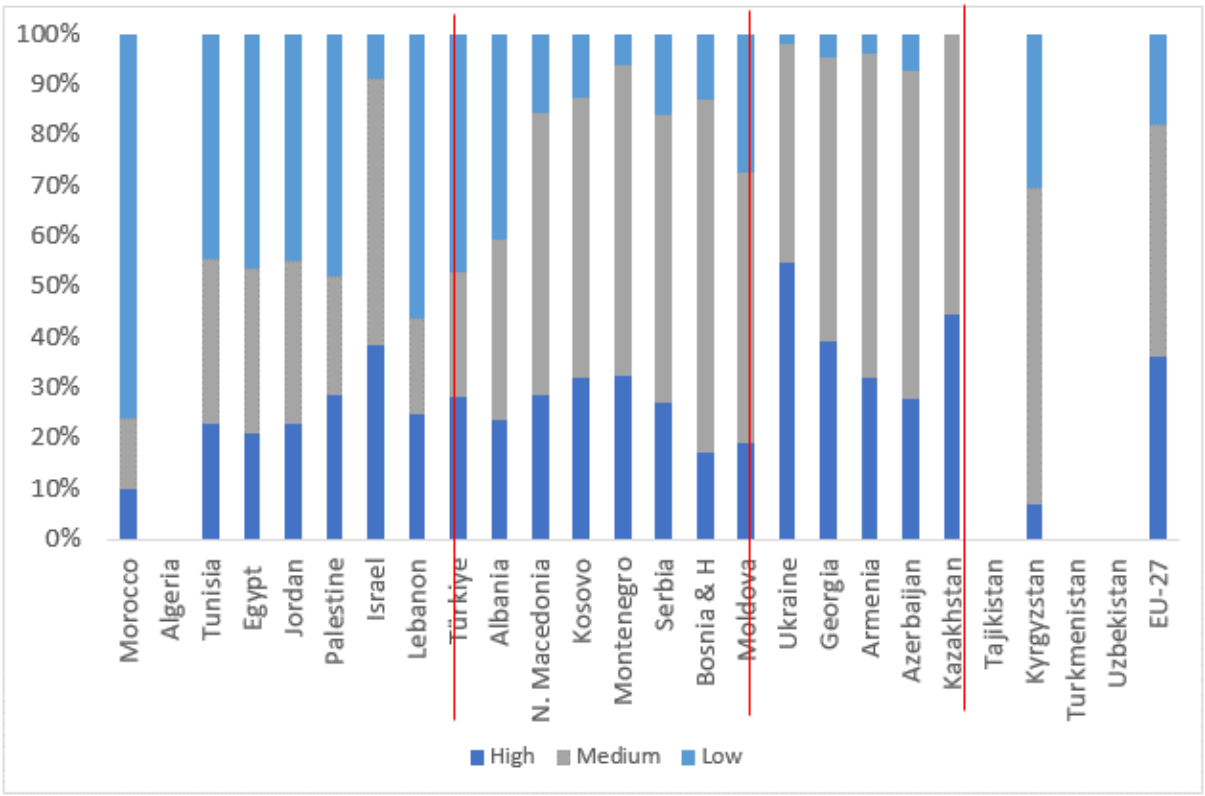
Source: Ourworldindata.org (based on data from UNESCO Institute of Statistics)

These disparities in expenditure highlight the need for strategic investment planning to ensure that education budgets support the development of green skills and align with future labour market requirements (see Annex 5.3 for more data).

2.2.2 Educational attainment

Patterns of educational attainment across the region (see Figure 11 below) provide a critical lens through which to interpret the capacity of national systems to respond to the green and energy transition. Variations in attainment levels shape both the scale and the nature of skills development required: countries such as Albania, where vocational education participation remains comparatively low, face an urgent need for short-cycle, practice-oriented training to support labour-intensive measures such as energy-efficiency retrofits. Conversely, systems with higher tertiary participation, such as Georgia or Ukraine, must prioritise conversion pathways and applied specialisations to address emerging technical and managerial roles in renewable energy and grid integration (Vakulchuk & Overland, 2024). These structural differences underscore the importance of aligning skills strategies with attainment profiles so as to ensure that the transition is both effective and inclusive.

Figure 11: Educational attainment levels in the active population (2022)

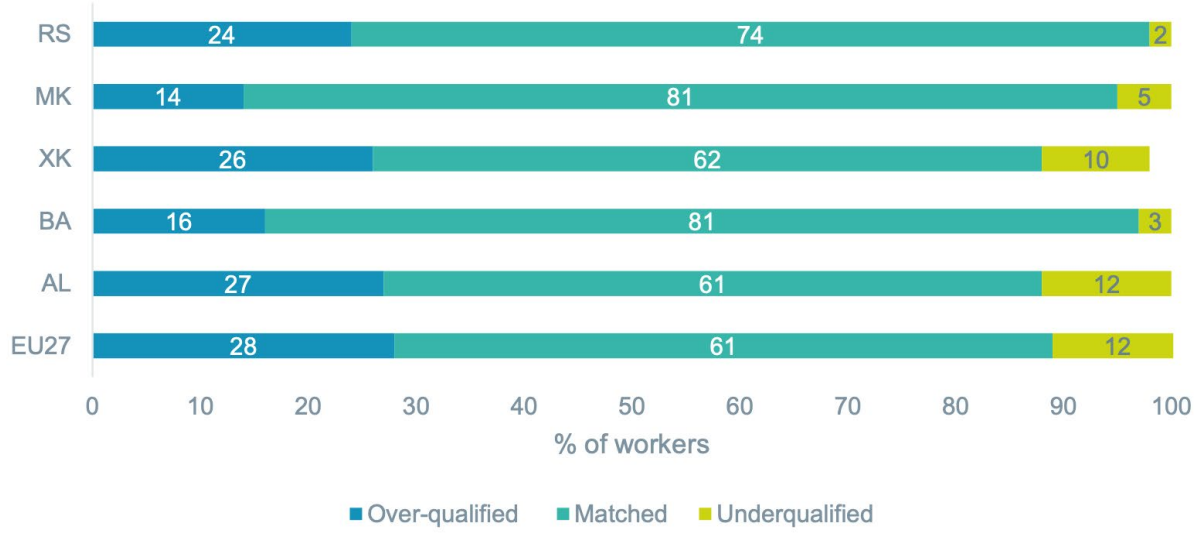


Source: KIESE database (see Annex 5.3)

2.2.3 Skills mismatch

Assessing skills mismatches provides insight into the readiness of education systems and workforces to meet the demands of emerging green sectors. Evidence from ETF (2022) indicates persistent mismatches across partner countries, with high skill gaps prevalent in the Western Balkans and Türkiye and medium skill mismatches more common in Eastern Partnership countries. In some cases, highly qualified workers occupy semi-skilled roles, while other regions exhibit signs of a low skill equilibrium, where limited technology adoption reduces demand for advanced skills and constrains investment in innovation.

Figure 12: Extent of skill mismatches in the Western Balkans and the EU



Source: ETF (2025) Figure 20, p.30 based on ETF Second ESJS (2023).

These patterns highlight structural weaknesses that could undermine the fairness of the transition. Addressing skills mismatches through targeted reskilling, upskilling and systemic reforms is essential to ensure equitable access to green jobs and prevent exclusion from new economic opportunities.

2.2.4 Examples of integration of workforce-related dimensions in climate change policies and actions in selected countries

A just transition requires coherent integration of employment outcomes, skills intelligence, and social dialogue into climate policy frameworks. These elements are now often included in NDCs and related documents. An overview of actions and measures complied from relevant literature is provided in Annex 5.5. Increasingly, these elements are reflected in NDCs, though implementation remains uneven.

Policy coordination and institutional engagement

Effective policy formulation demands cross-ministerial coordination, particularly involving education, employment, and TVET authorities. Their exclusion from climate policy discussions risks omitting critical skills dimensions (OECD, 2023). Moldova's NDC exemplifies good practice by explicitly referencing labour market transformation and skills development (see box below).

> Green jobs and climate change policy, Moldova
>
> Moldova's 2024 Climate Law commits the country to achieving net-zero greenhouse gas (GHG) emissions by 2050 and reducing emissions by 71%. The Ministry of Environment leads implementation and serves as the secretariat for the National Commission on Climate Change (NCCC), an inter-institutional body comprising the Ministries of Finance, Energy, Infrastructure and Regional Development, Agriculture and Food Industry, Health, Labour and Social Protection, Education and Research, and Internal Affairs.
>
> The forthcoming NDC 3.0 (2025) includes a section on just transition and human capital. It identifies new job opportunities in renewable energy and sustainable agriculture, while also noting risks for low-skilled workers and poorer administrative districts. It outlines the role of social protection, education and training, occupational health and safety, and healthcare services in addressing these challenges. The NDC highlights the need for a skilled workforce, noting that green jobs generally require more complex

skills than traditional roles. It also reports that Moldova's labour market faces difficulties in meeting current demand for skilled workers.

The World Bank's Climate and Development Report includes a section on human capital policies – covering social protection, employment, health, and education. It provides data on labour demand across occupations and sectors) and maps relevant human capital policy elements. Institutions involved include the Ministry of Labour and Social Protection, the National Employment Agency, the Ministry of Education, and the Ministry of Economic Development, in coordination with the private sector and workers' organisations.

The report documents the following measures:

- Systems for identifying and anticipating evolving skills needs, with sector-specific focus;
- Mechanisms for collecting, analysing, and disseminating labour market information;
- Efforts to align technical and vocational education and training (TVET) with labour market needs;
- Reskilling and upskilling programmes for workers in sectors affected by climate policies;
- Adaptation of skills development systems to support low-carbon and climate-resilient economies;
- Targeted training initiatives for green jobs, including for women, youth, people with disabilities, and minorities;
- Education system reforms to provide foundational skills for lifelong learning, in line with NDC 3.0 targets;
- Expansion of social protection systems to support the most vulnerable populations during the transition.

Source: Country Climate and Development Report (World Bank, 2024); Nationally Determined Contribution 3.0 of the Republic of Moldova (2025).

Labour market intelligence and skills mapping

Robust labour market data is essential for monitoring transition impacts and guiding policy. However, many countries lack granular, consistent datasets. Labour market observatories can bridge this gap by detailing occupational shifts and associated skill requirements, including soft and technical competencies. For instance, ETF partner countries have conducted sectoral studies to identify emerging skill needs (ETF, 2024) (see Table 2 below).

Table 2: Examples of education and training for green transition in the EU Neighbourhood and Central Asia

Country	Examples
Albania	Designed, prepared and launched new qualifications related to renewable energy production and distribution in partnership with relevant industry stakeholders
Egypt	Students can access short-term training in RE and EE technologies, and VET in green buildings, water management, and training programmes for energy managers RCREEE provides certification of energy management professionals
Jordan	Partnership established with Germany to set up an Energy Academy leveraging German experience in building clean energy systems, with the aim of upskilling and reskilling technicians in clean energy
Kazakhstan	University degree programmes with the potential of green transition, heat and power industry, energy supply of agriculture, agronomy, water resources and water use, forest resources and forestry, fruit and vegetable farming
Kyrgyzstan	State Technical University offers specific skills for engineers in the energy sector, with a focus on renewable sources

Country	Examples
Moldova	Secondary and high schools offer elective courses such as Environmental Education and Renewable Energy Sources;
Morocco	Three training institutes for renewable energy and energy efficiency professions (IFMEREEs) have been established as part of a public-private partnership (between public agencies and industry federations), providing two-year training course on RE and EE, à la carte training cycles for workers and job seekers as well as support and consultancy services (audits, system integration, energy management)
Tajikistan	Youth Ecological Centre trains rural women and female farmers to use energy efficiently and develop entrepreneurship
Türkiye	Training courses offered by sector associations (OSD, TAYSAD, OYDER, ODD), chambers of commerce or other employers' associations in the automotive sector

Compiled by the authors

It will be beneficial to have detailed lists of associated skills and activities for existing and new occupational roles, including information about skill level, the 'greenness' of skills, and the required soft and hard skills. To support more positive outcomes and reduce bottlenecks in green sectors, such as skills gaps and shortages, governments can take actions to promote skills development through green skills intelligence approaches.

OECD (2023) proposes mixed-method approaches to assess green skill demands, advocating for task-based analysis across job families. This enables targeted interventions and supports strategic planning. In general, however, many countries face challenges in collecting and disseminating job market data that is consistent and granular enough to understand changes in the skills of jobs and occupations.

Delivery of skills programmes

For people working in industries which will need to be phased down, ready access to re-skilling programmes will be important, together with economic diversification (illustrated by the case of coal mining in Serbia and Bosnia and Herzegovina (see box below). While the case focuses on coal, it should be noted that the skills impact on the Serbian economy will go beyond, with 16.5% of the workforce requiring upskilling or retraining in the medium run. Approximately 5.5% of jobs are in brown industries (including coal and energy-intensive industries, but the green transition will affect approximately one out of six workers in the entire labour force[2]. Training and education providers will need to consider possible labour mobility and accessibility limitations. Whether or not workers can take low-carbon jobs will depend on where and when existing jobs are being lost and new jobs become available. It will also depend on the supply of and demand for relevant training and education, which is likely to be unevenly distributed in terms of quantity and quality.

Coal mining, Serbia, BiH

Under the Green Agenda for the Western Balkans (GAWB), governments committed to decarbonisation aligned with the European Green Deal. The energy sector – dominated by coal – offers the highest potential for emission reductions. In 2021, coal and lignite made up 51% of Bosnia and Herzegovina's (BiH) and 45% of Serbia's primary energy supply (IEA, 2021). Accelerating coal phase-out is essential for carbon neutrality.

While coal employs only ~16,000 workers in each country, its local impact is significant. In towns like Ugljevik and Banovici, coal jobs account for up to 48% of employment. Unemployment in these areas already ranges from 28–46%, making job losses from mine closures socially disruptive.

[2] 'Western Balkans, Serbia Country Compendium, Climate and Development Report', World Bank (2024).

Despite this, socio-economic restructuring remains politically sensitive and largely absent from policy discourse. Coal jobs offer high wages and benefits, making transitions difficult. Mitigation scenarios in BiH and Serbia still rely on coal-fired power, reflecting the challenge.

- Labour markets face structural issues: high unemployment (12.7% in BiH, 8.4% in Serbia), widespread informality, and a preference for public sector jobs (IMF, 2023). Skills mismatches persist, especially in technical roles. A just transition requires:
- Targeted labour policies: phased workforce reduction, re-skilling, and income support;
- Economic diversification: incentives for new businesses, repurposing coal infrastructure, and reducing barriers for private firms;
- Education reform: career counselling, labour market intelligence, and curriculum alignment with private sector needs.

Cross-ministerial coordination and stakeholder engagement – including trade unions, NGOs, and local authorities – are critical. Public investment must support diagnostics, programme design and impact evaluation so as to ensure inclusive and effective transition planning.

Source: UNDP (2020), WB (2023)

Financing of programmes

As seen above, skills development is nearly systematically under-funded. For this reason, skills financing must be embedded within climate investment strategies. The EU's Just Transition Mechanism offers a model, mobilising EUR 100 billion to support affected regions (European Commission, 2020). National strategies should similarly allocate resources to training aligned with climate goals and economic diversification.

Examples from the ETF partner countries are given in Table 2, and the skills development and training implemented in Egypt are summarised in the box below. In sum, embedding skills intelligence and employment strategies into climate policy is not merely supportive; it is foundational. Governments must institutionalise cross-sectoral coordination, invest in labour market data systems, and ensure inclusive access to training. These measures will enable proactive, equitable responses to the structural shifts induced by the green transition.

Education and training provision for the energy sector in Egypt

Egypt's education and training system offers multiple pathways for energy sector skills development, including higher education programmes in engineering, technical institutes and upper secondary schools. Recent innovations such as Centres of Competence and Applied Technology Schools aim to strengthen practical training through partnerships with industry. Public-private initiatives, including dual systems and vocational training departments, complement these efforts, while international collaborations and private sector academies provide targeted capacity building for renewable energy technologies.

Despite these initiatives, significant gaps remain. Higher and technical education systems operate at scale but struggle to meet industry expectations for experienced workers, leaving young graduates facing slow labour market absorption. Collaboration between universities, VET providers and industry associations in curriculum design is limited, and national occupational standards for energy sector jobs are lacking. Establishing sectoral skills councils could address these gaps by aligning training provision with labour market needs and ensuring that emerging occupations are adequately supported.

These measures are critical for advancing fair transition principles, as they enable inclusive access to green jobs and prevent structural barriers that could exclude youth and vulnerable groups from new economic opportunities.

Source: ETF (2023), WB (2024a)

3 METHODOLOGICAL APPROACH AND DATA

This report analyses the integration of human capital dimensions (education, training, skills and employment support) within NDC documents submitted to the UNFCCC by ETF partner countries in the EU Neighbourhood and Central Asia. For this purpose, 'NDC documents' include Nationally Determined Contributions (NDCs) and related Biennial Update Reports (BURs) and Biennial Transparency Reports (BTRs). A detailed review of each country's submissions was conducted, complemented by ETF data so as to strengthen climate related insights and inform recommendations. This methodological approach combines quantitative and qualitative analysis, the details of which are outlined in the following section.

3.1 Quantitative review (contextual statistical data)

A review of national data was conducted, covering diverse metrics related to climate, energy, economic, population, education and employment dimensions, as presented in section 2. The full tables and the statistical sources are provided in the Annex.

3.2 Qualitative review (information in NDCs/BURs/BTRs and other reports)

3.2.1 Analysis of mitigation and adaptation options

For each country, an overview is presented in a table of priority measures grouped by sector: energy supply (low carbon sources, fossil fuels, electricity systems), sustainable transport, energy efficiency (buildings, industry, transport), waste, IPPU, agriculture, forestry and land use (AFOLU). This is based on a qualitative review of mitigation measures reported under the NDC framework, as well as proposed adaptation measures. The latest available documents were used for the analysis. Annex 5.9 contains the full list of NDC sources examined.

NDCs and related BUR/BTRs are primarily climate documents and therefore only partially address workforce and human capital issues. Additional information at the country level is drawn from reports by multilateral organisations such as the World Bank and the ILO, academic studies and publications by NGOs. The full list of sources is provided in the bibliography and Annex 5.1.

Key limitations include:

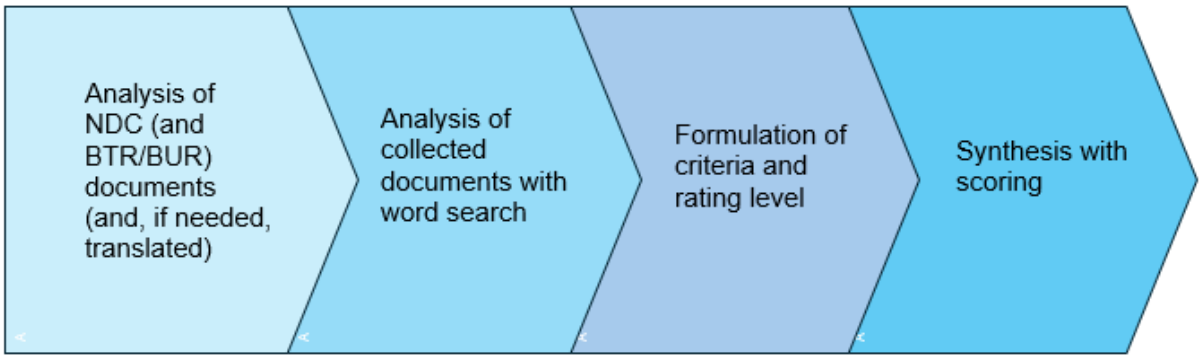
- At the time of drafting, only two countries (Moldova and Montenegro) had submitted updated NDC 3.0 documents. Globally, only 25 countries have submitted NDC 3.0, while 172 submissions remain outstanding. Three countries (Palestine, Ukraine, Turkmenistan) only had 2021 NDC submissions available;
- Kosovo, not being a UN Member State, does not submit an official NDC but published a voluntary NDC following the UNFCCC template, which was used for analysis;
- The study was conducted at the start of the NDC update cycle (2025-2026). Priority mitigation sectors are unlikely to change significantly between versions, and where possible, information was updated using BURs and BTRs published between 2021 and 2024;
- At least two reports per country were analysed (over 48 NDC and BUR/BTR documents), except for Ukraine and Palestine, which only submitted NDCs without detailed BUR/BTR reports.

