



Making the European Green Deal Work for People

The Role of Human
Development in the
Green Transition

Overview

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Green Transition**

Overview

This booklet contains the overview, as well as a list of contents and other front matter, from the “Making the European Green Deal Work for People: The Role of Human Development in the Green Transition.”

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Preface

The damage to the environment caused by human activity in the last decades is an issue that involves people and entities across borders, and addressing this challenge requires the commitment and buy-in of all stakeholders. The European Green Deal (EGD) represents a massive effort by the international community to adopt more environmentally sustainable practices at a scale that can make a difference for current and future generations.

A human-centered approach is fundamental to achieving a just transition to the more sustainable environment envisioned under the EGD. This report discusses how human development policies will play a key role in achieving this goal. First, human development policies are indispensable to enable the green transition. For example, training the workforce for greener jobs require higher skills compatible with technology to make the transition feasible. Second, human development policies are also needed to help society adapt to a green economy. Third, the level and size of the actions proposed in the EGD could imply unintended consequences with adverse effects, particularly for low-skilled workers and lagging regions. Appropriate changes to social protection programs, education and training systems, and health services can reduce the hardships involved and help people and regions adjust successfully.

This report offers an analysis of the challenges for the European Union (EU) posed by the EGD and highlights the essential role that human development will play in making the transition attainable and sustainable. The research in this report provides an in-depth analysis of the implications for the region and the potential of human development sectors to drive changes in our society towards more environmentally conscious actions. In addition, the report analyzes important topics, such as equipping people with green skills, monitoring and strengthening labor market conditions, and improving the health sector, that can help Europeans take advantage of the opportunities offered by the transition and incites further research.

The report team and multiple expert reviewers of this report have collaborated to make this document a catalyzer for further research and through policy dialogue, the development of purposeful strategies and policies by governments and other stakeholders. Based on the Human Transitions General Equilibrium Model, as well as the use of econometrics, available literature, and focused country notes, the report provides analyses with important implications for a topic critical for European, and global, welfare. We hope that the report will contribute to shaping the policy agenda in the diverse contexts of the EU.

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This report was prepared by a Human Development team led by Javier Sanchez-Reaza and coordinated by Diego Ambasz, Predrag Djukic and Karla McEvoy under the supervision of Harry Patrinos, Cem Mete, Tanya Dmytraczenko and Rafael de Hoyos, and the guidance from Fadia Saadah and Gallina Andronova Vincelette. The core team that produced inputs for this report includes: Noam Angrist (Oxford University and Youth Impact), María del Carmen Barrón Esper (Georgetown University), Federico Bartalucci (London School of Economics), Stephen Geoffrey Dorey, Moulay Driss Zine Eddine El Idrissi, Tomasz Janusz Gajderowicz (University of Warsaw), Maddalena Honorati, Zohar Ianovici, Maciej Jakubowski (University of Warsaw), Anshuman Kamal Gupta, Kevin Alan David Macdonald, Gustavo Nicolás Paez Salamanca, Lucian Bucur Pop, Domagoj Račić, Andres Rodriguez-Pose (London School of Economics), Nadima Sahar, William Shaw, María Alejandra Torres Cuello (Pontificia Universidad Javeriana), and Sara Umaña (Universidad Nacional de Colombia).

The report benefited from the findings stemming from four case studies. In the Croatia Green Buildings case study, Adrien Arnoux Dozol led a team including Diego Ambasz, Ana-Maria Boromisa, Lucia Brajkovic, Stephen Geoffrey Dorey, Jure Kotnik, Danijel Marasovic, Danica Ramljak, Tigran Shmis, and Maria Ustinova. The Research and Innovation case study for Poland led by Anna Koziel with a team that included Diego Ambasz, Jeremie Amoroso, Aleksandra Marta Kononiuk, Anna Gizela Krol-Jankowska, Marek Kwiek, Domagoj Račić, and Pluvia Zuñiga. The Slovak Republic skills case study was prepared

by a team led by Husein Abdul-Hamid and included Diego Ambasz, Maciej Jakubowski, and Domagoj Račić. Finally, Poland’s just transition case study was led by Lucian Bucur Pop with a team comprised by Tomasz Janusz Gajderowicz, Maddalena Honorati, Maciej Jakubowski, and Sylwia Michalina Wrona.