- Data on greenhouse gas emissions and employment are based on different classification systems[3].

3.2.2 Analysis of coherence in NDCs of climate polices with human capital dimensions

The study assesses diverse dimensions of human capital integration in the NDC documents using a desk review, word search protocol and structured scoring system. The schematic workflow of the process is presented in Figure 13.

Figure 13: Flowchart for analysis of coherence of climate and human capital policies in NDCs



Source: PPMI research team

Due to the high volume of literature assessed in the desk review, a systematic word search protocol was applied to NDC documents for each country. Standardised terms used in the search are presented in the table below. The analysis considered the uptake of just transition both through explicit references and by examining the extent to which fair transition considerations are incorporated into NDC documents. The protocol included a range of terms which reflect linguistic diversity and diversity of terminology across the EU Neighbourhood[4].

Table 3: Word search protocol per human capital dimension

Just transition and employment	Education, skills and training	Social dialogue and stakeholders
Employment Green jobs Just transition Decent work Labour market Workforce Inclusion / social inclusion Equity, Human capital	Education Skills development Upskilling/re-skilling Skills needs Training / training needs TVET Capacity building / development Vocational Curriculum / curricula	Social dialogue Tripartism Stakeholders Stakeholder involvement / engagement / consultation Target group Coordination

Source: PPMI research team

Table 4 below shows the assessment criteria and their specific alignments with different levels. There are 10 assessment criteria and 5 associated levels (baseline, minimum, fair, good, best). For each criterion, a qualitative assessment was made for the degree of fulfilment for each country based on three categories, which were assessed as follows:

[3] Emissions use IPCC sector categories, while employment relies on ISIC economic sectors. These systems do not align neatly, making it difficult to directly link climate targets with labour market trends. As a result, available data are often too broad or inconsistent to accurately assess how climate action will affect employment and skills needs in specific sectors.
[4] All documents were analysed in English, except for four in French, which were translated using DeepL Pro software.

- Yes: Clear evidence was found in the NDC documents that fulfils the assessment criteria;
- Partial: Partial evidence was found in the NDC documents for the criteria, but without sufficient detail or content to assess the criteria as completely fulfilled;
- No: No evidence was found in the NDC documents to fulfil the criteria.

Table 4: NDC Assessment Framework

Level	Assessment criteria	Yes / No	Source and rationale*
Baseline (1 and/or 2)	1. NDC documents clearly recognise the social and employment impacts or effects of climate change and related measures as part of the just green/energy transition.		
	2. NDC documents include clear references to emerging or changing workforce/employment needs because of climate change.		
Minimum (baseline plus 3 and/or 4)	3. NDC documents clearly refer to the re-skilling and/or upskilling of workers in economic sectors/activities that are negatively affected by the green/energy transition.		
	4. NDC documents refer to the role of education/skills development/training in anticipating the workforce needs in the green/energy transition (in 1 or more priority economic sectors/activities).		
Fair (minimum plus 5 and/or 6)	5. NDC documents identify targeted education/training/employment-related support for specific target groups, such as women/youth/migrant workers/people with disabilities.		
	6. NDC documents clearly refer to engagement in social dialogue with social stakeholders, such as worker/employer representative organisations or (private) training institutions.		
Good (fair plus 7 and/or 8 or 9 or 10)	7. NDC documents include clear references to existing policies/plans/measures/strategies to align education/training with labour market needs due to climate change and/or with broader socio-economic goals (policy coherence).		
	8. NDC documents include budgets (funded or unfunded) and/or financial commitments to invest in education, skills development, training in (priority) economic sectors/activities as part of the green/energy transition.		
	9. NDC documents clearly refer to specific roles of government entities (ministries/agencies) and/or coordination mechanisms focussed on the integration of education/skills/training/employment into the just green/energy transition.		
	10. NDC documents include specific actions related to workforce-related provision, such as workforce development, education, re-skilling, training; social protection and social dialogue.		
Best	Fair, plus 7, 8, 9 *and* 10		

Source' is the NDC document screened (NDC, BUR, BTR). 'Rationale' is a short (one-sentence) justification for the fulfilment of the assessment criteria. Operational thresholds for the rationale are included in Annex 5.6

3.3 Assessment of integration of human capital dimensions in ETF partner countries' NDCs

This section describes the integration of fair transition principles and human capital dimensions (employment, education, skills development, and social dialogue) in the countries' NDCs and BURs/BTRs. The full mapping of the NDC documents is presented in Annex 5.9. The level at which policy measures (policy coordination, social dialogue, skills needs and acquisition, education programmes, financing and inclusivity; described in section 2) is defined according to a set of 10 criteria (see Annex 5.7), which allows the countries to be assigned a rating (which may vary from 'below baseline' to 'best'; see Table 5 below).

Table 5: Overview of the NDC review for the ETF Partner countries

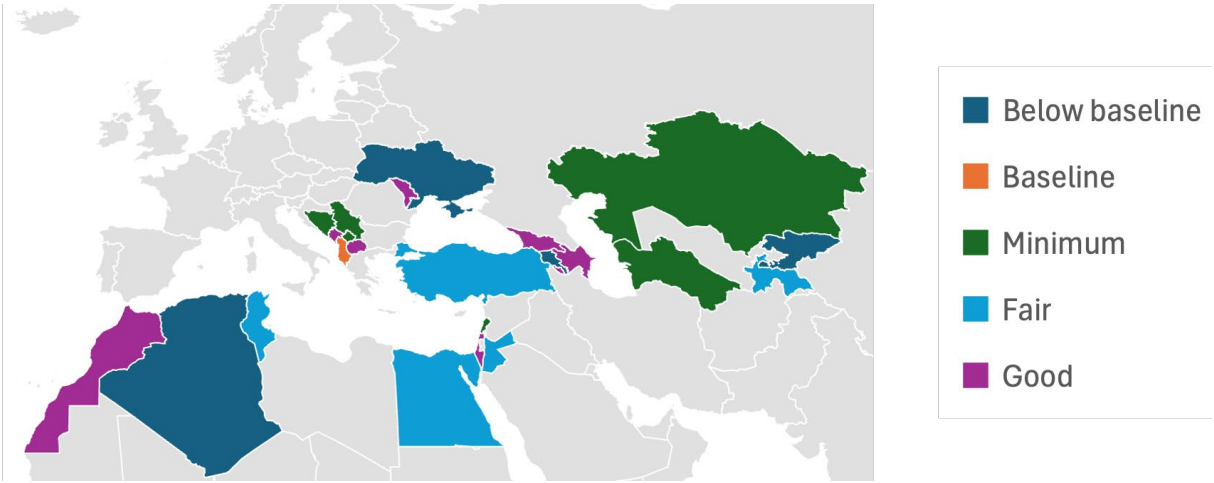
Rating of integration of workforce dimensions in NDC documents	Number of ETF partner countries meeting the assessment criteria of Table 13 (countries meeting all criteria)
Below baseline (criterion 1 and/or 2 not met)	4
Baseline (1 and/or 2)	20 (16)
Minimum (baseline plus 3 and/or 4)	17 (4)
Fair (minimum plus 5 and/or 6)	8 (2)
Good (fair plus 7 and 8 or 9 or 10)	8 (0)
Best (all criteria)	0 (0)

Source: Workforce dimensions include employment/jobs, education/skills and social dialogue

3.3.1 Overview of NDC assessment results

The NDC document mapping was conducted for 25 countries[5], as presented in visual format in the figure below.

Figure 14: Map of NDC partner country NDC assessments, based on findings of Annex 5.4

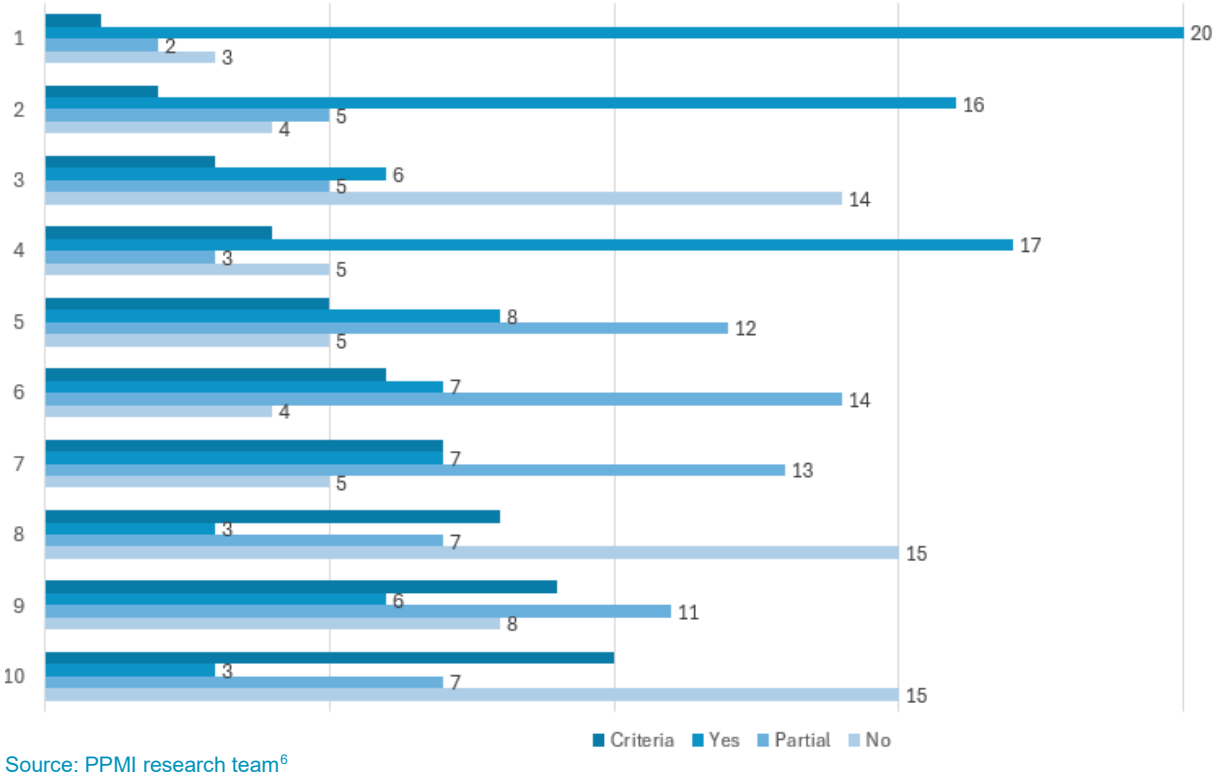


Source: See Annex 5.4

[5] Kosovo is not a UN Member State and therefore does not submit an NDC to the UNFCCC. Kosovo published a Voluntary NDC, which follows the UNFCCC template and has been used as the analytical document Accessible here: https://mmphi.rks-gov.net/Document/Legislations

Despite generous rating criteria, only nine countries achieve the highest level of integration of human capital dimensions in NDCs, and just one country meets all 10 criteria. Figure 15 below shows that most countries fall short of comprehensive inclusion, with critical gaps in areas such as workforce protection and skills development. Regional patterns are evident: the Western Balkans countries and Türkiye perform relatively strongly, supported by frameworks such as the Green Agenda and EU accession processes, while Eastern Partnership and Central Asian countries show weaker integration, with limited progress beyond baseline requirements.

Figure 15: Number of countries meeting each NDC assessment criterion



Source: PPMI research team[6]

Beyond geographical classifications, moderate patterns emerge when countries are grouped according to the dimensions outlined in Section 2.

[6] The number at the right of each row represents the number of countries that meet the criterion:

- NDC documents clearly recognise the social and employment impacts or effects of climate change and related measures as part of the just green/energy transition.
- NDC documents include clear references to emerging or changing workforce/employment needs because of climate change.
- NDC documents clearly refer to the re-skilling and/or upskilling of workers in economic sectors/activities that are negatively affected by the green/energy transition.
- NDC documents refer to the role of education/skills development/training in anticipating the workforce needs in the green/energy transition (in one or more priority economic sectors/activities).
- NDC documents identify targeted education/training/employment-related support for specific target groups, such as women/youth/migrant workers/people with disabilities.
- NDC documents clearly refer to engagement in social dialogue with social stakeholders, such as employee/employer representative organisations or (private) training institutions.
- NDC documents include clear references to existing policies/plans/measures/strategies to align education/training with labour market needs due to climate change and/or with broader socio-economic goals (policy coherence).
- NDC documents include budgets (funded or unfunded) and/or financial commitments to invest in education, skills development, training in (priority) economic sectors/activities as part of the green/energy transition.
- NDC documents clearly refer to specific roles of government entities (ministries/agencies) and/or coordination mechanisms focussed on the integration of education/skills and training/employment into the just green/energy transition.
- NDC documents include specific actions related to workforce-related provision, such as workforce development, education, re-skilling, training; social protection and social dialogue.

- Education expenditure and performance: Countries such as Israel, Montenegro, and Moldova, each demonstrating relatively high GDP expenditure on education, tend to perform well in integrating human capital dimensions. While Israel's higher-income status may partly explain its performance, Montenegro and Moldova, both middle-income countries, benefit from EU accession processes that promote alignment with inclusive human capital policies. Although this correlation is noteworthy, it does not imply causality; further empirical analysis is required so as to establish any causal links. Notably, this trend does not extend to Central Asian countries, despite their comparable education spending and high vocational education and training (VET) participation rates. This discrepancy suggests that political commitment and policy orientation may play a more decisive role than systemic factors such as access or availability of education.
- Energy-exporting countries and human capital inclusion: Net energy exporters (Kazakhstan, Turkmenistan, Azerbaijan and Algeria) generally underperform in integrating human capital dimensions into their national strategies. Among them, only Kazakhstan meets Criterion 3, which refers to explicit provisions for reskilling or upskilling workers in sectors adversely affected by the green transition. Despite their heightened vulnerability to labour market disruptions in the energy sector, these countries show limited policy responsiveness. This underscores the need to examine broader national development agendas and policy frameworks to understand the weak integration of human capital considerations in their NDCs.
- Coal-producing countries and policy variability: No consistent pattern is observed among coal-producing countries. Bosnia-Herzegovina, Montenegro, and Serbia meet Criterion 3, while Morocco and North Macedonia also demonstrate strong performance in human capital inclusion, each receiving favourable ratings. Algeria and Kosovo partially meet the criteria, whereas Kyrgyzstan falls short of the baseline. These variations highlight the heterogeneity of policy approaches within this group and suggest that national context and institutional capacity may significantly influence outcomes.

3.3.2 Assessment dimensions analysis

This section provides an analysis of each criterion of the NDC assessment exercise. Each criterion section includes (i) a qualitative synthesis analysis with insights on the portfolio assessment; and (ii) good practice examples of inclusion of the criterion in the NDC documents.

Criterion 1: NDC clearly recognise the social and employment impacts or effects of climate change and related measures as part of the just green/energy transition

Criterion 1 has the highest rate of attainment across the assessment dimensions, with only three countries not making reference to social and employment impact effects of climate change and the related measures as part of the green/energy transition. Some general insights emerged as part of the analysis with respect to this category.

Table 6: Number of countries fulfilling criterion 1

YES	PARTIAL	NO
20	2	3

Source: PPMI research team

- **Most countries focus on mitigating the employment-related and social impacts of climate change on vulnerable sectors, rather than addressing the potential effects of the decarbonisation efforts themselves**: there is a clear trend of countries identifying specific climate-vulnerable sectors (see next bullet) as being at risk of negative livelihood and employment impacts. It is less common for countries to identify the negative impacts of the decarbonisation strategy, with some examples being Serbia, Montenegro and Kazakhstan.

- **Agriculture and rural livelihoods were consistently identified as the most vulnerable sectors**: multiple countries[7] include a specific reference to the risks of climate change on agricultural livelihoods and production. Some countries highlight specific challenges that are of primary concern, such as Egypt observing the potential negative impacts on Nile Delta settlements, and Morocco identifying a heightened sensitivity within its agricultural sector.
- **Several countries highlight the risks of employment fragility and social vulnerability in specific sectors**: the framing of sector risk is most linked to the loss of potential livelihoods due to climate change. The Tunisian NDC identifies a potential loss of 1 000 jobs a year due to climate change, with Algeria and Morocco also identifying employment and poverty as areas that are at high risk due to climate-related disruption.
- **Some countries highlight employment-related effects**: there are examples of countries identifying the role of climate change and the green transition, with some countries identifying broadly the structural economic changes in the labour market (BiH, Kazakhstan) and other countries identifying specific sectors that will be affected. Montenegro presents a detailed section on the social and economic impacts of the phasing out of coal on workers, businesses and communities.
- **Others identify the need for capacity building and skills development to respond to climate change**: certain countries provided an explicit link to retraining and skills in their responses. Türkiye outlines actions to build technical and human capacity across sectors, including retraining needs. Georgia specifically links green skills development to the VET Strategy 2021-2025, and identifies skills gaps in multiple sectors (renewable energy, environmental services).
- **Employment-related effects are often linked to job creation potential and green opportunities**: in BiH, the green transition was connected with future economic development, in North Macedonia there is a focus on green job opportunities within the national strategic framework, and in Türkiye the employment benefits of mitigation measures have been highlighted.

Good practices

Moldova utilises a Livelihood Vulnerability Index of 19 indicators that assess exposure, sensitivity and adaptive capacity at the district level[8], including specific indicators for labour market sensitivity, social security sensitivity and demographic sensitivity. The application of this index helps to incorporate climate change into medium- and long-term development planning and include climate risks into investment decision-making and business planning, with the aim of increasing the resilience of economic sectors, land use and ecosystems so as to accelerate the transition towards resilient low-carbon development. Moldova also includes socially inclusive planning through the National Adaptation Planning (NAP) process, with the National Adaptation Plan submitted to the UNFCCC[9]. This approach includes specific sectoral plans on adaptation processes (including agriculture) and identifies education and training needs for specific sectors, along with identifying specific agencies or organisations responsible.

Serbia's 2021 NDC and Low Carbon Development Strategy integrate economic, environmental and social impact assessments to define its 2030 emission reduction targets. The Biennial Transparency Report (BTR) includes a dedicated section on social impacts, covering both benefits and risks, with sectoral employment estimates.

The BTR projects limited negative employment effects across all mitigation scenarios, with the highest under the 'With Additional Measures' (WAM) scenario. It proposes mitigation through financial instruments, such as loans and carbon pricing, and direct support to vulnerable households.

Sectoral analysis identifies mining, quarrying, and electricity supply as areas of job loss, while agriculture and forestry are expected to experience employment growth. Notably, job losses are

[7] Albania, Egypt, Azerbaijan, Tunisia, Lebanon, Morocco, Palestine, Tajikistan and Kazakhstan
[8] Additional information on the index is found in Gutium et al. (2021)
[9] https://unfccc.int/sites/default/files/resource/NAP_Moldova_2024.pdf

concentrated in large enterprises, whereas gains are anticipated in micro and small businesses. Gendered impacts are also highlighted, with men being more likely to be affected in both declining (mining) and growing (forestry) sectors.

Criterion 2: NDC documents include clear references to emerging or changing workforce and employment needs because of climate change

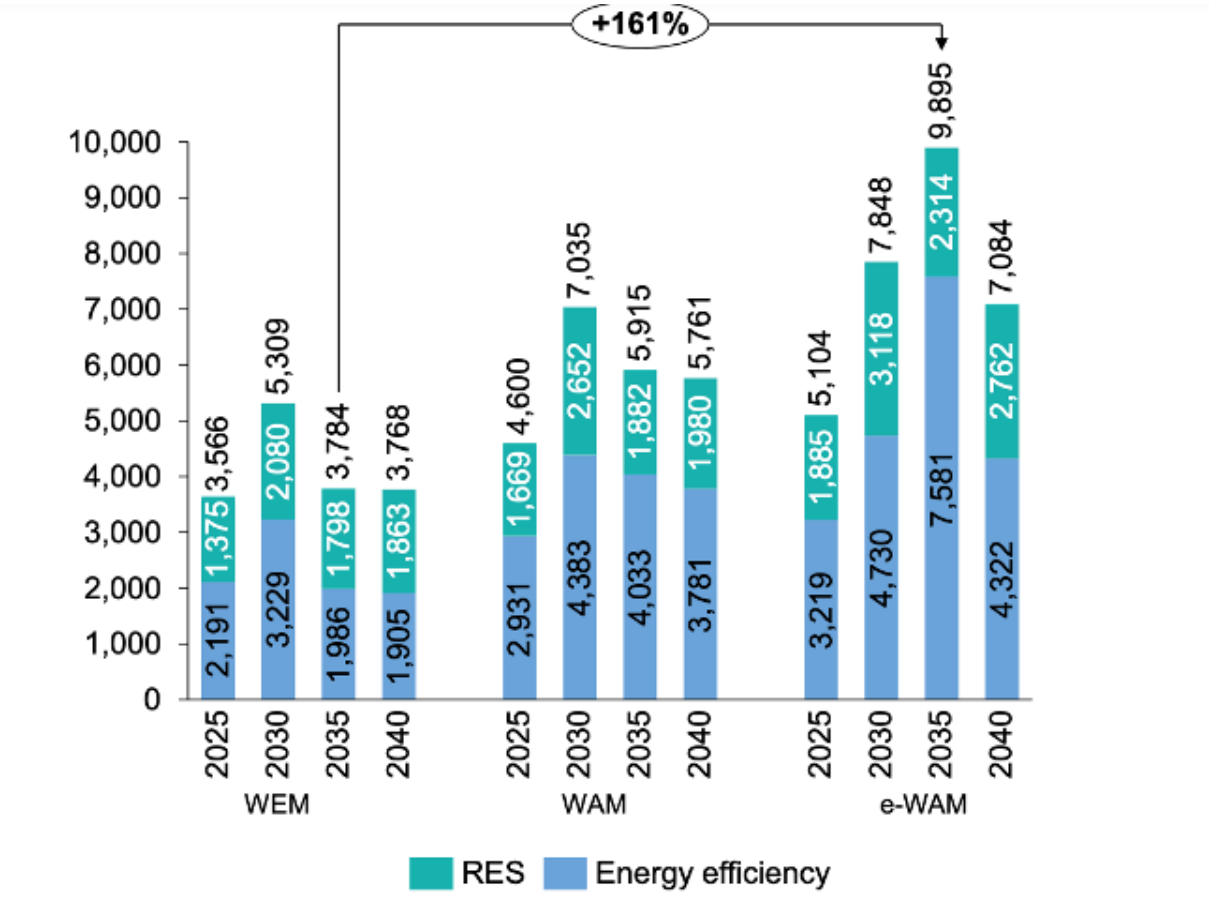
Table 7: Number of countries fulfilling criterion 2

YES	PARTIAL	NO
16	5	4

Source: PPMI research team

Criterion 2 shows some drop off in the high level of fulfilment of Criterion 1. To assess this as 'clearly' met, the research team required an explicit mention of the changing employment or workforce composition because of climate change. Main insights into how countries include this topic in their NDCs are below[10].

Figure 16: Number of domestic green jobs from RES and energy efficiency, by scenario



Source: North Macedonia BUR 2020

- **Several countries link climate action with the need to strengthen skills and technical capacity within the workforce**: these are captured in different modalities by the countries.

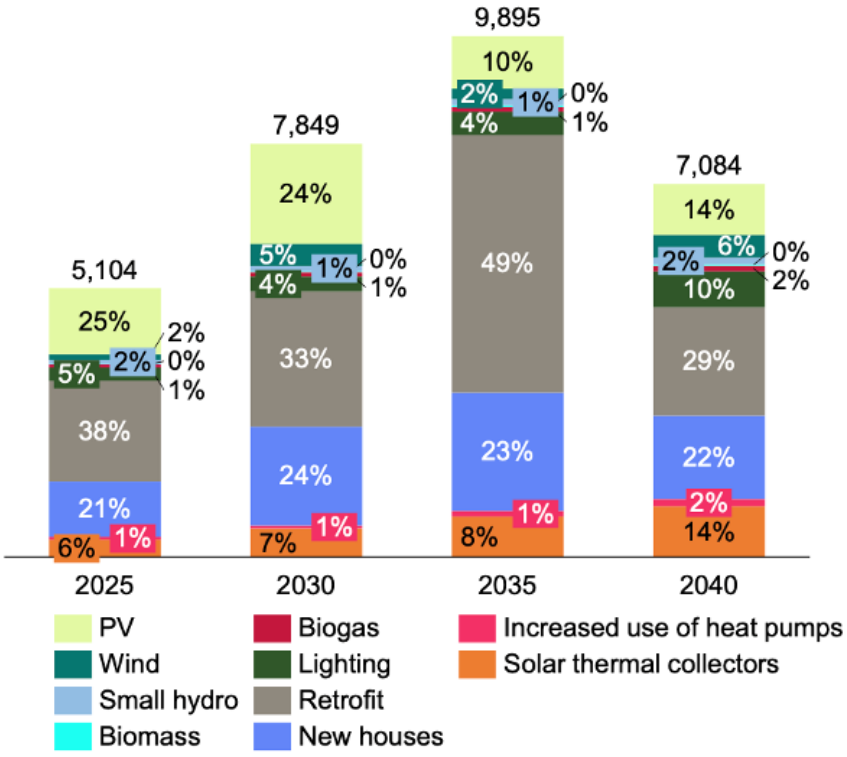
[10] While this is inferred throughout due to the quality of response to multiple other categories, this was not explicitly identified through the screening and word search methodology.

Azerbaijan has specified its plans to implement incentive measures for renewable energy and the technical skills development and training of specialists. Georgia has provided an explicit link to the VET Strategy 2021-2025, and the identification of skills gaps in sectors including renewable energy, construction, and environmental services. Kazakhstan has also identified the need for job retraining and upskilling for workers transitioning out of the fossil fuel sectors.

- **Green job creation is recognised by several countries as a co-benefit of the green transition**: Countries often focus on the potential of the green transition to create jobs in new or growth sectors. Tunisia has estimated the creation of 12 000 jobs stemming from energy efficiency and renewable energy measures by 2030, Lebanon has emphasised 'new green jobs' in order to empower NDC implementation, Kazakhstan has anticipated increased employment in agriculture, bioenergy and renewable energy sectors, and Türkiye has anticipated an increase in the workforce for nuclear and renewable energy projects. Georgia anticipates in the Low Emission Development Strategy (2018)[11] that there are a projected 200 000 additional jobs in the WAM scenario.
- **Youth participation and skill requirements for new workers are identified as a climate policy focus in several countries**: countries provide links to the role of education and training in preparing young people for meeting the needs of sectors with job creation potential. Egypt's NDC highlights the need for youth participation through skills training, research and green entrepreneurship, and Jordan's links climate targets to green job creation for young people, positioning job creation as a driver for both economic recovery and NDC implementation.
- **Education and training are understood by several countries as enabling climate action, with some also embedding this into broader frameworks supporting a just transition**: Moldova's BTR highlights that investment in education and human capital supports community resilience, Morocco's NDC identifies the integration of climate change curricula into training institutions as a national priority, Kazakhstan identifies the 2060 Strategy[12] with provisions for social protection, job retraining and green enterprise support for workers. Bosnia and Herzegovina similarly identifies the need to assess the socio-economic impacts of decarbonisation to support a just transition[13] and promotes a regional cooperation approach under the Green Agenda for the Western Balkans[14].

[11] This strategy has subsequently been updated, with 'Georgia's Long-term Low Emission Development Strategy' (2023) available here: https://www.undp.org/georgia/publications/georgia-low-emission-development-strategy-2050.
[12] The 2060 Carbon Neutrality Strategy includes a section on 'Just Transition and New Job [sic]', which highlights the need to retrain workers in declining industries and lays out the intention to conduct further studies and analysis to develop this policy. The strategy is available at: https://unfccc.int/sites/default/files/resource/Carbon_Neutrlaity_Strategy_Kazakhstan_Eng_Oct2024.pdf.
[13] A recent study estimates that there are 30,000 people employed in the coal sector in the Western Balkans countries (excluding Albania), with several coal and traditional power sectors already experiencing a decline in jobs. See Radovanic et al. (2024).
[14] The Council Recommendation on implementation of the Green Agenda identifies the need to update education systems to include the skills and competencies of the Green Economy (Recommendation available here: https://enlargement.ec.europa.eu/system/files/2020-10/green_agenda_for_the_western_balkans_en.pdf).

Figure 17: Number of domestic green jobs by technologies in E-WAM



Source: North Macedonia BUR 2020; WAM: with additional measures

Good practice

North Macedonia's NDC includes a detailed assessment of green job creation aligned with its just transition and regional development agenda. A dedicated study estimated employment impacts across national decarbonisation scenarios, focusing on energy efficiency and renewable technologies.

By 2030, the implementation of energy efficiency measures and renewable energy technologies is projected to generate approximately 6 000 new green jobs. Figure 17 illustrates the contribution of these sectors to future employment growth.

Further analysis (Figure 18) breaks down job creation by technology under the enhanced WAM (e-WAM) scenario. By 2035, retrofitting accounts for 50% of new jobs, followed by new housing construction (23%), photovoltaic (PV) systems (10%), and solar thermal collectors (8%). A decline in job creation is expected post-2036.

Gender-disaggregated data reveal that most new jobs will be occupied by men, with women representing a maximum of 27% of the projected green employment.

Criterion 3: NDC documents clearly refer to the re-skilling and/or up-skilling of workers in economic sectors/activities that are negatively affected by the green/energy transition

Table 8: Number of countries fulfilling criterion 3

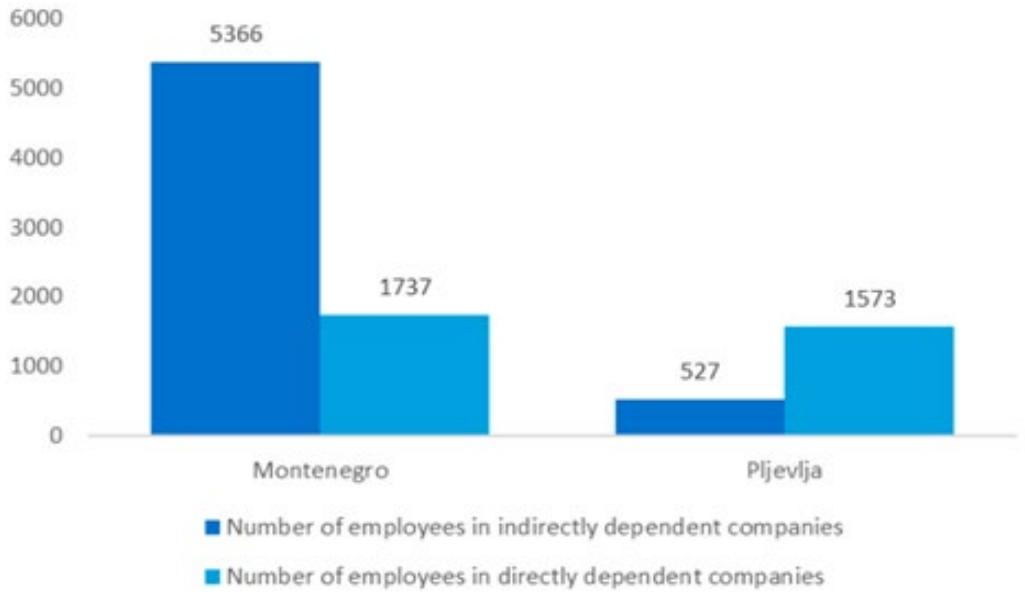
YES	PARTIAL	NO
6	5	14

Source: PPMI research team

Compared to Criterion 4, significantly fewer countries address the negative employment impacts of the green transition in their NDCs. Most focus on job creation and growth sectors, while reskilling and

upskilling needs in declining sectors remain underrepresented. In some cases, impacts are acknowledged only in general terms, without sector-specific detail.

Figure 18: Number of employees in indirectly and directly dependent companies



Source: UNDP (2023), p.36

The following countries provide more targeted insights:

- Azerbaijan (BTR 2024) highlights the need to develop new education content to support lifelong learning and reskilling of the existing workforce;
- Bosnia and Herzegovina (NDC 2020) calls for the creation of new jobs in non-coal sectors and assistance for a fair transition in mining regions;
- Montenegro references a survey near the Pljevlja thermal power plant, where 92% of coal workers expressed reluctance to change jobs, yet 54% were willing to engage in adult education for retraining and career development;
- Kazakhstan acknowledges international support (notably GIZ) in mitigating socio-economic impacts for coal workers through training programmes. It also outlines plans for an NDC Roadmap that will include formal education actions tailored to decarbonisation needs;
- Georgia identifies the need for a Just Transition Fund[15] that will be aimed at supporting local communities, individuals, municipalities, and businesses in the shift towards a zero-carbon economy. This is envisaged to include capacity building initiatives, including training, education and retraining opportunities. This is intended to be delivered through the Climate Law, with finance expected to come from the central budget, international financial organisations, and income from carbon emission training[16].

[15] The Just Transition Fund is also identified in the 'Just Transition Socioeconomic Impact Assessment for Georgia' (2025), Asian Development Bank, available here: https://www.adb.org/sites/default/files/publication/1041026/socioeconomic-impact-assessment-georgia.pdf.
[16] Further details on the proposed Just Transition Fund can be found in the 2023 'White Paper', available here: https://web-api.parliament.ge/storage/files/shares/Komitetebi/garemo/White-Paper-WDF-ENG.pdf.

Good practice

Montenegro is the only country to include a detailed site-specific case study on the employment impacts of the green transition. The coal mine and thermal power plant (TPP) in Pljevlja are economically central, generating an average annual value of EUR 69 million and supporting 55 dependent companies.

According to the BTR, 7 103 people are employed across the coal value chain, with 2 100 residing in Pljevlja. Around 75% of the municipality's workforce is employed in directly dependent companies. Most workers rely on these jobs for income and show little willingness to change roles, although over half are open to adult education and retraining (see Figure 20).

The BTR anticipates that energy transition policies will reduce fossil fuel-based electricity production, with significant social, economic, and ecological implications. Risks include declining living standards and economic migration. The report calls for targeted training, support for self-employment and retirement, and economic diversification in order to mitigate these effects. A related UNDP study highlights low entrepreneurial activity in Pljevlja compared to neighbouring regions. It also stresses the need to improve retraining systems and foster skills, creativity and innovation among young people to stimulate local entrepreneurship. Crucially, the study finds limited awareness of just transition principles among stakeholders. While all parties recognise the coal sector's importance, there is no clear roadmap to manage the transition. Without alternative energy sources and coordinated support, local communities face significant uncertainty.

Criterion 4: NDC documents refer to the role of education/skills development/training in anticipating the workforce needs in the green/energy transition (in one or more priority economic sectors/activities)

Table 9: Number of countries fulfilling criterion 4

YES	PARTIAL	NO
17	3	5

Source: PPMI research team

This criterion has been met by 17 countries, significantly more than Criterion 3 (only 4 countries), reflecting a broad range of approaches to incorporating human capital dimensions in planning for future workforce needs in the green transition.

- Education at all levels is covered in the portfolio, with some countries highlighting specific educational institutions or programmes:
  - VET is featured in multiple countries. Tunisia emphasises VET in the agriculture and water professions, Jordan identifies the VET needs for solid waste workers, and Azerbaijan identifies the requalification of human resources through lifelong learning;
  - Higher education is also identified in many countries, with a particular focus on the role of higher education courses in addressing the skills needs for future growth areas. Climate-specialisations in academic curricula are identified in multiple countries, including North Macedonia, Serbia, Tunisia, Morocco and Israel;
  - School-level education is also included for multiple countries, although the focus on this segment is principally to address awareness of climate change impacts, rather than addressing specific sectoral skills. Multiple countries identify the inclusion of green and climate change topics in the school curricula and general awareness raising on climate change for school-age children and young people.
- There were common sectors identified in the assessment;

- The most common sector addressed in terms of future needs is the energy sector, examples including Azerbaijan (renewable energy training), energy efficiency programmes (Egypt, Montenegro), and nuclear workforce development (Jordan, Türkiye). Algeria identifies the need to integrate the private sector more into national policy development, with a particular focus on both modernising training and better integrating the stakeholders (research, industry, education) to support industrial innovation and technology transfer;
- Agriculture and food systems are also frequently identified as being a focus for skills development and training. Examples include Kazakhstan identifying the need for farmer training in climate technologies, agricultural adaptation skills for Lebanon[17] and Tajikistan, and the transfer of knowledge for climate-resilient practices in Tunisia and Albania. Tunisia conveys an approach that involves creating regional training centres in pilot areas covering VET institutions and engineering schools to strengthen capacity and adapt research to the needs of the sector;
- Several countries also identify **water management**, including Tunisia (planning for higher education integration for water sector professionals) and Lebanon, identifying the need for smart irrigation and digital skills gaps;
- Some countries identify the **waste management** sector, with Algeria targeting the creation of 30 000-70 000 jobs in integrated waste management and Jordan identifying vocational training needs for municipal solid waste workers;
- Specific sectors are identified by some countries. Jordan highlights the importance of green infrastructure that can provide job opportunities and protect ecosystems. Israel identifies the hi-tech sector as a key engine of green jobs, with the sector totalling 18.1% of total GDP in 2022.

- The green transition is understood by several countries to provide an opportunity to both grow the economy and address ongoing structural challenges: Tunisia identifies that the green economy and investment in renewable energy and energy efficiency could help to address major employment challenges and the high youth unemployment rate.
- National planning and coordination are highlighted as key enablers for countries to take advantage of the opportunities offered by the green transition. Jordan identifies the need to coordinate with the private sector and proposes that a body such as a Green Jobs Council could be explored as a way to identify gaps in the ecosystem in terms of green technology and green entrepreneurship skills[18]. Tunisia identifies education and continuous training as one of the themes in capacity-building.

Good practices

Several countries demonstrate exemplary integration of future workforce needs within their Nationally Determined Contributions (NDCs), aligning climate objectives with national education and training strategies.

Georgia

Georgia's NDC includes a dedicated section titled 'Strengthening the country's capacity to combat climate change', which explicitly aligns climate commitments with national development strategies. Notably, it references the VET Strategy 2021-2025 and the SME Development Strategy Action Plan 2021-2025, signalling a coherent policy framework that links climate action with skills development.