In the process of creating a new outlook on the green transition, the report implied formulating innovative frameworks for analysis, rethinking the role of human development policy and the unintended consequences of climate action policy. In that learning journey, exchange of knowledge and ideas with World Bank staff through authors’ workshops, bilateral meetings across HD and with colleagues from SD and EFL, as well as with other leading institutions, was crucial. To ensure that this exchange was documented and produced a tangible effect on the regional report and the four case studies, the team created and carried out the Human Development Transitions Seminar Series where the ideas at the forefront of the debate were presented and discussed with the participation from Circle Economy, Chatham House, the Doughnut Economics Lab, the Milken Institute, the European Commission, the OECD, among other institutions and scholars.

Key to the knowledge exchange efforts was the creation of an Advisory Group comprised of World Bank staff and partner institutions. The team is grateful for knowledge exchange, guidance and suggestions to the Advisory Group members that include: Jack Barrie (Chatham House), Enrico Botta (OECD), Esther Goodwin Brown (Circle Economy), Stephen Hammer (Adviser, SCCDR, WBG), Andrew Fanning (Doughnut Economics Action Lab), Thomas Farole (Lead Economist, SCADR, WBG), Matthew Fraser (Circle Economy), Tillman Heidelk (European Commission), Rafael de Hoyos (Program Leader, HECDR, WBG), Kumi Kitamori (OECD), Kevin Klowden (Milken Institute), Elisa Lanzi (OECD), Jean-Francois Lengelle (OECD), Timea Moreau-Tepliczky (European Commission), Jamele Rigolini (Program Leader, HECDR, WBG), Patrick Schroder (Chatham House), Frank Siebern-Thomas (European Commission).

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OVERVIEW: A Human-Centered Green Transition

Climate change is the single most important existential threat of our times. Mounting average global temperature contributes to rising sea levels, more frequent extreme weather events, deteriorating biodiversity, and shifts in the sustainability of agriculture and aquaculture (Thompson 2020). By the end of the decade, up to 132 million people could become poor (Jafino et al. 2020), and 80 million full-time jobs could be lost due to climate change (ILO 2019a). A further increase in global temperatures beyond 1.5 degrees Celsius would have calamitous implications for human welfare (IPCC 2021b).

The European Green Deal (EGD) is the response of the European Union (EU) to the climate challenge. It will establish regulations and incentives to nudge European society toward a more sustainable economy. It puts together policies, investments, subsidies, and regulations to achieve three core objectives: (i) net-zero emissions of greenhouse gas (GHG) emissions by 2050, (ii) decoupling the economy from natural resource consumption, and (iii) leaving no person or place behind during the transition (Box O.1).

To achieve these ambitious goals the EGD combines a wide range of regulations, policies, and interventions. The policy levers of the EGD can be classified into five broad categories: (i) improve the size and effectiveness of the EU emissions trading system, (ii) promote energy efficiency of households and firms (including the renovation of buildings), (iii) increase the use of renewable energy, (iv) expand the circular economy, and (v) regulate land use and increase organic agricultural production.

But a green transition is only possible with an enabling human transition—and only with the

proper human development (social) policies to support this transition. In other words, to achieve the objectives of the EGD, EU member states (MS) must implement the right education, health, and social protection policies to make sure that the transition out of carbon leaves no one behind, particularly disadvantaged households. The EGD must be mindful of the short-term costs of the transition, addressing potential discontent in regions or groups of the society that will be negatively affected. Providing labor market opportunities and access to social safety nets to individuals and families bearing the costs of the transition is a necessary condition for a successful implementation of the EGD. Otherwise the EGD could exacerbate the already high levels of income inequality and political polarization, jeopardizing the continuity and sustainability of the green transition. In the long term, the EGD must support behavioral changes in consumers' preferences that favor sustainable and green production processes and help avoid slipping back into old, environmentally unsustainable consumption patterns. Therefore, human development policies—including education, health, and social protection—should be at the core of the EGD.

This report identifies the human development (HD) policies needed to enable the green transition in Europe. From an economic point of view, the EGD policies will impact the economy's relative prices to favor "green" over "brown" production and consumption. For instance, capping the amount of carbon emission increases the price of carbon-intensive goods, shifting consumption to environmentally sustainable consumer goods. In turn, this demand shift increases the price of "green"

Box O.1: The EGD's Three Objectives and Five Policy Levers

The European Green Deal (EGD) aims at addressing climate change by transforming the European Union (EU) into a modern, resource-efficient, and competitive economy with:

1. Net-zero greenhouse gas (GHG) emissions by 2050
2. Economic growth decoupled from natural resource consumption
3. No person or place left behind.