Further details on sector-specific capacity-building needs and targeted competencies and training requirements identified across key economic domains are provided in the BTR:

- Agriculture and rural development: The BTR highlights the role of the Agriculture and Rural Development Strategy 2021-2027, emphasising the need to enhance the qualifications of

[17] Lebanon's BTR identifies skills mismatches as a major challenge in the agricultural sector, with an overall lack of capacity and digital skills in smart irrigation applications, stress mapping and crop monitoring. Further insight into skills challenges in the agricultural labour market in Lebanon can be found in the study FAO (2020).
[18] The GIZ 'Green Jobs Assessment Report' 2023 provides additional insight on the current and prospective increase in green jobs across specific sectors in Jordan.

agricultural professionals and provide additional education for farmers and rural entrepreneurs. It identifies a shortage of specialists and proposes a multi-tiered education approach – encompassing higher education, vocational training and non-formal education – to address sectoral challenges;

- Industrial sector: Training needs are identified for emerging technologies, including biomass/biogas, green hydrogen and energy storage systems;
- Renewable energy and energy efficiency: The BTR outlines the development of four training programmes aimed at improving the competencies of energy audit engineers. It also specifies the need for expertise in solid fuel and biomass heating, and for construction professionals skilled in installing thermal insulation materials, energy-efficient doors and windows, and solar PV water heating systems;
- Cross-sectoral coordination: The BTR underscores the importance of prioritising the energy sector and calls for innovative mechanisms to engage research and educational institutions in addressing systemic challenges.

North Macedonia

North Macedonia's mitigation strategy includes detailed projections for green job creation linked to specific policy measures. Table 16 of the strategy illustrates the direct connections between mitigation actions, greenhouse gas (GHG) emission reductions, and associated implementation budgets, providing a transparent and measurable framework for workforce planning.

Morocco

Morocco's BTR features a dedicated section on 'Training and Education in Sustainable Development and Climate Change', offering a comprehensive breakdown by educational level and programme. It presents a set of national recommendations aimed at strengthening education, training and awareness in support of the green transition:

- formal integration of environmental education into national education system guidelines and projects;
- continuous professional development for environmental leaders to ensure relevance and currency of training;
- inclusion of environmental education in the initial training of future teachers at regional education and training centres;
- enhancement and expansion of existing training initiatives in green professions to foster a coordinated national approach;
- support for non-governmental organisations (NGOs) in delivering environmental education and awareness-raising activities.

Criterion 5: NDC identify targeted education/training/employment-related support for specific target groups, such as women/youth/migrant workers/people with disabilities

Table 10: Number of countries fulfilling criterion 5

YES	PARTIAL	NO
8	12	5
Morocco, Jordan, Georgia, Tunisia	Türkiye, Palestine, Egypt, Algeria	Albania, Kosovo, Armenia

Source: PPMI research team

Many ETF partner countries only partially meet this criterion in their NDCs. While gender considerations are often included – reflecting the NDC, BUR and BTR templates – they are seldom

clearly linked to human capital support at national, sectoral or project level. Related actions frequently overlap with general awareness raising and gender mainstreaming in climate strategies, which, although relevant, are insufficient to fully meet the criterion. Among the eight countries that fulfil it, training support explicitly targets women and youth, with far fewer examples addressing migrant workers and people with disabilities.

Of the countries with over 20% NEET rates (see Figure 7), the table below shows the level of inclusion of this criterion in the analysis. 3 countries with significant NEET levels have not included information on targeting of specific target groups in their national climate strategy.

Gender-focused support is the most frequently cited measure. This reflects the inclusion of dedicated sections on the gender impacts of climate change within NDCs, where countries outline mechanisms for gender-sensitive planning in their transition pathways. In many cases, this extends to integrating gender considerations into broader climate strategies, with several countries specifically highlighting education and training opportunities for women.

Algeria's NDC proposes plans to have specific training offers for women to support female entrepreneurship in the technical and non-technical fields of mitigation and to incorporate gender and climate governance in university and private training curricula in order to support SMEs in specific sectors (including tourism and ICT). **Tunisia** includes gender and social inclusion as a cross-cutting aspect of the green transition, and identifies a need to increase women's entrepreneurship in the green economy sector and to increase the inclusion of women in science and technology sectors. **Tajikistan** identifies the National Strategy for Enhancing the Role of Women in the Republic of Tajikistan for 2011-2021[19], which defines goals for women's economic empowerment, including strategies to train women in new skills and specialisms. Bosnia and Herzegovina conducted a gender study on the inclusion of gender perspectives in sector planning in five sectors: energy, transport, agriculture, health and waste. **Moldova** has established social protection programmes that address the needs of vulnerable groups, including gender-related vulnerabilities in the agriculture sector and rural livelihoods. However, the BTR notes that the strategic alignment between policy documents in climate change and gender mainstreaming is not yet sufficiently aligned at the programmatic level, and the Gender Equality Acceleration Programme[20] needs to be aligned with the NCCAP 2030[21]. N**orth Macedonia** notes the need for including women in active labour market programmes, and the Ministry of Labour and Social Policy has developed services for increasing the competitiveness of the workforce, with a focus on equal participation of women, and the Ministry of the Economy is implementing a Strategy for Women's entrepreneurship.

Georgia includes a specific strategy to promote gender inclusivity in the energy sector under the framework of the Enhanced Lima Work Programme on Gender[22]. The BTR identifies the gender gap in the energy sector that can be targeted through gender inclusivity measures. This approach is aligned with the Long-term Low Emission Development Strategy that identifies specific measures for supporting workforce participation, including fostering mentorship programmes, comprehensive educational programmes, and targeted recruitment initiatives for supporting women's career advancement and creating pathways to leadership.

Morocco includes a specific section on Education, Training and Awareness-raising for a Gender and Climate Approach[23], with trainings and skills development activities conducted so as to support the participation of women in sustainable resource management. This section includes examples of specific trainings and activities conducted on supporting livelihoods as good practices, which include projects in the water management, agriculture and renewable energy sectors. This section also

[19] Strategy available here (in Russian): https://www.fao.org/faolex/results/details/en/c/LEX-FAOC209955/#:~:text=The%20main%20goal%20of%20the,Keywords.
[20] Additional information on the Programme is available here: https://social.gov.md/en/communication/press-news/the-programme-for-promoting-and-ensuring-equality-between-women-and-men-in-the-republic-of-moldova-for-the-years-2023-2027-approved-by-the-government/.
[21] National Climate Change Adaptation Programme until 2030 is available here: https://unfccc.int/sites/default/files/resource/NAP_Moldova_2024.pdf.
[22] https://unfccc.int/topics/gender/workstreams/the-enhanced-lima-work-programme-on-gender.
[23] Morocco BTR, p.337.

includes a set of recommendations on gender mainstreaming, with one being to 'Increase women's access to education and training on climate issues' to support active participation in adaptation solutions.

Some countries include a youth focus beyond the institutional school system for addressing workforce needs. **Egypt**'s BTR includes a key focus on training youth in climate technologies to increase participation in green transition sectors and new technologies. North Macedonia identifies linkages to national initiatives such as the Youth Guarantee Scheme and Self-employment Programme as part of their youth-targeted initiatives in the green transition. The **Türkiye** BTR identifies a specific project – the 'Young Climate Envoys Movement'[24] – with part of their role being to encourage green and climate-friendly studies in universities and private higher education institutions.

Jordan specifically identifies the needs of people with disabilities in the green transition, and highlights that the NDC and climate plans should create new green skilled labour opportunities which integrate people with disabilities through learning, awareness, education and management career paths, taking advantage of opportunities in virtual working environments.

Criterion 6: NDC documents clearly refer to engagement in social dialogue with social stakeholders, such as worker/employer representative organisations or (private) training institutions

Table 11: Number of countries fulfilling criterion 6

YES	PARTIAL	NO
8	12	5

Source: PPMI research team

As with the previous criterion, most countries partially address this scoring dimension. While most countries include some components of social dialogue activity in their NDC strategies, this is often linked to the general NDC and climate strategy, rather than with a focus on human capital or workforce dimensions. This made this criterion harder to assess. While there is evidence of a wider stakeholder engagement approach for the development of NDC targets in most countries, the extent to which this engagement addresses core human capital dimensions is often unclear.

There are limited examples of mentioning engagement on human capital dimensions. **Montenegro** includes a case study on coal production (see Criterion 3) which identifies engagement with employers, employees, the local community and regional government on the impacts of the green transition on the local coal mining and power plant industries. This was part of a study conducted by UNDP, which included surveys, focus groups and engagement with residents to generate a set of recommendations included in the NDC documents. **Georgia** undertook a stakeholder consultation process, with the Climate Change White Paper cited as including consultation through the Environmental Information and Educational Centre of the Ministry of Environmental Protection and Agriculture. The Centre coordinates with target groups on capacity building, non-formal education and awareness raising, including ministries, local municipalities, the private sector and NGOs. **Algeria** identifies a set of engagements in the Housing, Town Planning and Urban Affairs sector, with partnerships developed with universities, agencies, institutions and associations to work with the vocational training and education sector in order to promote green occupations.

[24] Further information here: https://turkiye.un.org/en/173104-turkey's-young-climate-envoys-are-forefront-tackling-climate-change.

Criterion 7: NDC documents include clear references to existing policies/plans/measures/strategies to align education/training with labour market needs due to climate change and/or with broader socio-economic goals (policy coherence)

Table 12: Number of countries fulfilling criterion 7

YES	PARTIAL	NO
7	13	5

Source: PPMI research team

While most countries mention national or sectoral strategies in their NDCs, labour market needs arising from climate change are directly linked to these in only seven cases. Georgia's Climate Law and Just Transition Fund support training and retraining aligned with NDC targets, with specific goals for skills development in building and agriculture, and a climate-linked education budget – as shown in Table 14. Azerbaijan's national priorities integrate competitive human capital and green growth, with education and employment opportunities embedded in its transition strategy. Montenegro's sustainable development strategy combines lifelong learning and inclusive education with green transition objectives. Serbia's Low Carbon Development Strategy and Integrated National and Energy Climate Plan(INECP) connect green jobs, economic growth and sector-specific training, especially for energy. Israel's BTR details green curricula and certification across all education levels, including formal and informal programmes. Morocco's BTR lists environmental education and sustainable development initiatives, such as 4C Maroc, and provides information on higher education courses supporting the transition.

Criterion 8: NDC documents clearly refer to specific roles of government entities (ministries or agencies) and/or coordination mechanisms focused on the integration of education /skills/ training / employment into the just green/energy transition.

Table 13: Number of countries fulfilling criterion 8

YES	PARTIAL	NO
3	7	15

Source: PPMI research team

A minority of countries (six) explicitly reference government ministries or agencies with defined responsibilities for integrating education, skills, training or employment into their green transition strategies. In these cases, the NDCs or related documents go beyond general mentions, specifying which entities are tasked with delivering relevant measures.

Other countries include ministries such as education, labour or social policy within broader coordination structures without assigning them a clear implementation role. These are considered to have achieved partial fulfilment of the criterion.

Approaches vary; some countries designate specialist agencies within environment ministries, while others rely on more traditional bodies responsible for education or workforce development. For example, Serbia assigns its Ministry of Environmental Protection to lead climate-related education and training, whereas Georgia highlights the role of its Environmental Information and Educational Centre in capacity building and stakeholder engagement. Algeria's NDC identifies agencies focused on environmental education and cleaner technologies, while Moldova's coordination mechanism involves both the Ministry of Education and Research and the Ministry of Labour and Social Protection, with responsibilities linked to specific projects. Israel and Morocco also provide examples of ministries and agencies involved in sectoral training and capacity building for the green transition.

Overall, while some countries demonstrate clear institutional arrangements, most still lack detailed assignment of roles for integrating human capital into climate strategies.

Criterion 9: NDC documents include budgets (funded or unfunded) and/or financial commitments to invest in education, skills development, training in (priority) economic sectors/activities as part of the green/energy transition

Table 14: Number of countries fulfilling criterion 9

YES	PARTIAL	NO
6	11	8

Source: PPMI research team

Only three countries provide specific, planned funding commitments for education, skills development, or training in their climate strategies. In most other cases, references to budgets are limited to projects supported by international partners, or to activities already underway, rather than dedicated national allocations for human capital development. Among those meeting the criterion, Moldova offers the most detailed breakdown, though its funding is primarily directed toward training for civil servants and agency staff, rather than workers in key transition sectors (see figure 26). Serbia outlines a planned national strategy with an indicative budget but details are limited and implementation is still pending. Kosovo identifies two budgeted actions for education and training, including a small allocation for a targeted programme, though broader funding for workforce development is not specified.

Overall, while some countries are beginning to address the financial dimension of skills for the green transition, dedicated and comprehensive funding for same remains rare.

Figure 19: Identified cross-cutting capacity development sectoral needs in Moldova (extract)

Climate knowledge and training	Sectoral training institutions mapped and climate- related training programs developed	Map and identify sectoral training institutions and develop climate- related training programs	Number of sectoral education programs that can incorporate climate change	MARDE in conjunction of Ministry of Education	1,000,000
		Climate considerations integrated in sectoral education curricula, taking into consideration gender aspects	Number of sectoral education programs that integrate climate into curricula	MARDE in conjunction of MECR	80,000
	Training for staff on leadership, coordination, mainstreaming, communication and project management	Identify/designate mentors and coaches among officials/staff	Established roster of trained climate mentors and coaches for each sector (women and men)	MARDE based on discussions with relevant ministries and sectors	100,000
		Train identified mentors and coaches on climate issues	Number of participants in mentors and coaches' trainings (women and men)	Initially to be conducted by MARDE	60,000 per training session
	Training on climate change, risks and vulnerability with	Training for civil servants on climate policy and climate considerations	Number of civil servants participating in	MARDE	10,000

Source: Moldova NDC, p.51

Criterion 10: NDC documents include specific actions related to workforce-related provision, such as workforce development, education, re-skilling, training; social protection and social dialogue

Table 15: Number of countries fulfilling criterion 10

YES	PARTIAL	NO
6	11	8

Source: PPMI research team

Only three countries fully meet this criterion by detailing specific, planned actions to support workforce development as part of their green transition strategies. This includes initiatives such as mandatory climate education across all school levels (Israel), the establishment of skills centres and targeted training programmes (Morocco), and budgeted capacity-building activities for both public and private sector workers (Moldova).

While these examples demonstrate a proactive approach, most countries either reference workforce-related actions in general terms or overlap with measures described under previous criteria. Comprehensive and actionable plans for workforce development remain the exception rather than the norm.

4 FINDINGS AND IMPLICATIONS FOR POLICY IMPLEMENTATION

Within the ETF sample of 25 countries, the research generated many insights that were triangulated with skilling performance and context. On that basis, several findings on the inclusion of human capital dimensions in the NDC are now presented and contextualised. Each finding is accompanied by policy pointers, outlining implications for policy-making and further implementation, based on findings and ETF insights.

Finding 1: Climate mitigation and adaptation plans across regions show varied ambition levels, yet consistently prioritise certain sectors and measures

Almost all countries communicate the need for actions on renewable energy, re-/afforestation, sustainable agriculture, and better collection and more sustainable disposal of waste. Efficiency measures in the built environment are mentioned by two-thirds, as well as using more efficient appliances and equipment[25]. While many actions are common to most countries, some are specific to the country's circumstances, for example, countries with large oil, gas or coal reserves or forest cover[26].

Policy pointer 1: Cross-sectoral synergies can amplify climate mitigation and adaptation impact while allowing flexibility for context-specific measures in resource-dependent and industrialised economies.

Policies should promote integrated approaches where, for example, energy-efficient buildings reduce demand on renewable energy systems, and sustainable waste practices contribute to clean energy and low-carbon construction, or higher water use efficiency is linked with energy use (efficient pumps) as well as sustainable agriculture.

Finding 2: Human capital dimensions are present in most countries that submitted NDC documents, but in many cases lack close integration and are fragmented across strategies, actions, and budgets. There is a moderate regional trend on integration, but limited evidence of how economic, labour market or system performance affect the inclusion of human capital dimensions

The majority of the 25 countries in the sample studied include human capital considerations in NDCs, though the depth of integration varies significantly. There are limited good examples of national strategy actively incorporating education, training and labour policies in NDC documents.

The analysis of NDCs did find that the Western Balkans and Türkiye region had a stronger performance in the incorporation of human capital components in the NDC documents assessed. These effects are also present in some countries in the Eastern Partnership, but less evident in the Central Asian and Eastern and Southern Mediterranean Regions. One possible reason for this may be the alignment with the broad EU green transition agenda as articulated through regional agreements and structural reforms linked to the accession process. Beyond this regional dimension, there is no consistent trend at the economic, labour market or system performance angle that indicates a higher likelihood of inclusion of human capital dimensions in NDC documents.

However, most countries include only base or minimum references in their NDC on human capital dimensions. While most countries contain content and discussion of human capital dimensions, these

[25] Many countries communicate one or more quantitative mitigation targets specific to priority areas or sub-areas, which support and underpin their overall mitigation targets. One such target is, for example, the share of renewable energy in electricity production by a target year (e.g. 2030).

[26] For example, the reduction of fugitive emissions is important in oil and gas-producing countries (Algeria, Egypt, Turkmenistan, Kazakhstan and Uzbekistan). Replacing fossil fuels with large carbon content (coal) is important in coal-producing countries (such as the Balkan countries, Morocco, Türkiye and Kazakhstan). The role of energy efficiency, fuel substitution or process-improving measures in industry depends on the importance of specific industries (construction materials, chemicals, iron and steel, fertiliser) in the country's economy.

are often not aligned to core action plans, strategies and budgets. Few countries explicitly link their climate strategies to specific education and training, skills or human capital development policies outside of their national strategic development frameworks.

While some countries have not clearly linked climate change targets and mitigation/adaptation with the human capital dimensions (employment, skills, education, social dialogue), others may have a 'partial' approach, i.e. targeted at specific groups, regions, sectors or industries, thereby leading to an unbalanced or non-comprehensive inclusion of human capital dimensions.

Policy pointer 2: Policies should require structured inclusion of education, training and labour dimensions, beyond awareness raising, in order to support workforce transitions in priority sectors of the green economy.

Embedding green skills into education and training systems requires clear roles for government, employers and social partners, and should be adapted to each country's institutional context. This structured approach helps bridge fragmented efforts and ensures that workforce transitions are both effective and inclusive.

Linking climate strategies to skill development and employment planning enables countries to anticipate and manage labour market shifts. This alignment strengthens the effectiveness and social equity of climate action, especially in regions undergoing rapid industrial or energy transformation.

Finding 3: There is a noticeable tendency that countries that are not candidates for EU accession are less likely to develop robust inclusion of human capital dimensions in their climate strategies.

Regional alignment with broader green transition agendas (such as those linked to EU accession) appears to support stronger integration of human capital dimensions in climate strategies[27].

Policy pointer 3: Further case studies and additional research are needed in order to understand the drivers and enablers for better inclusion of human capital components in climate strategies (and NDCs). One enabler could be the support provided by EU institutions, multilateral or UN organisations in the elaboration of NDC and related documents.

Comparative research highlights that countries with strong coordination between public authorities and employers are better able to integrate green skills into climate strategies. Future studies should also examine how institutional models influence the success of international support and partnerships.

Finding 4: There is no standardisation across countries, with a very high degree of variation in what human capital dimensions are included in NDCs. Education and training topics that are frequently mentioned are mostly linked to capacity building of the climate change research and reporting process itself.

The UNFCCC does not provide a specific instruction on the inclusion of human capital dimensions in climate strategies in the template documents (BUR, BTR, NDC). These documents tend to mention some human capital elements but not as a core part of the content. Which content to include (or not include) is based on the country's level of priority and ambition in the areas of education, training, skills and social protection. This results in both uneven inclusion of human capital components in the screened documents and the asymmetric inclusion of certain topics (but not others) for certain countries. UNFCCC reporting may encourage discussing human capital components, but it does not incorporate these in a structured way into the reporting. Therefore, countries adopt a wide range of approaches of varying complexity.

Education and training form topics that are frequently mentioned but mostly linked to climate awareness raising or capacity building to support adaptation or the climate mitigation planning process

[27] In prospective EU accession or association candidates, some frameworks, such as the Green Agenda for the Balkans, EU acquis communautaire, alignment processes are quite prominent, resulting in a deeper level of integration of human capital dimensions into their NDC documents. Based on the analysis conducted in this study, countries engaged in EU alignment processes show higher inclusion of human capital dimensions across most categories, indicating that there is a high 'value-add' to the awareness of needs to comply with EU policies in driving high quality integration of human capital dimensions.

itself and rarely linked with the skill development needs associated with labour and employment changes (in priority sectors) in the green transition[28].

Policy pointer 4: Policies should advocate for clearer international guidance and regional coordination mechanisms to support comprehensive inclusion of education, training, and labour components. Without such frameworks, countries risk fragmented approaches that overlook workforce needs in key mitigation and adaptation sectors.

International guidance should encourage countries to adapt green skills strategies to their own institutional strengths and gaps, rather than relying on one-size-fits-all solutions. Regional coordination can also help to facilitate the sharing of lessons learned in terms of what works in different skills system contexts.

The absence of standardised guidance in UNFCCC templates leads to wide variation in how countries include human capital dimensions in their climate strategies. Where frameworks such as EU accession processes exist, countries show deeper and more consistent integration – highlighting the value of structured regional alignment. Where feasible, the role of external partners, such as UN agencies, can be identified so as to provide capacity and technical support.

Finding 5: Sectoral or thematic analysis is often missing, and the necessary information systems are lacking

With the generally observed tendency to have references to human capital dimensions in the NDCs (and BTR/BUR) to be on a base or minimum level, it is no surprise that sectoral data on human capital dimensions (in particular projected skills needs and gaps) is lacking throughout the NDC documents. Nonetheless, there are some good practice examples identified of countries that have included discussion on specific workforce and learning needs in key sectors, often based on data generated through partners[29].

Even countries with more granular public data public monitoring datasets (according to international standard classification, such as ISIC or adapted national definitions) often show limited alignment in terms of priority sector definition as used in IPCC-based reporting, such as NDCs.

Unavailability of granular, consistent data on the projected employment and growth in transition sectors, as well as the linked skills gaps and needs for the current and future labour market, are limiting progress towards building more detailed labour information on green transition needs. Qualitative and quantitative, detailed skill needs analyses conducted at the sector or regional/level are rarely cited with any complexity in NDC documents. Neither are interlinked labour market and education and training information systems present in the NDC documents. Only a small number of countries provide detailed insight (Israel, Morocco) into the education and training options to support the green transition.

Policy pointer 5a: Partner countries can develop more robust labour market analysis systems, such as job observatories, or bodies such as sector skills councils (energy seems an absolute priority since all countries prioritise this sector) for supporting the integration of education and training offers with skills needs.

The creation and effectiveness of such bodies depend on the underlying skills formation regime – whether led by the state, employers or both. Recognising these institutional differences can help to ensure that labour market analysis leads to actionable training reforms.

[28] The templates of the NDC documents, in particular sections focused on technology transfer and capacity building needs, result in more content on these specific dimensions being included. In both cases, these are narrow applications of human capital within the scope of this study. For technology transfer, countries report on high-level and specific research in most cases. For capacity building needs, the focus is on the capacity building of civil servants and other personnel involved in the monitoring, reporting and verification of GHG emissions data, and therefore does not fall in the core scope of this study as it does not address workforce components in key mitigation and adaptation sectors.

[29] Examples include a UNDP and WB studies on coal in Montenegro, Bosnia-Herzegovina and Serbia, ILO and GIZ studies on green jobs In Türkiye and Jordan, WB-commissioned studies on jobs and skills in the energy sector in Morocco and Egypt, and studies done by ETF on the energy sector (Albania, Egypt), agri-food sector (Morocco) and automotive sector (Türkiye).

Sectoral analysis of human capital dimensions in climate strategies remains limited, with few countries providing detailed insights into skills needs, employment impacts or workforce planning in key transition sectors. This gap undermines the ability to deliver targeted education, training and social support to affected groups, regions and industries. For key transition sectors, partner countries should identify approaches and resources to conduct robust and detailed skills intelligence exercises, generating data and evidence on current and projected workforce needs, and associated skills and competencies. Policies should promote the use of granular labour market data and sector-specific skills anticipation to inform climate planning. Without this, countries risk overlooking both opportunities for green job creation and the risks of employment disruption in vulnerable sectors.

An effort should be made to have public monitoring datasets on employment and education data (according to international standard classification, such as ILO's or national definitions) more aligned with IPCC-type sector definition as included in NDCs and National Communications to UNFCCC.

Policy pointer 5b: Partner countries should apply this approach to both potential growth areas – in order to maximise gains – but also to sectors expected to experience negative effects to mitigate risks and reduce the potential impact of the green transition.

Evidence suggests that countries with flexible and inclusive skills systems are better able to support workers in both expanding and declining sectors. Policy design should therefore consider how to adapt training pathways for workers at risk of displacement.

There is also a clear trend of countries prioritising potential growth sectors for green jobs for inclusion in NDCs, such as new technologies or innovations. On the other hand, there is also a trend that countries with significant industry or sectoral exposures to negative employment and livelihood impacts from the green transition (such as coal producers) are less likely to specifically identify or target risks that these sectors may face. Seventeen countries include information on workforce needs in potential growth sectors, with only 6 countries including details on the potential negative effects on specific sectors. There are very limited examples of substantive analysis of the negative impacts of green transition on certain sectors (and regions), even for countries where this could be expected as part of the overall transition strategy.

Finding 6: Coordination with and involving relevant human capital stakeholders is not commonly seen as an integrated part of the NDC strategy formulation

Coordination processes are often led by environmental or climate ministries. Coordination is implied but often with key roles for certain sectors (energy, waste, transport). The role of human capital ministries or agencies (education and training, labour and social affairs) is mentioned, but their role is not well-articulated and, in most countries, not specified as having an implementation function in climate plans. Partial inclusion – for example, as a member of a national committee – is a positive sign but this needs to be enhanced so as to provide embedded focus on human capital components in sector strategies and measures. Of the countries covered by this study, only six included a clear role for a government entity or agency in incorporating the integration of education, skills, training or employment components into the just transition. More common (11 additional countries in the study sample), was reference to ministries or agencies with some degree of responsibility (e.g. Ministry of Education) being included in coordination mechanisms, without additional evidence that this role was central to the development of climate change response strategies. Further analysis of how each country is building a strong mechanism of institutional support would allow a greater understanding of where significant gaps in human capital inclusion remain.

Policy pointer 6a: Climate strategies should formally embed education, labour, and social affairs ministries or agencies into the design and implementation of NDCs, beyond mere participation in advisory or committee roles. Coordination mechanisms should be strengthened to enable joint planning across climate and human capital domains.

Institutional research shows that joint governance, where ministries and employers share responsibility, can accelerate the update of training programmes for green jobs. Embedding such mechanisms in NDC implementation increases responsiveness to changing skills needs.

Partner countries can assign clear roles, responsibilities and mandates for different human capital dimensions in their larger strategy. Ensuring an empowered engagement of the relevant stakeholders will be important at the government level to ensure that climate plans are supported by the human capital capacity of countries. Coordinating bodies can also be used as a potential pathway to fulfil this requirement, such as agencies or bodies assigned to coordinate the incorporation of skills, education and training among key stakeholders. Assigning clear mandates and responsibilities to these entities ensures that human capital components – such as skills development, employment planning, and social protection – are integrated into sectoral climate measures.

Although some countries have undertaken sector-specific analyses, these studies rarely cover all major national transition sectors or are integrated into national strategies. Moreover, sectoral studies are frequently conducted by external organisations (i.e. the World Bank, UNDP, GIZ, ILO and ETF) that are not directly involved in the NDC coordination council or committee. Consequently, there is a risk that sectoral findings remain disconnected from the NDC strategy and therefore fail to inform policy and implementation effectively. Establishing Sector Skills Council and similar coordination and planning mechanisms could play an important role in ensuring that the integration remains relevant over the long-term transition strategy period.

Policy pointer 6b: Climate strategies should explicitly link education and training offers across general, vocational, and higher education, with sector-specific skill needs to support workforce transitions in the green economy.

Linking education and training to sector needs is most effective when curricula and standards are regularly updated in partnership with employers and social partners, as recommended by recent comparative studies on green skills.

With coordination lacking, it is not a surprise that this study found that it is more frequent for countries to incorporate national-level approaches – such as those that target primary and secondary education – rather than sector-specific or regional strategies for skills development. Education and skills planning at various levels (including general, higher, vocational and informal) are rarely aligned with an assessment of specific skill needs to support the green transition. It is essential to distinguish between capacity building for climate professionals (e.g. civil servants, planners, MRV personnel) and training for sector-level professionals (e.g. technicians, engineers, construction workers), as these groups require different competencies and delivery mechanisms. Policies should promote targeted programmes that address both strategic climate planning and operational workforce readiness in priority sectors. This dual-track approach ensures that climate goals are supported by both institutional expertise and a skilled labour force capable of implementing transition measures.

Policy pointer 6c: Develop processes that ensure the engagement of vulnerable or underrepresented groups with concrete commitments or options for these stakeholders. Human capital development strategies by countries should address inclusivity awareness and sensitivity.

Inclusive green skills strategies should be designed with input from affected groups and tailored to local institutional realities, ensuring that equity is embedded in both policy and delivery.

Fully inclusive policies that support the fair transition must consider vulnerable groups. For example, almost every ETF partner country reports an existing higher rate of NEETs for women, which will further challenge national and educational policies to achieve a just green transition. Specific discussions and analysis of inclusivity of vulnerable or underrepresented groups (e.g. gender, youth, refugees, ethnic minorities) are included in some country NDC documents and are often focused on specific sectors (such as agriculture). However, examples of concrete steps to overcome gaps in access to training, informal and formal work, and education and training offers are much more limited or mainly absent.

Finding 7: Lack of financing for climate-relevant education and training (in NDCs)

There is a clear gap in committed or planned finance within the ETF partner countries to support education and training for employment as an integral part of the green transition. Inclusion of financial

options is partial, often cited as unfunded and needing partner support, and without concrete implementation plans. Some countries have established potential funding instruments or modalities (such as Georgia and Serbia) but these are still in the early phases and have not moved towards implementation. In the context of underfunded and lower-income countries, education and training components are often included as components of wider externally financed projects, which have activities such as training, workshops or capacity building as part of the approach. Education and training programmes targeted at specific workers and/or sectors through specified institutions are only present in a few countries.

Beyond the specific funding and financing gaps, the wide variations in national average public expenditure on the broader education sector also shape the capacity for education and training support in climate strategies. As high-performing and responsive skilling systems also require funding, it is unlikely that underfunded national systems will be able to deliver sufficient investment to support net-zero pathways.

Policy pointer 7a: Partner countries should assess the cost of supporting the human capital dimensions of the green transition, and climate strategies should include dedicated and clearly costed financing plans for education and training to support workforce transitions in the green economy.

Without committed funding, even well-designed human capital measures risk remaining aspirational and unimplemented, particularly in underfunded or lower-income systems. Policies should prioritise the integration of education and training investments into national climate budgets and explore blended financing models, including public, private and international sources. Establishing targeted funding instruments for skills development in priority sectors is essential to ensure that national skilling **systems can deliver on net-zero commitments.**

Policy pointer 7b: Countries can also use this exercise to approach development finance institutions to support green transition pathways, when there are financing gaps that are not feasible to be filled through current revenue streams. Financing models should be adapted to local institutional arrangements, drawing on lessons from countries where public–private partnerships or international cooperation have successfully scaled up green skills training.

Without committed funding, even well-designed human capital measures risk remaining aspirational and unimplemented – particularly in underfunded or lower-income systems. Policies should prioritise the integration of education and training investments into national climate budgets and explore blended financing models, including public, private and international sources. Establishing targeted funding instruments for skills development in priority sectors is essential to ensure that national skilling systems can deliver on net-zero commitments. Specific instruments, such as a Just Transition Fund, can also be identified that could support the integration of education and training into climate strategies.

5 ANNEX: Datasets and insights related to climate, energy and employment

5.1 Emissions and climate data for the entire portfolio

Climate and energy data																		
Main source of data:			Ourworldindata.org		Climate watch	Ourworldindata.org									ourworldindata.org
Code+ AA5:BL5+A4:BN5	0.01	0.02	1.01		1.02								1.02		1.01
			GHG emissions MtCO2		Sectoral emissions (2021)										GHG emissions 2023
BUR/BTR		WB class	1990	2010	2021 LULUCF	Energy supply elecrt/fuel	Energy demand Transp	Energy demand Bldng	Energy industry & IPPU	Waste	Agricult	Total	2021	Share energy in GHG	
2021	2024 Morocco	LO MID	65.5	89.1	-1.9	33.5	20.6	8.4	13.4	5.0	15.7	94.6		79%	106.5
			70.4	93.6											108.4
2015	2024 Algeria	UP MID	160.9	210.8	-0.4	138.7	44.3	27.1	34.7	15.3	12.6	272.1		90%	282.6
2021	2024 Tunisia	LO MID	23.0	46.2	-3.8	13.4	8.6	3.2	11.0	3.3	4.7	40.4		82%	46.8
			23.9	47.6											50.5
2023	2024 Egypt	LO MID	141.1	303.6	-0.2	130.7	56.4	17.0	63.4	29.7	22.3	319.3		84%	367.5
2021	2021 Jordan	LO MID	12.2	26.7	0.0	10.2	8.1	2.0	7.7	6.1	1.3	35.3		79%	29.4
2021	Palestine		0.9	3.2	0.0										3.5
2021	2025 Israel	HIGH	42.6	79.5	0.0	36.2	16.6	0.7	20.5	8.8	1.6	84.3		88%	81.2
2021	2024 Lebanon	LO MID	10.1	24.4	0.0	7.7	7.8	0.7	4.8	3.2	0.7	24.8		84%	25.1
2023	2024 Türkiye	UP MID	243.5	390.9	-28.5	177.3	101.2	62.8	136.7	17.5	56.7	523.6		87%	606.5
2021	2021 Albania	UP MID	11.4	9.0	-0.2	0.2	2.0	0.6	2.7	1.0	2.3	8.5		62%	7.7
			11.4	10.1											7.9
2021	2020 N.Macedonia	UP MID	12.3	8.6	-	3.6	2.0	0.3	1.2	1.3	1.1	9.4			8.9
			12.5	11.2											11.0
-	- Kosovo	UP MID	11.2	8.4	0.0										8.4
2025	2025 Montenegro	UP MID	5.4	4.1	-2.6	1.6	0.9	0.1	0.5	0.3	0.4	1.3		83%	1.5
			7.0	6.6											4.0
2021	2023 Serbia	UP MID	81.3	57.7	-4.5	34.1	7.8	2.9	4.8	5.9	5.6	56.4		81%	58.0
			82.7	63.8											62.6
2020	2022 Bosnia & H	UP MID	26.6	22.7	-6.4	14.9	3.8	1.2	7.6	1.1	2.0	24.1		90%	26.8
			34.0	25.2											32.9
2025	2024 Moldova	UP MID	43.4	13.6	0.0	5.1	3.0	1.7	1.6	1.8	1.5	14.7		77%	13.0
			44.9	14.5											13.7
2021	Ukraine	UP MID	889.7	383.1	-3.2	86.9	26.2	20.4	44.1	14.8	33.0	222.2		79%	214.9
2021	2024 Georgia	UP MID	40.3	5.1	-6.0	1.9	4.6	3.1	3.9	3.2	1.9	12.4		72%	14.3
			46.6	8.6											21.0
2021	2023 Armenia	UP MID	25.1	7.5	0.0	3.2	0.9	1.7	1.2	0.7	1.7	9.5		74%	10.6
2023	2024 Azerbaijan	UP MID	84.6	46.0	-5.3	24.8	9.3	8.4	3.7	4.4	7.9	53.1		79%	77.1
			88.6	51.4											82.4
2023	2024 Kazakhstan	UP MID	385.7	313.5	-4.7	187.7	24.9	39.6	35.2	5.8	29.0	317.6		89%	353.0
			390.5	351.4											348.8
2021	2021 Tajikistan	LO MID	20.1	10.5	-0.1	3.2	2.0	1.1	3.8	0.9	6.9	17.8		56%	21.2
2021	2022 Kyrgyzstan	LO MID	18.0	2.7	-3.3	3.1	1.7	4.3	1.9	0.8	5.72	14.2		63%	18.8
			28.3	13.0											24.2
2022	2023 Turkmenistan	UP MID	81.6	100.6	0.0	147.2	12.2	13.7	2.1	1.5	12.0	188.6		93%	122.4
2021	2025 Uzbekistan	LO MID	145.4	177.5	-3.4	72.5	17.2	34.1	22.7	7.4	38.8	189.3		76%	208.7
	EU-27		803.6	4080.0	-161.0	1045.5	979.7	450.0	529.7	105.2	385.3	3334.3		31%	3011.0