The EGD is organized around five broad policy levers:

1. Emission trading system
2. Circular economy
3. Energy efficiency in households and firms
4. Investing and subsidizing renewables
5. Regulate land use and increase organic agricultural production.

Source: EC 2022a.

goods, creating incentives to boost production. Increasing “green” production must be followed by reallocating workers to those industries and out of “brown” ones. The general equilibrium effect of the EGD creates winners and losers—as is the case with any other transition. Two transmission mechanisms link EGD policies with household well-being, both operating through price channels. The first is a direct price effect, whereby the price of energy rises, reducing household well-being, particularly vulnerable ones that devote a significant share of income to cover energy bills. The second is a labor market channel with workers in carbon-intensive “brown” industries losing jobs and/or wages and workers in green industries benefiting.

This report identifies the HD policies that would enable the transition, mitigate the unintended consequences or costs of the transition, while adapting workers and households to a new reality where environmental sustainability is prioritized. Since the transition from a carbon-based (brown)

economy to a green economy impacts people, HD policies are necessary for the transition to materialize (Table O.1).

In the short run, social protection policies will be critical to *mitigate* the costs of the transition. Workers in shrinking carbon-intensive industries must get training opportunities. Training and re-skilling programs must be closely linked to the needs of the growing green industries and work in collaboration with Public Employment Services (PES) to provide labor market opportunities to displaced workers. But even assuming a very effective reskilling program and an efficient PES, some workers would need social assistance (income support) to *mitigate* the transition costs, and in some cases, *adapt* to the new equilibrium through early retirement (pensions).

When a coal miner loses the only job he or she has ever had, more than a cash transfer and a training program is needed. Previous transitions show that mental health support is needed to mitigate the

A green transition is only possible
with an enabling human transition

Table O.1: Policies for a Human-Centered Green Transition

	Enable	Adapt	Mitigate
Education	Foundational skills		
	Fungible skills		
	R&D+Innovation		
	TVET (e.g. upskilling)		
	Behavioral change & Lifelong learning		
Health		Mental health support	
		Physical health protection systems	
SPJ		Public Employment Services (e.g. reskilling)	
	Active Labor Market Policies (ALMPs)		
		PES orientation to new occupations	
		Early retirement & bridge pensions	
			Social registries & assistance (e.g. cash transfers)

Source: Authors.

cost of switching career paths (Hollingsworth, Ruhm, and Simon 2017). In addition, preventive health policies and services will be needed during the adaptation phase for workers in the growing waste management industries and the circular economy.

Education systems must act now to produce long-term improvements in foundational skills (numeracy, literacy, and socio-emotional skills), develop the technologies to cut emissions, and change consumer preferences. People with strong foundational skills will be more capable of learning new skills and reinventing themselves into the new occupations created by the green transition. Education systems can also contribute to designing and implementing a research and innovation agenda to produce the technologies required to curb emissions and decouple economic growth from resource consumption. Finally, reformed education curricula can increase awareness of man-made climate change, generate and maintain a sense of urgency in addressing environmental damages, and create interest in common well-being. All these changes can encourage behaviors that contribute to reducing GHG emissions and the use of natural resources.

The European Green Deal

The EGD calls for policies that provide incentives for change, but that also restrict the actions of workers and firms. Reducing GHG emissions and decoupling the economy from natural resource consumption requires an effective emission trading