Climate and energy data																									
	NDC/BUR/BTR						Ourworld indata	Various		CoM EF Table 4	Ourworld	IEA data (2023)		IEA data (2023)											
	1.03						1.04			1.05	1.06	1.07	1.08	1.09											
	Emissions and reduction, NDC					Reduction	Share renewables in			Power production															
	Condit.+uncondit. reduction targets					2030 target compared 1990 level	power product	power policy	target year	Grid factor	Share of	% export energy	% import energy	Largest source % of energy supply											
	BaU 2030 MtCO2	Uncond MtCO2	NDC % (Alt-BaU)	year Source			2023	target		2020	coal	prod.	supply	Hydro	Oil	Gas	Coal	Nuclear							
Morocco	170.8	98.8	42%	2030	NDC 2021	-51%	21.0%	52%	2030	0.862	64%		94%			58%									
	170.8	113.2	34%	w/o LULUCF																					
Algeria	314.0	285.0	9%	2030	BTR 2024	-77%	0.9%	27%	2030	0.638		56%					65%								
Tunisia	49.9	31.0	38%	2030	NDC 2021	-35%	3.2%	12%	2030	0.557			53%			40%	49%								
	54.6	16.7	69%	2040	BTR 2024			40%	2050																
	73.6	43.3	41%	w/o LULUCF																					
Egypt	341.7	215.3	37%	2030	NDC	-53%	11.8%	42%	2030	0.480			9%				52%								
Jordan	44.0	30.3	31%	2030	NDC 2021	-149%	22.9%	35%	2030	0.428			96%			47%	41%								
Palestine	15.9	13.1	18%	2040	NDC 2021		22.6%	20-33%	2040	-			-												
Israel	65.4	54.6	16%	2030	NDC 2021	-28%	10.5%	30%	2030	0.554			14%			38%	44%								
	59.6	43	28%	2040	BTR 2025			50%	2040																
	-	12.0	-	2050	NDC 2021																				
Lebanon	39.0	26.9	31%	2030	NDC 2021	-167%	9.5%	30%	2030	0.788			97%			86%									
Türkiye	1,175.0	695.0	41%	2030	NDC 2021	-185%	42.0%	60%	2040	0.485	37%		72%			29%	26%								
Albania	15.1	12.0	21%	2030	NDC 2021	-5%	100.0%	100%	2030	0.000			32%	28%	48%										
	13.4	11.4	15%	w/o LULUCF																					
N.Macedonia	7.6	4.9	35%	2030	BUR 2020	60%	32.5%	66%	2030	0.545	47%		64%			45%		32%							
	11.4	8.7	24%	w/o LULUCF																					
Kosovo	-	9.0	-	2030	voluntary WB		11.5%	32%	2030	1.310	88%		32%					59%							
	13.3	6.2	53%	2040	report																				
Montenegro	2.4	0.59	75%	2030	NDC/BUR	89%	33%	60.0%	2030	0.564	40%		30%			27%		43%							
	4.9	3.1	36%	w/o LULUCF																					
Serbia	59.6	36.4	39%	2030	NDC/BTR	55%	35.9%	45%	2030	1.017	60%		45%					51%							
	64.7	46.1	29%	w/0 LULUCF																					
Bosnia & H	27.0	21.5	20%	2030	NDC/BTR	19%	40.7%	59%	2030	1.345	59%		26%				51%								
	33.0	28.1	15%	w/o LULUCF																					
	21.0	11.7	44%	2050	BTR 2024																				
Moldova	13.5	11.2	18%		BTR 2024	74%	9.7%	30%	2030	0.595			87%												
	14.0	12.5	11%	w/o LULUCF																					
	13.3	8.5	36%	2040																					
Ukraine	409.3	311.4	24%	2030	NDC 2021	65%	19.7%	27%	2030	0.430	21%		25%				25%		26%						
Georgia	20.1	14.9	26%	2030	NDC 2021	63%	76.1%	87%	2030	0.106			80%				51%								
	25.8	21.2	18%	w/o LULUCF																					
	16.8	8.3	51%	2040	BTR 2024																				
Armenia	13.6	10.1	26%	2030	BUR 2023	60%	26.6%	50%	2030	0.241			77%				59%								
Azerbaijan	84.6	55.0	35%	2030	BTR 2024	60%	6.9%	30%	2030	0.597		71%					66%								
Kazakhstan	394.2	304.0	23%	2030	BTR 2024	21%	12.8%	15%	2030	0.947	67%	54%						51%							
	409.0	305.8	25%	w/o LUKUCF				50%	2050																
Tajikistan	24.9	17.8	29%	2030	NDC 2021	12%	89.4%	-		0.095	9%		28%	42%	30%										
Kyrgyzstan	14.9	8.4	44%	2030	BUR 2022	53%	85.9%	-		0.064	13%		34%		34%	33%									
	25.3	20.2	44%	2030																					
Turkmenistan	-	80.5	-	2030	NDC 2021	1%	0.0%	3%	2030	1.262		52%					87%								
Uzbekistan	260.0	195.0	25%		BTR 2024	-34%	9.3%	25%	2030	0.594	7%		2%				83%								
	280.4	217.0	23%	w/o LULUCF																					
EU-27	466.1	442.0	5%	2030	NDC 2023	45%	45.0%	70%	2030	-	12%	-	-	-	-	-	-	-							

5.2 Economy, population and employment data

Economy, population and employment														
	data.worldbank.org					EPI report 2024			UNDP	IRENA	WB data.world	KIESE		
	2023	2023												
	2.01			2.02				2.03	2.04	3.01	23.02	3.03	3.04	3.05
	2023 GDP PPP current USD 10^6 USD	2023 Popul 000	GDP capita 000 USD	GHG per USD GDP kgCO2/US	GHG per capita t/person	EPI 0-100	EPI-CC	EPI-CC regional rank	HDI 2022 0 to 1.0	Jobs in RE 2023	Population 15+ % of total	Employ-ment 15+ 2022	Employ-ment 15+ 2022	Unemploy-ment rate 2022
Morocco	376,906	37,713	9.99	0.28	2.82	39.7	34.9	10	0.698	14,577	74%	10,748	39%	12%
Algeria	776,689	46,164	16.82	0.36	6.12	42	36.2	6	0.745	2,448	69%	?	37%	12%
Tunisia	169,975	12,200	13.93	0.28	3.83	45.7	41.4	3	0.732	3,390	75%	3,458	39%	15%
Egypt	2,121,724	114,536	18.52	0.17	3.21	43.8	40.4	4	0.728	7,420	67%	27,976	40%	7%
Jordan	118,865	11,439	10.39	0.25	2.57	47.5	44.6	1	0.736	33,560	68%	1,419	32%	18%
Palestine	30,461	5,166	5.90	0.11	0.68	-			0.716	591	61%	?	34%	24%
Israel	527,413	9,767	54.00	0.15	8.31	48.1	43.3	2	0.915	17,090	72%	4,187	62%	4%
Lebanon	70,619	5,774	12.23	0.35	4.34	40.1	38	5	0.723	6,248	73%	?	40%	12%
Türkiye	3,611,521	85,326	42.33	0.17	7.11	37.6	37	19	0.855	117,672	78%	30,724	48%	10%
Albania	58,388	2,746	21.26	0.13	2.79	52.1	59.4	3	0.789	14,733	83%	1,249	56%	12%
N. Macedonia	44,581	1,828	24.39	0.20	4.89	50	51.3	10	0.765	4,540	83%	692	45%	14%
Kosovo	26,594	1,756	15.14	0.32	4.77	-			0.787	270	74%	408	29%	12%
Montenegro	19,081	617	30.93	0.08	2.50	47.6	43.1	17	0.844	80	82%	251	50%	15%
Serbia	190,406	6,623	28.75	0.30	8.76	49.3	43.6	16	0.805	1,915	86%	2,819	52%	8%
Bosnia & H	71,502	3,185	22.45	0.37	8.41	45.6	45.9	14	0.779	240	87%	1,162	45%	13%
Moldova	43,249	2,458	17.60	0.30	5.27	45.6	45.4	3	0.763	130	80%	862	70%	1%
Ukraine	621,636	37,733	16.47	0.35	5.70	54.6	53.9	1	0.734	19,276	85%	15,610	49%	10%
Georgia	93,155	3,715	25.08	0.15	3.84	46.9	46	2	0.814	-	79%	1,284	43%	17%
Armenia	63,833	2,991	21.34	0.17	3.54	44.7	42.8	6	0.811	-	80%	1,145	57%	9%
Azerbaijan	239,611	10,154	23.60	0.32	7.60	40.4	34.7	10	0.76	5,646	77%	4,901	64%	6%
Kazakhstan	783,018	20,331	38.51	0.45	17.36	47.5	42.3	7	0.802	6,724	70%	?	65%	5%
Tajikistan	51,571	10,390	4.96	0.41	2.04	31.9	18.5	12	0.679	6,578	64%	2,545	38%	7%
Kyrgyzstan	50,454	7,100	7.11	0.37	2.65	42.2	45.4	3	0.701	2,260	67%	2,581	57%	5%
Turkmenistan	146,029	7,364	19.83	0.84	16.62	40.7	29.6	11	0.744	-	68%	?	46%	4%
Uzbekistan	395,989	35,652	11.11	0.53	5.85	42.6	37.5	8	0.727		69%	13,706	54%	5%
EU-27	26,519,968	449,426	59.01	0.11	6.70	-	-	-	0.922	-	64%	203,157	54.1%	-

5.3 Employment and education data

Employment and education														
	WB ILO data	KIESE (ETF, ILOSTAT)			KIESE (ETF, ILOSTAT)				KIESE (ETF, ILOSTAT) Educational attainment			Ourworldindata Expenditures	
	3.06			3.07			3.08	3.09			3.10	3.11	3.12
	Share of informal jobs 2019	2022 Activity rate			NEET (youth not employed, in ecductaion or training)			% 15-24 yr vocational training 2022	Active population, 2022			Education, 2022	
		Age 15+	Male 15+	Female	Total 15-24	M	F		High	Medium	Low	% of publ. exp	% of GDP
Morocco		44%	70%	20%	33%	15%	52%	8%	10%	14%	76%	23.9%	5.9%
Algeria		42%	66%	16%	20%	11%	30%	?	?	?	?	13.1%	4.7%
Tunisia	37%	46%	65%	27%	24%	25%	22%	?	23%	33%	45%	20.0%	6.0%
Egypt	71%	43%	69%	15%	27%	15%	39%	11%	21%	33%	46%	12.0%	3.9%
Jordan	55%	39%	61%	14%	31%	27%	36%	1%	23%	33%	45%	9.7%	3.2%
Palestine	49%	45%	71%	19%	28%	23%	33%	4%	29%	23%	48%	?	5.4%
Israel		65%	69%	61%	15%	15%	16%	15%	38%	53%	9%	17.5%	6.5%
Lebanon	55%	46%	66%	27%	25%	20%	31%	?	25%	19%	56%	9.9%	2.4%
Türkiye	27%	53%	71%	35%	24%	16%	32%	23%	28%	25%	47%	8.8%	2.6%
Albania		60%	68%	53%	24%	22%	26%	5%	24%	36%	41%	?	2.7%
N. Macedonia	11%	53%	64%	42%	18%	18%	19%	?	29%	56%	15%	?	?
Kosovo		29%	43%	16%	33%	32%	34%	?	32%	55%	13%	?	?
Montenegro		59%	66%	52%	20%	22%	18%	22%	33%	61%	6%	?	?
Serbia	18%	57%	65%	50%	13%	13%	13%	23%	27%	57%	16%	7.4%	3.2%
Bosnia & H	16%	51%	62%	41%	18%	18%	18%	24%	17%	70%	13%	?	?
Moldova	52%	73%	74%	73%	15%	15%	15%	16%	19%	53%	27%	15.8%	6.1%
Ukraine		55%	63%	48%	17%	14%	21%	?	55%	44%	2%	8.5%	5.9%
Georgia	56%	63%	73%	55%	23%	21%	25%	3%	39%	56%	4%	12.2%	3.8%
Armenia	48%	62%	70%	56%	22%	26%	19%	11%	32%	64%	4%	9.7%	2.5%
Azerbaijan		75%	77%	73%	4%	2%	5%	11%	28%	65%	7%	?	3.0%
Kazakhstan		69%	75%	63%	7%	5%	9%	18%	45%	56%	0%	?	4.5%
Tajikistan	64%	41%	51%	31%	37%	25%	47%	?	?	?	?	21.4%	5.7%
Kyrgyzstan	59%	60%	75%	46%	16%	9%	22%	?	7%	62%	31%	21.0%	7.2%
Turkmenistan		48%	46%	49%	15%	15%	14%	0%	?	?	?	28.7%	3.7%
Uzbekistan		56%	73%	40%	16%	10%	21%	8%	?	?	?	?	5.2%
		Note: Ukraine 2021			Note: Ukraine 2021								
EU-27	-	58%	64%	51.90%	10%	10%	10%	-	36%	46%	18%	-	-

5.4 Detailed overview of the NDC documents screening for all the ETF Partner countries

	Assessment criteria	Western Balkans and Türkiye							Eastern Partnerhsip				
		Albania	BiH	Kosovo	Montenegro	N. Macedonia	Serbia	Türkiye	Moldova	Ukraine	Armenia	Azerbaijan	Georgia
1	NDC documents clearly recognise the social and employment impacts or effects of climate change and related measures as part of the just green/energy transition.	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y
2	NDC documents include clear references to emerging or changing workforce/employment needs because of climate change.	Y	Y	P	Y	Y	Y	Y	Y	N	N	Y	Y
3	NDC documents clearly refer to the re-skilling and/or upskilling of workers in economic sectors/activities that are negatively affected by the green/energy transition	N	Y	P	Y	N	Y	P	P	N	N	Y	Y
4	NDC documents refer to the role of education/skills development/training in anticipating the workforce needs in the green/energy transition (in 1 or more priority economic sectors/activities)	N	N	P	Y	Y	Y	Y	Y	N	N	Y	Y
5	NDC documents identify targeted education/training/employment-related support for specific target groups, such as women/youth/migrant workers/people with disabilities	N	P	N	P	Y	P	P	Y	N	N	Y	Y
6	NDC documents clearly refer to engagement in social dialogue with social stakeholders, such as worker/employer representative organisations or (private) training institutions	N	N	P	Y	N	P	Y	Y	P	P	P	Y
7	NDC documents include clear references to existing policies/plans/measures/strategies to align education/training with labour market needs due to climate change and/or with broader socio-economic goals (policy coherence)	N	N	P	Y	Y	Y	P	P	P	N	Y	Y
8	NDC documents include budgets (funded or unfunded) and/or financial commitments to invest in education, skills development, training in (priority) economic sectors/activities as part of the green/energy transition	N	N	Y	N	P	Y	N	Y	N	N	N	p
9	NDC documents clearly refer to specific roles of government entities (ministries/agencies) and/or coordination mechanisms focussed on the integration of education / skills/training / employment into the just green/energy transition.	N	N	N	P	P	Y	P	Y	N	P	P	Y
10	NDC documents include specific actions related to workforce-related provision, such as workforce development, education, re-skilling, training; social protection and social dialogue	N	N	P	P	N	N	P	Y	N	N	P	P

	Assessment criteria	Central Asia					Eastern and Southern Mediterranean							
		Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Palestine	Tunisia
1	NDC documents clearly recognise the social and employment impacts or effects of climate change and related measures as part of the just green/energy transition.	Y	N	Y	Y	Y	P	Y	Y	Y	Y	Y	P	Y
2	NDC documents include clear references to emerging or changing workforce/employment needs because of climate change.	Y	N	P	P	Y	P	Y	P	Y	Y	Y	N	Y
3	NDC documents clearly refer to the re-skilling and/or upskilling of workers in economic sectors/activities that are negatively affected by the green/energy transition	Y	N	N	N	P	N	N	N	N	N	N	N	P
4	NDC documents refer to the role of education/skills development/training in anticipating the workforce needs in the green/energy transition (in 1 or more priority economic sectors/activities)	P	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	P	Y
5	NDC documents identify targeted education/training/employment-related support for specific target groups, such as women/youth/migrant workers/people with disabilities	P	N	P	P	P	P	P	Y	Y	P	Y	P	Y
6	NDC documents clearly refer to engagement in social dialogue with social stakeholders, such as worker/employer representative organisations or (private) training institutions	P	N	Y	P	P	Y	Y	P	P	P	p	P	P
7	NDC documents include clear references to existing policies/plans/measures/strategies to align education/training with labour market needs due to climate change and/or with broader socio-economic goals (policy coherence)	P	N	P	P	P	P	P	Y	P	P	Y	P	N
8	NDC documents include budgets (funded or unfunded) and/or financial commitments to invest in education, skills development, training in (priority) economic sectors/activities as part of the green/energy transition	N	N	N	N	N	P	P	P	P	N	P	N	N
9	NDC documents clearly refer to specific roles of government entities (ministries/agencies) and/or coordination mechanisms focussed on the integration of education / skills/training / employment into the just green/energy transition.	P	P	P	P	P	Y	P	Y	N	N	Y	N	N
10	NDC documents include specific actions related to workforce-related provision, such as workforce development, education, re-skilling, training; social protection and social dialogue	N	N	N	N	N	N	P	Y	P	N	Y	N	N

5.5 Overview of mitigation and adaptation actions for the entire portfolio[30]

Main sector	Measures and actions
Energy supply: Transition to renewable energy and end-use electrification	Improving the efficiency of energy generation and transmission & distribution (T&D) Interconnection grids abroad; expanding battery storage and pumped-up hydro storage to overcome variability issues of intermittent sources (solar photovoltaics and concentrated solar power, wind Reducing fugitive emissions (methane) from oil and gas production Shift to sustainably produced biomass and biofuels (biodiesel; ethanol) Shift to 'green' hydrogen and derivative fuels (ammonia, synthetic fuels and gases) Nuclear power complementing renewable energy Shifting from fossil fuels (coal, oil, gas) to renewable sources like solar, wind, hydro, and geothermal in power generation. Phase-out coal; replacing oil products with natural gas
Energy demand, transport	Fuel-saving measures in aviation and shipping. Road improvements Reducing emissions from passenger and freight transportation through electric and hybrid vehicles, and fuel-efficient vehicles Move away from car-dominated transport to increased public transportation (electric buses and freight by railway; railways network expansion
Energy demand: Enhanced energy efficiency	Energy-efficient industrial process and increased use of hydrogen in energy-intensive processes. Improved buildings designs for new buildings and retrofitting existing building stock by using thermal comfort standards and better insulation of the envelope Use of heat pumps (where possible with geothermal heating); Use of solar water heaters and distributed solar PV in buildings Reducing energy consumption in buildings homes, businesses, and industries by more rationale use and high-efficiency equipment and appliances
Processes and products (IPPU)	Replace ozone-depleting substances (ODS) in refrigeration and cooling with substances that also have a low global warming potential (GWP). Decarbonisation of cement production
Waste	Wastewater treatment and re-use. Recycling and re-use and re-make (towards circular economy) Reducing methane emissions from various sources. landfills, and natural gas production. Reduce organic content in waste; reduce spillage of food and products; separation of waste streams
AFOLU	Regenerative agricultural practices, including enhancing soil health, reducing livestock-related emissions, direct seeding techniques and using cover crop Reducing deforestation and promoting reforestation and afforestation; restore degraded land; Protecting and restoring natural carbon sinks like forests, wetlands, and soil. Improved and more efficient water management Reduce CH4 emissions from enteric fermentation in cattle and N2O emission form manure and fertiliser use
Other	Implementing carbon pricing mechanisms, such as carbon taxes or cap-and-trade systems, to incentivise emission reductions. CO2 capture, utilisation and storage (CCUS)
Adaptation	Strengthen infrastructure (buildings, roads, hydropower) to withstand weather extremes Incorporating climate resilience and disaster risk planning in health Early warning systems (droughts, floods, cyclones) Less water-intensive and drought-resistant crop varieties Improved and more efficient water management with water basins; rainwater harvesting Restoring coastal and river systems to reduce flood risk and improve water quality Agroforestry and better agricultural practices; re-/afforestation Creating more green areas in cities to reduce temperatures; Support and restore ecosystems (forests, grassland, pastures) and biodiversity. Reinstating natural fire regimes to reduce risk of severe wildfires.

[30] Compiled from information provided in the NDC 3.0 (only for Montenegro and Moldova), NDCs 2.0 (2020-21), BTRs (2024-25) or the latest updated BURs (2020-2023) OF 24 ETF countries.