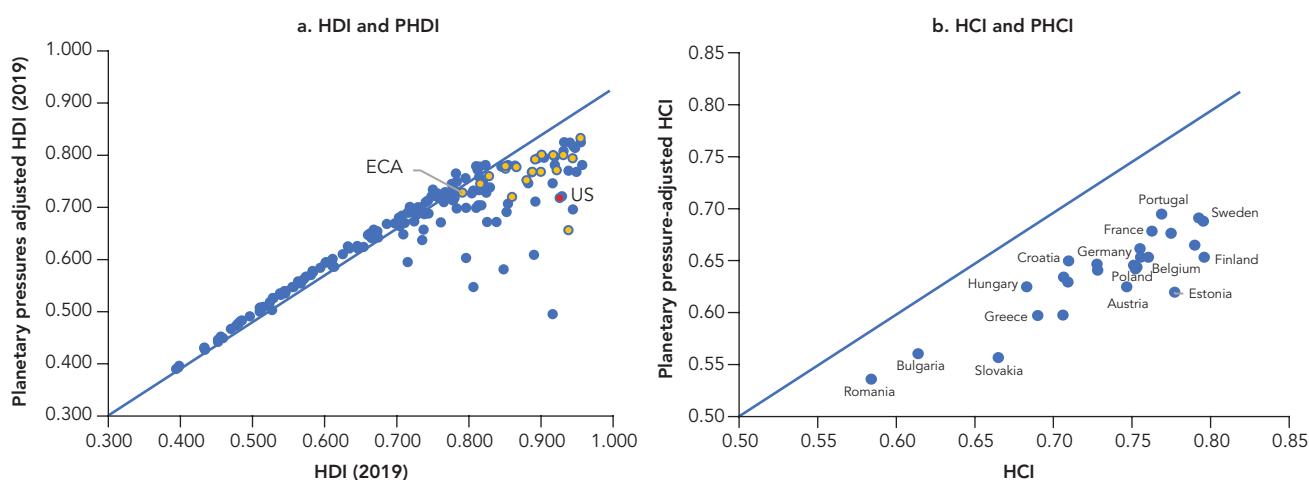
system, enabling a circular economy; improvements in the energy efficiency of housing and consumer products; much greater use of renewable energy; and reduced emissions from road transport, agriculture, and land use. There will be transition costs as firms adapt their mix of factors of production and workers acquire the necessary skills for the green economy to reach a new equilibrium.

Net-zero emissions and decoupling economies from natural resource consumption

Global growth over the past century relied heavily on natural resource consumption. Every 1 percent increase in global GDP was associated with a 0.8 percent increase in the consumption of natural resources. The extraction and processing of resources accounted for about half of global GHG emissions and more than 90 percent of biodiversity loss.

Countries with high or very high human development have also exerted significant pressure on planetary boundaries. Adjusting the UNDP's Human Development Index (HDI) to account for the use of natural resources and GHG emissions, considerably reduces the ranking of countries at the top in the HDI (Figure O.1, panel a). Similarly, adjusting the World Bank's Human Capital Index (HCI) for each country's contribution to global environmental pressure, consistently shows diminished rankings (Figure O.1, panel b). This relationship underlines the importance of new economic models that shift

Figure O.1: Human Development and Human Capital Indices Adjusted by Environmental Pressure



Source: Author's elaboration based on UNDP (2020) (panel a), authors' calculations using the World Bank (2020) (panel b).

Note: 1. PHDI stands for Planetary-adjusted Human Development Index; PHCI stands for Planetary-adjusted Human Capital Index.

2. Planetary-adjusted indices take into account a country's level of carbon dioxide emissions and material footprint.

3. Relative to standard HDI/HCI (x-axes in both panels), countries above the 45-degree line show a higher level of HDI/HCI if environmental pressure is taken into account (y-axes). The reverse is also true: countries under the 45-degree line have lower HDI/HCI when those environmental pressures are included.

4. Yellow dots represent EU member states.

New economic models need to shift the focus from economic growth alone to include its impact on human welfare

the focus from economic growth alone to accounting for growth's impact on human welfare, as well as the need to mitigate and adapt to climate change.

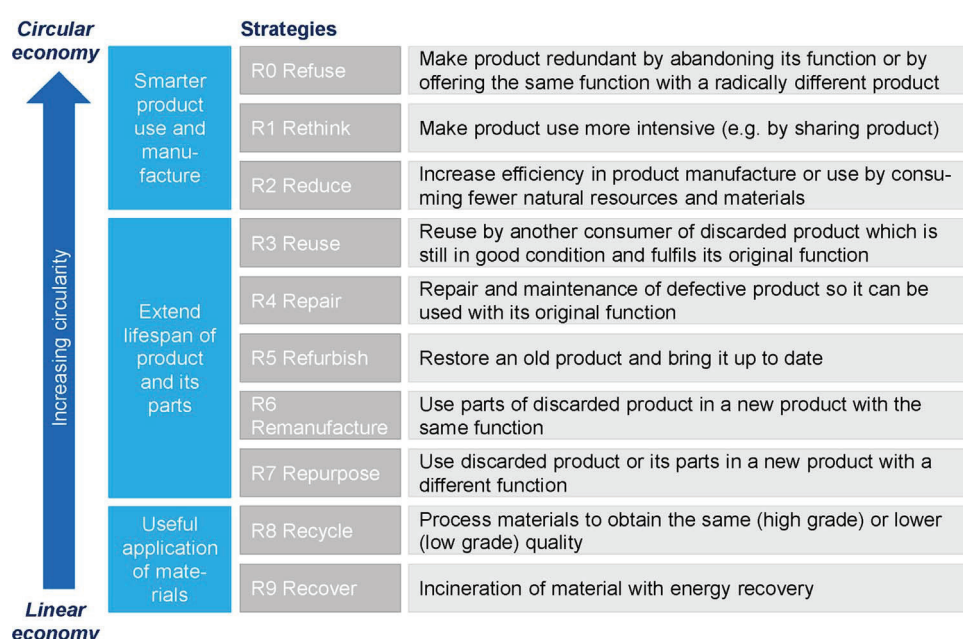
In the last 20 years, Europe has made significant progress in decoupling growth from consumption, but more is needed. Between 2000 and 2020, the EU economy grew 22.5 percent, while domestic material consumption dropped from 6.5 gigatons to a little over 6 gigatons, slightly more than 6 percent of total global domestic material consumption. During this period, renewable energy consumption more than doubled as a share of total energy consumption, rising from 9 percent in 2000 to 22 percent in 2020. The 30 percent decline in fossil fuel consumption accounted for more than 90 percent of total domestic material consumption reduction. In contrast, the consumption of metal ores rose by 4 percent, and the consumption of biomass and nonmetallic ores decreased only slightly.

One of the most critical policy actions within the EGD to achieve net-zero emissions by 2050 and

decouple economic growth from the consumption of natural resources is the transition to a circular economy. The circular economy is the systematic recovery and reuse of products and natural resources that minimize the extraction, consumption, and disposal of natural resources and maximizes resource efficiency (World Bank 2022a). The ecological benefits of embracing a circular economy model include reduced dependence on primary raw materials and a considerable reduction in GHG emissions and externality costs related to manufacturing, transportation, and built environment systems, with annual savings of €600 million in primary raw materials costs (EEA et al. 2016). The reduced dependence on primary raw material extraction will also reduce EU countries' dependence on imports and exposure to supply chain disruptions (EC 2018).

Though the circular economy model has various applications, the nine Rs framework is a widely accepted benchmark for strategies to enable the transition to the circular economy. The circular

Figure O.2: Nine Rs for the Circular Economy



Source: Kirchherr 2017.

Europe has a comprehensive plan to transition to a circular economy based on maximizing resource efficiency

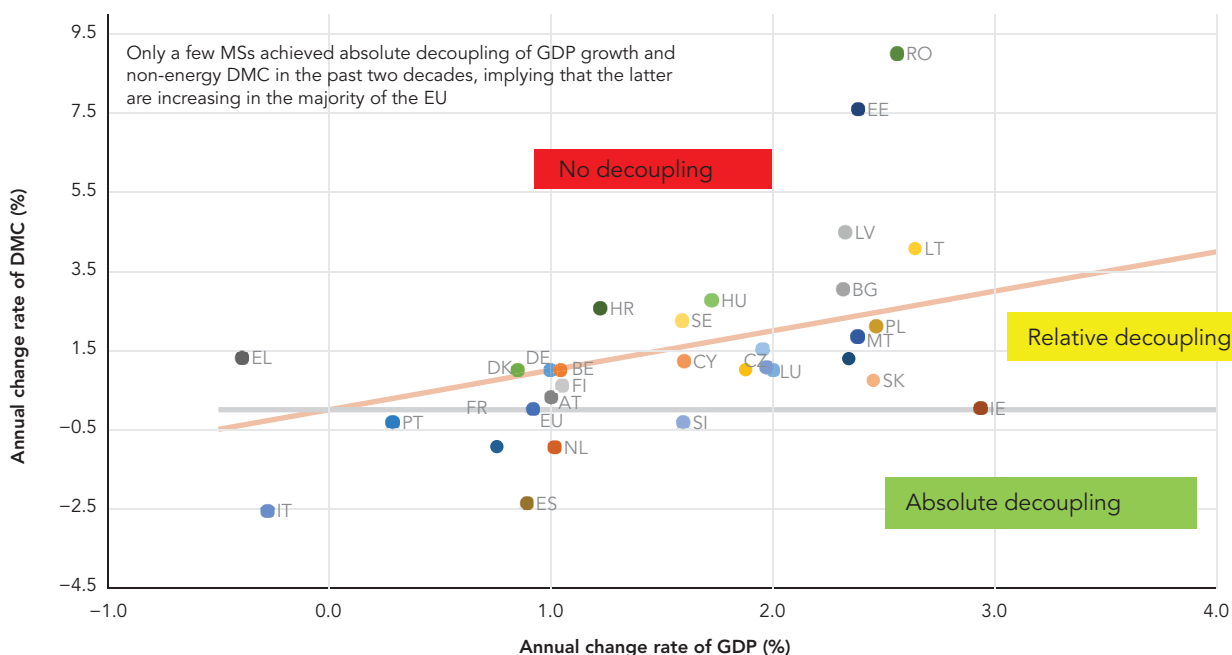
economy model has a biological cycle, in which natural resources are returned to nature, and a technical cycle, in which products, components, or natural resources are designed and marketed to reduce waste significantly (Figure O.2).