5.6 Criteria for NDC assessment with actions for developing skills in transition

Type of actions for developing skills for jobs in transition	Criteria for assessment of inclusion of workforce dimensions (employment/skills, education, training, social dialogue) in NDCs
Policy and regulation	2. NDC documents include clear references to emerging or changing workforce/employment needs because of climate change 7. NDC documents include clear references to existing policies/plans/measures/strategies to align education/training with labour market needs due to climate change and/or with broader socio-economic goals (policy coherence) 10. NDC documents include specific actions related to workforce-related provision, such as workforce development, education, re-skilling, training; social protection and social dialogue
Coordination and social dialogue	6. NDC documents clearly refer to engagement in social dialogue with social stakeholders, such as worker/employer representative organisations or (private) training institutions 9. NDC documents clearly refer to specific roles of government entities (ministries/agencies) and/or coordination mechanisms focussed on the integration of education/skills/training/employment into the just green/energy transition.
Data and information	1. NDC documents clearly recognise the social and employment impacts or effects of climate change and related measures as part of the just green/energy transition
Skills mobility and transferability	3. NDC documents clearly refer to the re-skilling and/or upskilling of workers in economic sectors/activities that are negatively affected by the green/energy transition
Higher education, TVET and in-house training	4. NDC documents refer to the role of education/skills development/training in anticipating the workforce needs in the green/energy transition (in one or more priority economic sectors/activities)
Financing	8. NDC documents include budgets (funded or unfunded) and/or financial commitments to invest in education, skills development, training in (priority) economic sectors/activities as part of the green/energy transition
Inclusivity	5. NDC documents identify targeted education/training/employment-related support for specific target groups, such as women/youth/migrant workers/people with disabilities

5.7 Assessment criterion "RATIONALE DESCRIPTION"

Criterion	Rating	Rationale description
NDC documents clearly recognise the social and employment impacts or effects of climate change and related measures as part of the just green/energy transition.	Yes	Substantive description social and employment impacts in multiple sectors or regions.
	Partial	Limited description of social and economic impacts in one or more sectors.
	No	No mention of social and employment impacts.
NDC documents include clear references to emerging or changing workforce/employment needs because of climate change.	Yes	Clear and descriptive reference to emerging or changing workforce or employment needs in specific sector(s).
	Partial	Short reference to changing workforce or employment needs in sector(s), without substantive analysis.
	No	No mention of emerging or changing workforce/employment needs.
NDC documents clearly refer to the re-skilling and/or upskilling of workers in economic sectors/activities that are negatively affected by the green/energy transition.	Yes	Substantiated analysis of potential re-skilling or upskilling needs of workers. Quality dimensions can include data analysis, sectoral descriptive analysis or policy discussion.
	Partial	Limited and short reference to the potential need in sectors without substantive analysis or description.
	No	No mention of re-skilling or upskilling of workers in negatively affected economic sectors.
NDC documents refer to the role of education/skills development/training in anticipating the workforce needs in the green/energy transition (in one or more priority economic sectors/activities).	Yes	Specific identification of education, skills, development or training in anticipating workforce needs in the green energy transition. Can be captured at any stage (general, higher, vocational, lifelong learning) of education system. Includes more detailed analysis or description of specific existing or future offers or needs, linked to priority sectors.
	Partial	General identification of education, skills, development or training needs linked to the green energy section. Basis for further analysis established, without substantive additional information or description.
	No	No mention of the role of education, skills, development and training in anticipating workforce needs in the green transition.
NDC documents identify targeted education/training/employment-related support for specific target groups, such as women/youth/migrant workers/people with disabilities.	Yes	Specific measures identified and described – either current or planned – are identified for one (or more) of the specified target groups and are integrated into wider understanding of green transition employment needs.
	Partial	Singular or limited mention of support or measures for target group(s) included without additional detail or analysis.
	No	No mention of targeted human capital support to specific groups.
NDC documents clearly refer to engagement in social dialogue with social stakeholders, such as worker/employer representative	Yes	Description of outreach process and stakeholders engaged included. Includes description of outreach methodology and engagement modalities (i.e. consultations, in-depth engagement, inclusion in NDC committees) included.

Criterion	Rating	Rationale description
organisations or (private) training institutions.	Partial	Singular or limited mention of engagement (i.e. list of stakeholder names) included without additional description of process or modalities.
	No	No mention of social dialogue and engagement processes.
NDC documents include clear references to existing policies/plans/measures/strategies to align education/training with labour market needs due to climate change and/or with broader socio-economic goals (policy coherence).	Yes	Specific current and future strategies identified, with clear integration into climate change strategies. Some description of the education, training and labour market components included.
	Partial	Singular or limited policies/plans/measures/strategies without additional integration into NDC approach (i.e. included in list of strategies without specific additional analysis).
	No	No inclusion of clear reference to existing policies/plans/measures/strategies.
NDC documents include budgets (funded or unfunded) and/or financial commitments to invest in education, skills development, training in (priority) economic sectors/activities as part of the green/energy transition.	Yes	Clear and identifiable budget lines or costed work plans included supporting investment in education, skills development or training in one (or more) sectors. Can include national or project level budgets that are either with or seeking funding.
	Partial	Some inclusion of budget or financial needs without clear and identifiable budget lines or costs.
	No	No mention of budgets or financial commitments to fund investment in human capital development.
NDC documents clearly refer to specific roles of government entities (ministries/agencies) and/or coordination mechanisms focussed on the integration of education/skills/training/employment into the just green/energy transition.	Yes	Clear identification of relevant Ministries with detailed description of a substantive role in the green/just transition plans and integration into clear processes.
	Partial	Singular or limited mention of relevant Ministries involvement in NDC planning, without clear identification of roles, responsibilities or function (i.e. inclusion in Committee list).
	No	No mention of ministries or agencies involvement in coordination mechanisms in integration education/skills/training/employment into the just/green energy transition.
NDC documents include specific actions related to workforce-related provision, such as workforce development, education, re-skilling, training; social protection and social dialogue.	Yes	Clear planning documents (such as workplan, project tables) that detail specific activities linked to sectoral or national workforce related provision on green or just transition education, training or skills. Identification of the actual activities and plans.
	Partial	Singular or limited mention of specific activities on workforce development without significant description or content explanation.
	No	No mention of specific actions on workforce related provision.

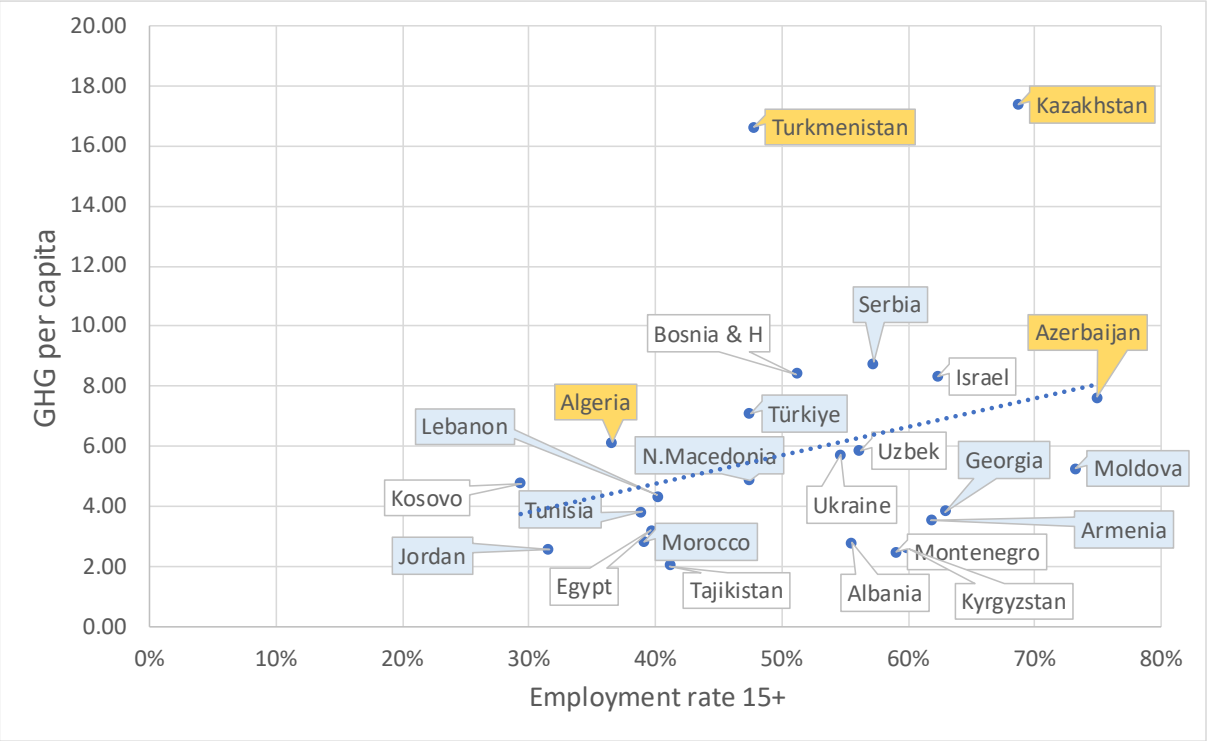
5.8 Carbon emissions versus GDP for all ETF partner countries

The data reveal no clear linear relationship between GDP per capita, employment rates, and GHG emissions per capita across ETF partner countries. While higher GDP per capita is generally associated with greater employment opportunities – since economic growth tends to stimulate demand for goods and services – the link is mediated by structural factors. Growth in labour-intensive sectors (e.g. manufacturing, certain services) typically generates more jobs than expansion in capital-intensive or resource-based industries. Conversely, productivity gains or shifts from informal to formal employment can decouple GDP growth from employment increases.

Similarly, the relationship between energy trade balance and employment is ambiguous. Among net energy exporters, Kazakhstan and Azerbaijan combine relatively high GDP per capita with strong employment rates, whereas Algeria and Turkmenistan exhibit lower employment, likely reflecting less diversified economies and a heavy reliance on extractive sectors. Import-dependent countries do not display a consistent pattern either, suggesting that energy dependency alone does not determine labour market outcomes.

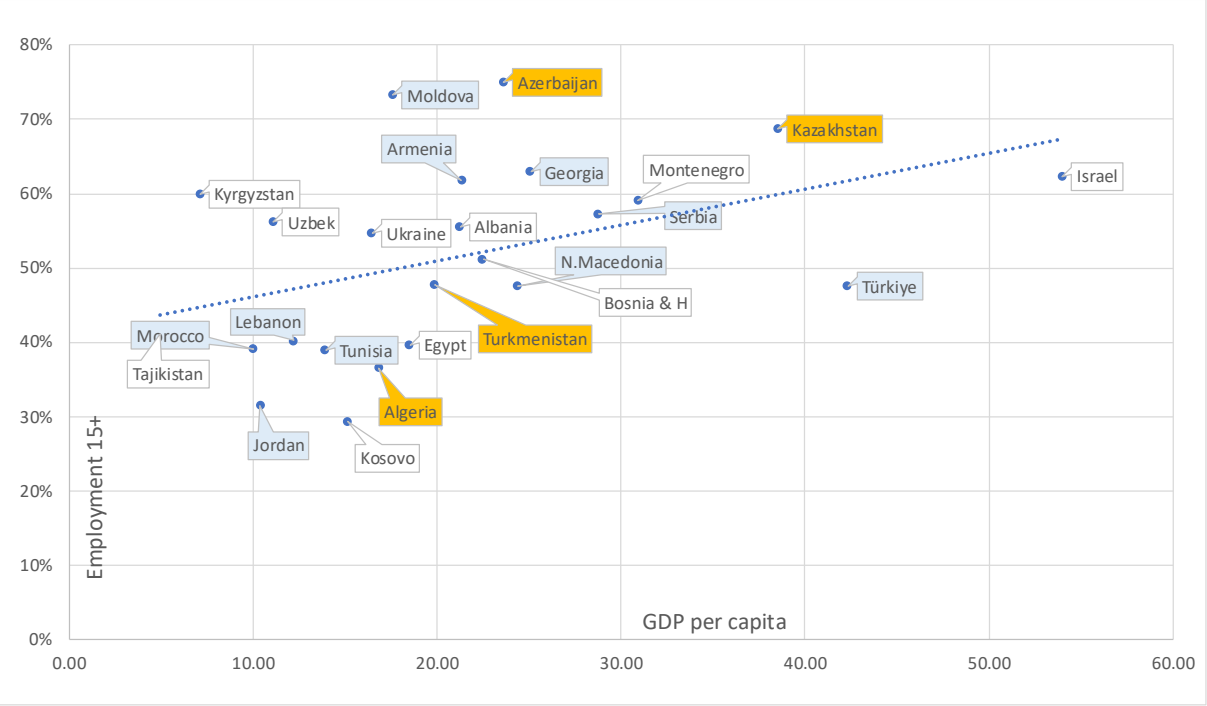
One observable trend is that resource dependence tends to correlate with higher per capita emissions, as seen in Kazakhstan and Turkmenistan, while more diversified economies (e.g., Türkiye, Morocco) show lower emissions intensity. However, this does not translate into predictable employment effects, underscoring the complexity of interactions between economic structure, energy systems and labour markets.

Figure 20: Employment and GHG emissions per capita in ETF partner countries



Source: PPMI research team

Figure 21: Employment rate and GDP per capita in ETF partner countries



Source: PPMI research team

5.9 NDC documents screened by ETF Partner Country

Country	Screened documents[31]	Country	Screened documents
Albania	NDC 2023 BTR 2024	Moldova	BTR 2024 NDC 2025
Algeria	BTR 2024 NDC 2015	Montenegro	BTR 2025 NDC 2025
Armenia	BUR 2023 NDC 2021	Morocco	BTR 2024 NDC 2021
Azerbaijan	BTR 2024 NDC 2023	North Macedonia	NDC 2021 BUR 2020
Bosnia and Herzegovina	BUR 2022 NDC 2021	Palestine	NDC 2021
Egypt	BTR 2024 NDC 2023	Serbia	BTR 2024 BUR 2023 NDC 2021
Georgia	BTR 2024 NDC 2021	Tajikistan	BTR 2024 BUR 2021 NDC 2021
Israel	BTR 2025 NDC 2021	Tunisia	BTR 2024 NDC 2021

[31] All documents available here: https://unfccc.int/documents.

Country	Screened documents[31]	Country	Screened documents
Jordan	BUR 2021 NDC 2021	Türkiye	BTR 2024 NDC 2023
Kazakhstan	BRT 2024 NDC 2023	Turkmenistan	NDC 2021
Kosovo[32]	Voluntary NDC 2025	Ukraine	NDC 2021
Kyrgyzstan	BUR 2022 NDC 2021	Uzbekistan	BTR 2025 NDC 2021
Lebanon	BTR 2024 NDC 2021		

5.10 Overview of barriers and recommended measures for developing skills for jobs in transition[33]

Type	Barriers and gaps	Options and measures
Policy and regulation	Restrictive employment protection legislation, not promoting flexibility in formal occupations, while not protecting informal workers Lack of coherence between green transition, employment and education policies	National strategy seeking coherence between energy and green transition strategies, industrial, education and labour policies Review existing labour market policies and instruments Fiscal incentives for employers to provide training (for skills in the green transition)
Coordination and social dialogue	A multitude of institutional actors are involved, which can lead to conflicting roles and overlap in responsibilities Competition between economic sectors and between public and private sectors to attract qualified staff	Set up (sub)sectoral councils with education and sectoral representatives (ministries/agencies, business) Set up national coordination bodies (e.g. committee, commission, task force) Attain synergy by regular dialogue between social partners (government, employers, unions, education and training) Enhance collaboration among educators, trainers and companies Set up a communication strategy and awareness campaigns on green jobs and pathways with companies and schools
Data and information	Data limitations; paucity of granular, accurate data Classification system mismatches (SIC, ESCO, national systems, NACE), limiting disaggregation and comparability of data	Improve data collection and monitoring with more detailed labour info (with a view to transition aspects) Qualitative and quantitative detailed skills need analysis (at sectoral and regional/local level) Set up an interlinked labour market and education and training information system (education and training offered, market data, forecasts, gaps between current and future skills, available training and certification that helps closing the gap) Review and update occupational metrics (and classification) and provide occupational standards for new jobs

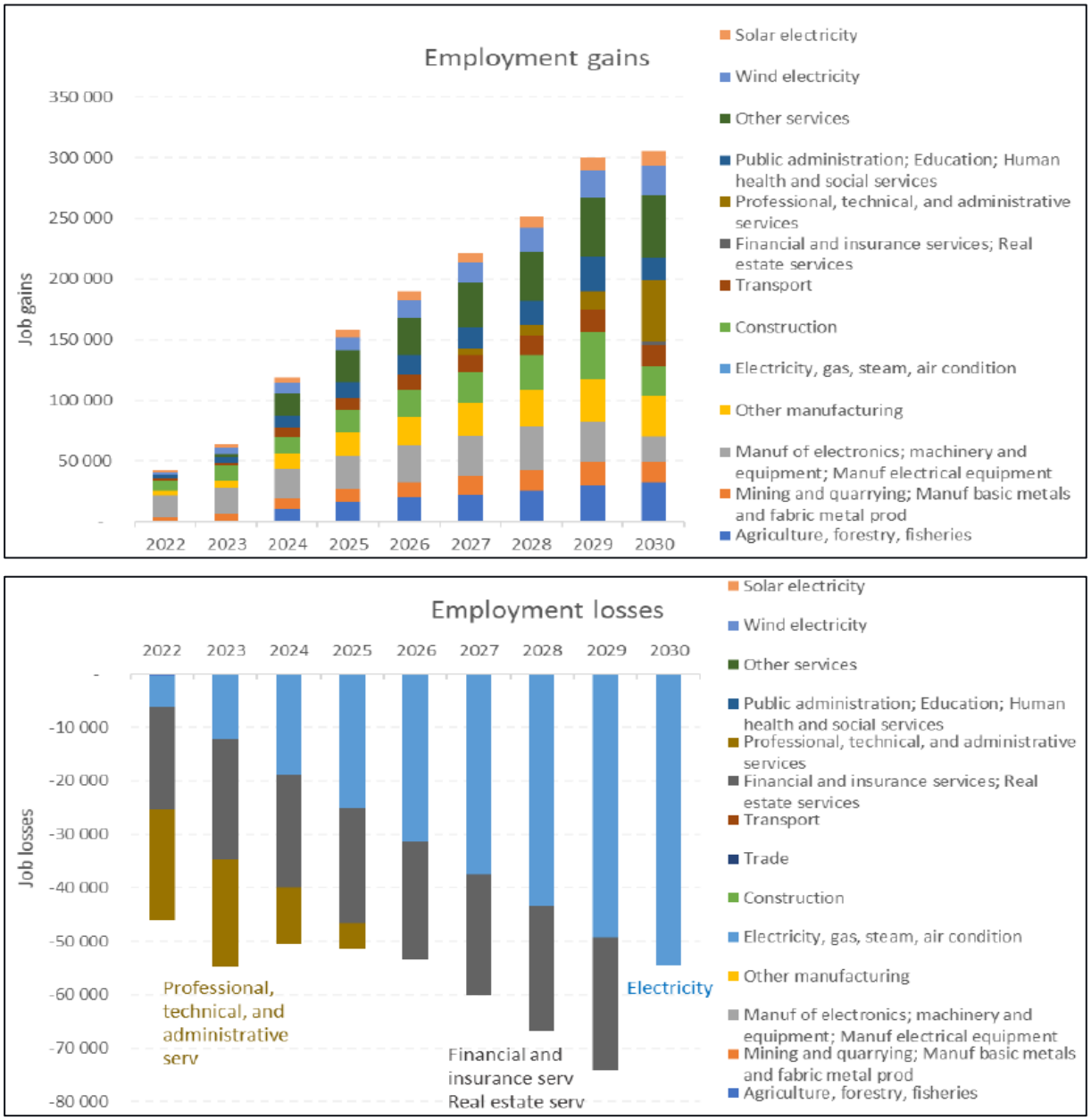
[32] Kosovo Voluntary NDC accessible here: https://mmphi.rks-gov.net/Document/Legislations.
[33] Compiled from World Bank 'Job Creation and Skills Development during the Energy Transition' reports, Morocco (2024), Egypt (2024) and 'Skills for a Greener Future: a Global View' (ILO, 2019), "Greening with Jobs, WESO 2018" (ILO): Skills Development and Inclusivity for Clean Energy Transitions" (IEA, 2022), "Skills for the Green Transition" (ETF, 2023).