But the transition to a circular economy has been slow and uneven. Since 2000, only a few EU countries have achieved an absolute decoupling of economic growth from non-fossil fuel consumption (negative growth or absolute decline in non-energy domestic material consumption). The annual rate of change of non-fossil fuel domestic material consumption surpassed the average annual economic growth rate in 10 of the 27 EU countries. Absolute decoupling occurred in only six countries (France, Italy, the Netherlands, Portugal, Spain, and Sweden). The other countries have achieved relative decoupling—an annual economic growth rate higher than

domestic material consumption growth (see Figure O.3). Relative decoupling is observed in Austria, Cyprus, the Czech Republic, Finland, Luxembourg, Malta, Poland, and the Slovak Republic. But no decoupling is observed in Bulgaria, Croatia, Estonia, Greece, Hungary, Latvia, Lithuania, Romania, and Sweden.

The circular economy is promising, but its implementation still needs to be improved. Circular economy sectors and activities account for less than 1 percent of EU GDP and less than 2 percent of employment, with moderate variations across EU MS. Although the EU outperforms all other regions in e-waste management, only three MS met the electric/electronic waste collection target for 2019: 65 percent. Three countries have yet to meet the 2016 target: 45 percent. Part of the reason for the slow transition is that firms still find it cheaper to use raw materials than to reuse waste materials (World Bank

Figure O.3: Annual Change Rate of GDP and DMC in EU Member States, 2000–2020 (%)



Source: Authors' elaboration using Eurostat data.

2022a). The implementation of the circular economy—waste management, production and consumption, and trade and use of secondary materials—is still emerging in Europe.

Financing the EGD

To make the green transition viable and equitable, it must be congruent with economic and social needs in regions and sectors that rely heavily on carbon- and fossil fuel-related industries.¹ To that end, the European Commission (EC) established a Just Transition Mechanism mobilizing up to €150 billion from the Just Transition Fund, InvestEU, and the European Investment Bank (EIB) to support regions and individuals most adversely affected by the green transition through worker reskilling, enterprise development, and circular economy projects (Más Rodríguez 2021).

Making the green and human transitions efficient in Europe requires adequate financing. The EC plans to direct at least €1 trillion (about 7.2 percent of the EU's 2020 GDP) over the next 10 years to support the EGD (EC 2020). Nearly half of the funding will come from the EU budget. National co-financing will contribute around 10 percent, while development banks will contribute around 27 percent. The Just Transition Mechanism will contribute around 14 percent of funding; some of those funds are a combination of Invest EU with national co-financing.

Even with record amounts of public funds allocated to the green transition, there is an estimated gap of at least €2.5 trillion for the 2021–2027 period, which the private sector will need to fill by funding environmental, social, and governance efforts (Brühl 2021). Mechanisms that redirect public funding, taxation, and consumption to green economy projects can leverage private sector capital for the green transition.