Type	Barriers and gaps	Options and measures
Skills mobility and transferability	Uncertainty of transferability of skills within and between (sub)sectors Land lack of minimum standards for new jobs Geographical congruence job gains and losses with workers unable to move or to be (re-)trained (due to high relocation cost, high training fees, lack of time, other reasons)	Organise re-skilling in regions where (sub)sectors with job losses in the transition Organise technical certification for certain (new) job Dialogue between companies and unions to facilitate movement of workers across companies and sectors More flexible teaching and training (e.g. online/in-person; flexible hours)
Higher education, TVET and in-house training	Mismatch between skills training needs and available options' Training not offered locally or regionally where needs exist	Regular revision of education curricula and TVET according to developing needs (inclusion of skills for green transition) Proper accreditation of new training Expanded training of trainers Set up specialised training centres Improve synergies between existing training centres Companies set up structured HR departments and boost internal training, including working with other companies in the same sector to set up private training centres Provision of internships and apprenticeships Improved partnerships universities and TVET
Financing	Relative high cost of specialised training Lack of private and public funding in appropriate education and training	Provide dedicated financing for specific training (e.g. apprentice and skills funds, adult education) and for budget of TVET/education institutes Set up regional centres of excellence Targeted financial support (e.g. for SMEs) to be able to attract qualified people
Inclusivity	Gaps in current jobs/skills (women, youth, other under-represented groups) simply continue Lack of integration of informal jobs	Better recruitment practices, targeting women, unemployed, women and other under-represented groups) Set targets for share of under-represented groups Provide specific training, career guidance for unemployed or under-represented at reduced cost

5.11 Projections of Sectoral job gains and losses in the green transition in Türkiye

A 2022 ILO-UNDP report describes quantitatively the economy-wide employment (and other social) impacts of the green transition by comparing two scenarios. In a reference scenario, the installed capacity in coal-fired power plants increases from 1 126 MW (2020) to 3 413 MW (2030), while in a green scenario, the same amount of energy (about 450 GWh/year in 2030) is generated by 6 562 MW of solar and wind power. In the modelling, the green scenario has net positive impacts, as detailed in the figure below.

Figure 22: Projections of Sectoral job gains and losses in Türkiye



Source: 'Social and Employment Impacts of Climate Change and Green Economy Policies in Türkiye'; ILO, UNDP (2022).

5.12 Summary of indicators and their sources utilised (carbon emissions, climate targets, employment, education and training data analysed)

Indicator		Data source	Country #1
Climate and energy data			
0.01	BUR / BTR (Biennial Update/Transparency Report) referred to	UNFCCC BUR < 2024; BTR ≥ 2025 UNFCCC NDC 2.0; NDC 3.0 (2025)	
0.02	WB classification, income level	World Bank	2024
1.01	Carbon emissions ($MtCO_2$)	Ourworldindata.org Climate Watch	1990, 2010, 2023
1.02	Carbon emissions per main sector (energy, waste, AFOLU[1], IPPU[1])		2021
1.03	Carbon emissions 2030 (BaU, NDC commitment; % reduction)	NDCs; BTRs	See 0.01
1.04	Share RE in power production (2023; NDC commitment)	Ourworldindata.org NDCs/BTRs/national	2023 See 0.01
1.05	Grid emission factor (tCO_2/MWh)	CoM EF (table 4)	2020
1.06	Share of coal in power supply	Ourworldindata.org	2023
1.07	Exports as % of energy production	IEA	2023
1.08	Imports as % of energy supply	IEA	2023
1.09	Largest source(s) % in energy supply (hydro, oil, gas)	IEA	2023
Economy and population; environment			
2.01	GDP, population, GDP/capita; population 15+	Data.worldbank.org	2023; Pop.15+ 2022
2.02	GHG per GDP, GHG/GDP/capita	TBC	2023
2.03	Environmental Protection Index (EPI)	EPI	2023
2.04	Human Development Index (HDI)	UNDP	2022
Employment and education			
3.01	Renewable energy (RE) employment by country	IRENA	2022
3.02	Population (aged 15+)	ETF KIESE (ILOSTAT)	2022
3.03	Employment rate 15+	ETF KIESE (ILOSTAT)	2022
3.04	Employment rate	ETF KIESE (ILOSTAT)	2022
3.05	Unemployment rate	ETF KIESE (ILOSTAT)	2022

Indicator		Data source	Country #1
3.06	Informal employment	WB (ILO data)	2022
3.07	Labour activity rate (15+; M, F)	ETF KIESE (ILOSTAT)	2022
3.08	NEET (Total 15-24; M, F)	ETF KIESE (ILOSTAT)	2022
3.09	% 15-24-year-olds in vocational education	ETF KIESE (ILOSTAT)	2022
3.10	Educational attainment (High, low, medium) in active population	ETF KIESE (ILOSTAT)	2022
3.11	% of public expenditure on education as a share of public expenditure	Ourwoldindata.org	2022
3.12	% of public expenditure on education as a share of GDP	Ourworldindata.org	2022

ACRONYMS

ACE	Action for Climate Empowerment
AFOLU	Agriculture, Forestry and Land-use
ALMPs	Active Labour Market Policies
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CCUS	Carbon Capture, Utilisation and Storage
CNG	Compressed Natural Gas
EE	Energy Efficiency
EPC	Engineering, Procurement and Construction
EPI	Environmental Protection Index
ETF	European Training Foundation
EU	European Union
EV	Electric Vehicle
FOLU	Food and Land Use
GAWB	Green Agenda for the Western Balkans
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GIZ	Deutsche Gesellschaft für Zusammenarbeit
GreenComp	European Sustainability Competence Framework
HDI	Human Development Index

HVAC	Heating, Ventilation and Air Conditioning
ICT	Information and Communication Technology
IEA	International Energy Agency
ILO	International Labour Organization
INECP	Integration National and Energy Climate Plan
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
IRENA	International Renewable Energy Agency
JTM	Just Transition Mechanism
KIESE	ETF employment and education database
MENA	Middle East and North Africa
MW	Megawatt
NACE	Nomenclature of Economic Activities in the European Community
NAP	National Adaptation Planning
NCCAP	National Climate Change Action Plan
NCCC	National Commission on Climate Change
NDC	Nationally Determined Contribution
NEET	Not in Education, Employment or Training
OECD	Organisation for Economic Cooperation and Development
PES	Planned Energy Supply
PPMI	Public Policy and Management Institute
PPP	Purchasing Power Parity

PV	Photovoltaic
RE	Renewable Energy
RES	Renewable Energy Sources
SDG	Sustainable Development Goals
SME	Small and Medium-sized Enterprises
T&D	Transmission and Distribution
TPP	Thermal Power Plant
TRP	Torino Process
TVET	Technical and Vocational Education and Training
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WAM	With Additional Measures
WEM	With Existing Measures
WOM	Without Measures

BIBLIOGRAPHY

Caruso, G.D. and Marcos, I. de and Noy, I. (2023). *Climate Changes Affect Human Capital,* CESifo Working Paper No. 10374. Available at SSRN: https://ssrn.com/abstract=4422849.

COACCH (2018). *The Economic Cost of Climate Change in Europe: Synthesis Report on State of Knowledge and Key Research Gaps*. Policy brief by the COACCH project. Editors: Paul Watkiss, Jenny Troeltzsch, Katriona McGlade. Available at https://www.ecologic.eu/sites/default/files/publication/2018/2811-coacch-review-synthesis-updated-june-2018.pdf.

CLIMATEWATCH (2025), as of 19 July 2025, accessed through https://www.climatewatchdata.org/ndc-tracker.

Council of the European Union (2022). *Council Recommendation on learning for the green transition and sustainable development*. Brussels.

European Commission (undated). *Cooperation on climate action with non-EU countries - Climate Action*. Available at: https://climate.ec.europa.eu/eu-action/international-action-climate-change/eu-engagement-climate-action-non-eu-countries/cooperation-climate-action-non-eu-countries_en.

European Commission (2019). Communication from the Commission to the European Parliament, the European Council, the European Economic and Social Committee, and the Committee of the Regions; *The European Green Deal*, COM/2019/640 final. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2019:640:FIN.

European Commission (2025). *Union for Skills: Policy package*. Brussels.

EPI (2024). *Environmental Protection Index*, Yale University, Columbia University.

ETF (2023). *Greening Skills in the EU Neighbourhood*. Turin, Italy.

ETF (2023a). *Skills for the Green Transition*, European Training Foundation. Turin, Italy.

ETF (2024a). *Education, Skills and Employment – Trends and Development*. Turin, Italy.

ETF (2024b). *Green horizons: Skills for climate action*. Turin, Italy.

EU (2023). *Skills for the energy transition in the changing labour market*, European Union – Joint Research Centre.

GIZ (2022). *Skills for a Just Transition to a Green Future*, GIZ GmbH – Fakt Consult.

Hanna, R., Heptonstall, P. and Gross, R. (2024). 'Job creation in a low carbon transition to renewables and energy efficiency: a review of international evidence', *Sustainability Science*, 19, pp. 123–145, available at doi:10.1007/s11625-023-01440-y.

IEA (2022). *Skills Development and Inclusivity for Clean Energy Transitions*, International Energy Agency.

IEA (2025). *World Energy Employment 2024*.

ILO (2015). *Guidelines for a just transition towards environmentally sustainable economies and societies for all*, International Labour Organisation.

ILO (2018a). *Greening with Jobs, World Employment Social Outlook* (WESO) 2018.

ILO (2019a). *Skills for a greener future: A global view based on 32 country studies*.

ILO (2024). *Mapping Just Energy Transition in NDCs: An Overview*.

ILO (2025). *Integrating skills for just transition in Nationally Determined Contributions (NDCs) 3.0, Guidance Note*.

IPCC (2022). *Annex I: Glossary* [van Diemen, R., J.B.R. Matthews, V. Möller, J.S. Fuglestvedt, V. Masson-Delmotte, C. Méndez, A. Reisinger, S. Semenov (eds). In IPCC, 2022: *Climate Change 2022: Mitigation of Climate Change*.

IRENA (2023a). *Finding common ground for a just energy transition: Labour and employer perspectives*, International Renewable Energy Agency.

IRENA (2023b). *World Energy Transitions Outlook 2023*, 1.5oC Pathway.

IRENA (2024). *Renewable Energy and Jobs, Annual Review 2024*.

IRENA-IEA (2017). *Executive Summary, Perspectives for the Energy Transition*.

Johansson de Silva, S.; Moessinger, M.; Santos, I.V. *Impact of Climate Change and the Green Transition on Human Capital: A Review of the Evidence from Europe and Central Asia*. Social Protection and Jobs Discussion Paper, World Bank Group.

Kirsten E.H. Jenkins, Benjamin K. Sovacool, Andrzej Błachowicz, Adrián Lauer (2020). *Politicizing the Just Transition: Linking global climate policy, Nationally Determined Contributions and targeted research agendas*, in: Geoforum, Volume 115, October 2020, pp.138-142.

ETF (2022). *Skills Mismatch in ETF Partner Countries: Cross-country report*, ETF.

Marelli, L. et al (2025). *Delivering the EU Green Deal – progress towards targets*, Black, C. and Sternino, S. editor(s), Joint Research Centre, Publications Office of the European Union.

McKinsey (2021). *The economic transformation: What would change in the net-zero transition*, McKinsey and Company.

OECD (2020). *Employment Outlook 2020*. Paris: OECD Publishing.

OECD (2023). *Getting Skills Right, Assessing and Anticipating Skills for the Green Transition*,

Sharpe, S. A., and Martinez-Fernandez, C. M. (2021). *The Implications of Green Employment: Making a Just Transition in ASEAN. Sustainability*, 13(13), 7389. Available at https://doi.org/10.3390/su13137389.

Tyros, S., D. Andrews, D. and A. de Serres, A. (2023). *Doing green things: skills, reallocation, and the green transition*, OECD Economics Department Working Papers, No 1763, OECD Publishing, Paris. Pp.32-33., https://doi.org/10.1787/286a5007-en.

UN-DESA, UNEP and UNCTAD (2011). *The Transition to a Green Economy: Benefits, Challenges and Risks from a Sustainable Development Perspective*. Report by a Panel of Experts* to Second Preparatory Meeting for United Nations Conference on Sustainable Development.

UNDP studies (e.g. on green jobs in Bosnia and Herzegovina), Bianchi, G., Pisiotis, U. & Cabrera Giraldez, M. (2022). *GreenComp: The European sustainability competence framework*. Publications Office of the European Union.

UNEP (2008). *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*, United Nations Environment Programme.

UNDP (2022). *How Just Transition Can Help Deliver the Paris Agreement*, United Nations Development Programme.

UKERC (2024). *Net Zero Skills: Jobs, skills and training for the Net-Zero energy transition*, UK Energy Research Centre – Imperial Futures Lab, Imperial College London.

UNFCCC (2015). *Paris Agreement*. United Nations Framework Convention on Climate Change.

UNFCCC (2021). *NDC Synthesis Report*. UNFCCC Secretariat.

UNFCCC (2022). *Glasgow Climate Pact and Sharm el-Sheikh Implementation Plan*. UNFCCC Secretariat.

UNFCCC (2024). *Nationally Determined Contributions under the Paris Agreement*, Synthesis report by the Secretariat, United Nations Framework Convention on Climate Change.

EU (2022). *Economic Impacts of the Green Transition, Briefing towards Climate Neutrality*, European Parliament, European Union.

Vandeplas, A, et.al. (2022). *The possible implications of the green transition for the EU labour market, European Economy Discussion Paper 176*, Publications Office of the European Union. Available at https://data.europa.eu/doi/10.2765/583043.

Van den Akker, J. (2022). *Just Energy Transitions in Africa.* Available at www.ascendis.nl.

WB (2022a). *Climate and Development: An Agenda for Action,* The World Bank Group.

WB (2023). *Jobs for a Liveable Planet, Job Creation Potential of the Clean Energy Transition.*

Country-level studies and reports

Agora (2024). *Enabling a just coal transition in Kazakhstan*. Agora Energiewende - Qazaq Green.

Cobenefits (2019). *Future skills and job creation through renewable energy in Turkey;* IASS – RENAC – UfU – IET – Sabanci University.

CoM (2024). *CoM GHG Emission factors for national electricity*, Convenant of Mayors (Excel spreadsheet).

CRP (2016). *Green Jobs, Analysing the Employment Impact of Energy Efficiency Measures in Bosnia and Herzegovina,* Centar za Razvoj i Podršku (CRP) – UNDP.

ETF (2020). *The Future of Skills, A case study of the agri-tech sector in Israel.* Turin, Italy.

ETF (2021a). *The Future of Skills, A case study of the agri-food sector in Morocco.* Turin, Italy.

ETF (2021b). *The Future of Skills, A case study of the automotive sector in Turkey.* Turin, Italy.

ETF (2022). *Future Skill Needs in the Albanian Energy Sector.* Turin, Italy.

ETF (2023b). *The Future Skill Needs in the Egyptian Energy Sector.* Turin, Italy.

FAO (2020). *Skills Development for Inclusive* Growth *in the Lebanese Agriculture Sector - Policy Brief*, Food and Agriculture Organisation. Available at https://openknowledge.fao.org/items/494d5382-9980-4bfb-b81f-afb67bf6c857.

GIZ (2023). *Green Jobs Assessment Report in selected Economic Sectors in Jordan, Technical Report,* Gesellschafft für Internationalee Zusammenarbeit (GIZ) – International Labour Organisation.

Gözkün, K.A. and Orhangazi, O. *Green transition for Turkey: Growth, employment, and current account effects,* Sabanci University, Kadir Has University.

Gutium, Tatiana & Țăranu, Lilia. (2021). *Climate change vulnerability index case study for the Republic of Moldova*. Available at https://www.researchgate.net/publication/373138051_Climate_changevulnerability_index_case_study_for_the_Republic_of_Moldova.

IRENA (2021). *Renewables Readiness Assessment: The Hashemite Kingdom of Jordan*; International Renewable Energy Agency.

KSF (2024). *Just Transition Model for Coal Mine Workers in Lazarevac and Tuzla,* Kalevi Sorsa Foundation.

KCC (2024). *GreenNet – Fast forwarding the green transition in a just and socially responsible way – cases of industry, energy and transport sectors,* North Macedonia; KCC – European Union.

Karimov, I. *Impact of Alternative Energy Investments on Employment in Azerbaijan,* in: AGORA International Journal of Juridical Sciences, Vol. 18, No. 1 (2024), pp. 191-203.

ILO (2018b). *Skills for green jobs in Tajikistan,* International Labour Organisation.

ILO (2018c). *Skills for green jobs in Kyrgyzstan.*

ILO (2018d). *Green Jobs in Tunisia, Measuring Methods and Model Results.*

ILO (2019b). *Skills for green jobs in Egypt.*

ILO (2023). *Skills for Green and Digital Transitions and Employment in Jordan.*

IRENA (2021). *Renewables Readiness Assessment: The Hashemite Kingdom of Jordan*; International Renewable Energy Agency.

PAGE (2020). *Kazakhstan's Transition to Green Economy,* Partnership for Action on Green Economy.

Radovanovic, N. and Stevanovic Carapina, H. (2024). *Green transition and Smart Specialisation in the Western Balkans*, Publications Office of the European Union, doi:10.2760/370696, JRC136482.

UNDP (2020). *Initiating the Just Transition in Serbia, Leaving no one behind in the coal intensive regions and communities in Serbia,* United Nations Development.

UNDP (2023). *Diagnostics of socio-economic situation of coal region Pljevlja*, https://www.undp.org/montenegro/publications/diagnostics-socio-economic-situation-coal-region-pljevlja.

UNDP-ILO (2022). *Social and Employment Impacts of Climate Change and Green Economy Policies in Türkiye, Application of the Green Jobs Assessment Model for Türkiye.*

WB (2023). *Jobs Diagnostic, Bosnia and Herzegovina, Implications of Coal Transition,* World Bank / ESMAP.

World Bank (2022b). *The Employment Benefits of an Energy Transition in Egypt.*

World Bank (2022c). *The Employment Benefits of an Energy Transition in Morocco*.

World Bank (2024a). *Jobs Creaüion and Skills Development during the Energy Transition – Egypt.*

World Bank (2024b). *Jobs Creation and Skills Development during the Energy Transition – Morocco.*

World Bank (2024c). *Jobs Creation and Skills Development during the Energy Transition – Tunisia*.

World Bank (2024d). *The disruptive energy transition and opportunities for job creation in the Middle East and North Africa: Case study – Egypt*. Washington, DC: World Bank. Available at https://documents1.worldbank.org/curated/en/099012324070535949/pdf/P17054613550c90311bcca14bbb87596a7a.pdf (Accessed: 13 October 2025).

World Bank (2024e). *The disruptive energy transition and opportunities for job creation in the Middle East and North Africa: Case study – Morocco*. Washington, DC: World Bank. Available at https://documents1.worldbank.org/curated/en/099012324071522189/pdf/P1705461161e5d8813e9114dbf1b92a137252142a242.pdf (Accessed: 13 October 2025).

Vakulchuk, R. & Overland, I. (2024). *Green skills: we need educational reform in renewable energy*. World Economic Forum. Available at https://www.weforum.org/stories/2024/04/green-skills-gap-educational-reform-renewable-energy.

World Bank, *Country Climate and Development Report*

- Albania (2024);
- Armenia (2024);
- Azerbaijan (2023);
- Bosnia and Herzegovina, Western Balkans (2024);
- Egypt (2022);
- Jordan (2022);

- Kosovo, Western Balkans (2024);
- Lebanon (2024);
- Moldova (2024);
- Montenegro, Western Balkans (2024);
- Morocco (2022);
- North Macedonia, Western Balkans (2024);
- Serbia, Western Balkans (2024);
- Tajikistan (2024);
- Tunisia (2023);
- Türkiye (2022);
- Uzbekistan (2023);
- West Bank and Gaza (2023).

European Training Foundation

www.etf.europa.eu

https://bsky.app/profile/etf.europa.eu

www.youtube.com/user/etfeuropa

www.facebook.com/etfeuropa

www.instagram.com/etfeuropa

openspace.etf.europa.eu

https://www.linkedin.com/company/etfeuropa/