1. See chapter 5.

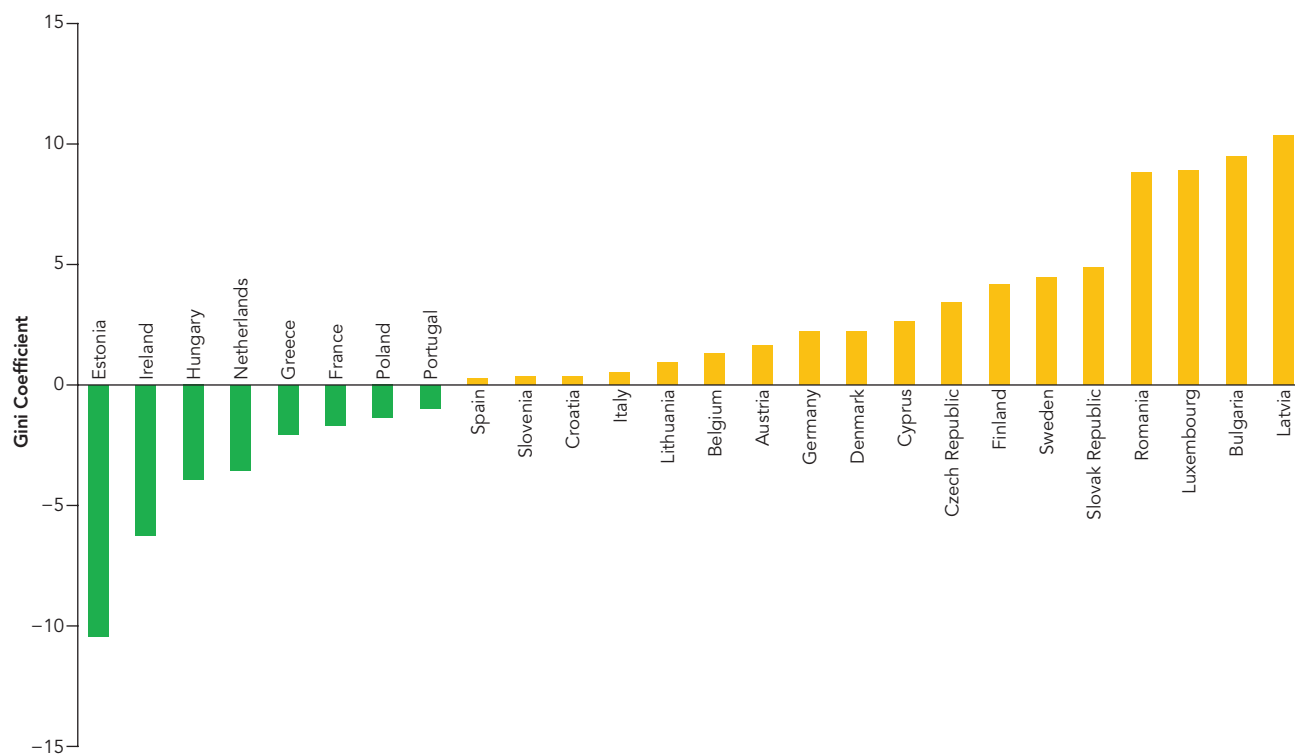
The EGD can avoid previous transitions' increased income disparities

Every transition towards a new equilibrium in the economy generates winners and losers, and, if not complemented with the right HD policies, the EGD won't be an exception. The asymmetric impact of previous transitions such as globalization or technological progress increased income disparities in high-income countries. Between 1970 and 2016, the share of employment in occupations requiring mid-level skills in the United States (such as office clerks, sales associates, and production workers) declined, while the number of high- and low-skilled occupations rose or remained largely unchanged (Autor 2019). A similar pattern is observed in Europe between the 1990s and early 2010s, with the number of occupations involving routine tasks decreasing throughout the period (Bussolo et al. 2018). This process of *hollowing the middle* can be partly explained by the transitions triggered by trade and technology; for instance, OECD countries that traded more with China also lost more jobs in the manufacturing sector, which are typically mid-level skills—and middle-income—occupations. The loss of manufacturing jobs contributed to the increase in per capita household income inequality—measured by the Gini coefficient—observed in 19 of the 27 EU member states between 1993 and 2019 (Figure O.4).

Low- and middle-class workers bore the highest costs of the trade and technological transitions in the United States and the EU, partly explained by insufficient or ineffective HD policies. This, in turn, had adverse political consequences. The rise in income disparities increased political polarization, promoted mistrust in institutions, and strengthened the support for protectionist and populist policies (Autor et al. 2020; Rodrik 2021). The emergence of

To make the green transition viable and equitable, it must be congruent with economic and social needs in regions and sectors that rely heavily on carbon- and fossil fuel-related industries

Figure O.4: Change in Income Inequality in the EU, 1993–2019 (Gini Coefficient)



Source: World Bank.

The EDG, like every transition towards a new equilibrium in the economy, generates winners and losers, and must be complemented with the right social policies

political polarization in the United States and the EU can be traced back to the erosion of labor market opportunities for middle-skilled workers in manufacturing industries caused by trade liberalization and automation in the manufacturing sector (Autor et al. 2020; Rodrik 2021; Klein and Winkler 2019).

A more gradual phase-in of the trade and technological transitions would have provided enough time for adjustment or a proper design of the right HD policies to protect the well-being of at-risk workers. But gradualism is not an option for a green

transition that must be done. Therefore, education, health, and social protection systems, particularly in lagging EU MS and regions, must receive the resources and technical support needed to mitigate the impact of the transition on disadvantaged households. The remainder of this overview describes the HD policies that will *enable* the green transition, *mitigate* its short-term adjustment costs, and *adapt* households to a new, environmentally sustainable, equilibrium in the economy.

Decisive social policy action is needed to implement a green transition that must not be delayed

HD policies to enable the transition: leaving no person or place behind

HD policies can enable the green transition through the provision of the technology and solutions needed to address climate change and the education to change behaviors. HD is also paramount in mitigating the unintended consequences of the transition, particularly job losses and declining relative wages among low-skilled workers. HD policies can also help individuals and households adapt their core skills, the focus of their education, and their consumption patterns in ways that support the green transition and the emergence of an environmentally sustainable equilibrium in the economy.

The EGD could have a significant impact on the distribution of income across regions and individuals. Regions that rely heavily on exploiting fossil fuels, energy-intensive production, or the linear production model, many of which already have lower-than-average incomes, could be left behind. And shifts in demand for skills, driven by the green transition, could lead to job losses and declines in the relative income of lower-skilled workers.

HD policies to mitigate the costs of the transition

The EGD will have asymmetrical impacts across individuals and regions. Prosperous, innovative regions with a highly skilled workforce will benefit while marginalized places could be left behind. Unskilled workers in carbon-intensive industries will need significant support in reskilling, cash transfers, and job placement services to seize potential job opportunities.

The EGD will reshape the geography of jobs and wealth between individuals and across the EU. Some individuals and regions are set to tap into the opportunities offered by regional diversification and

specialization in the green economy. Employment growth and capital investments related to green innovations will likely cluster in a few core, prosperous regions, as has been the case for other leading-edge innovations (Atkinson et al. 2019). Meanwhile, other regions—often plagued by pre-existing economic, social, and institutional bottlenecks—risk falling further behind (McCann and Soete 2020; Moreno and Ocampo-Corrales 2022). Ignoring the differential regional impact of the EGD will jeopardize its inclusiveness and long-term sustainability and could even derail the transition to a low-carbon equilibrium.

Skills to prevent further regional disparities

High levels of carbon-intensive economic activity in some vulnerable EU regions are a vital determinant of the negative externalities expected with the green transition. Regions with carbon-intensive economies will bear additional costs and price increases stemming from carbon taxes. Three additional factors increase a region's vulnerability to the negative externalities of the EGD: low technological relatedness, weak regional innovative potential, and deficiencies in local governance. Vast differences in the technological relatedness of local industrial capabilities, innovation potential, and quality of governance will increase the concentration of green investment and skilled labor in leading regions beyond those related to agglomeration and brain drain effects. In addition, without fair and adequate mitigation policies, higher energy prices will lead to declining consumption and incomes in the hardest-hit regions and among disadvantaged households.

Skilled labor will flow from lagging regions to more prosperous ones. Achieving regional specialization in green technologies and sustainable economic activities is likely to require preconditions that need to be put in place everywhere, including a qualified workforce, specialization in related economic

fields, and adequate infrastructure and facilities (Moreno and Ocampo-Corrales 2022). The inability of lagging regions to profit from the opportunities offered by the development and production of green technologies—reflecting a mismatch between the skills supplied by the labor force, and those demanded by firms in the local economy—may lead to job losses, dissatisfaction, and possibly a brain drain (Fratesi and Rodríguez-Pose 2016).

Just as the poorest regions are likely to experience the most adverse impacts from the EGD, lower-skilled workers are likely to experience a decline in earnings relative to higher-skilled workers. Green jobs tend to be more skill-intensive than brown jobs and to require higher proficiency in all types of skills than brown jobs, captured by differences in learning outcomes in numeracy, literacy, and problem-solving (Figure O.5). These differences

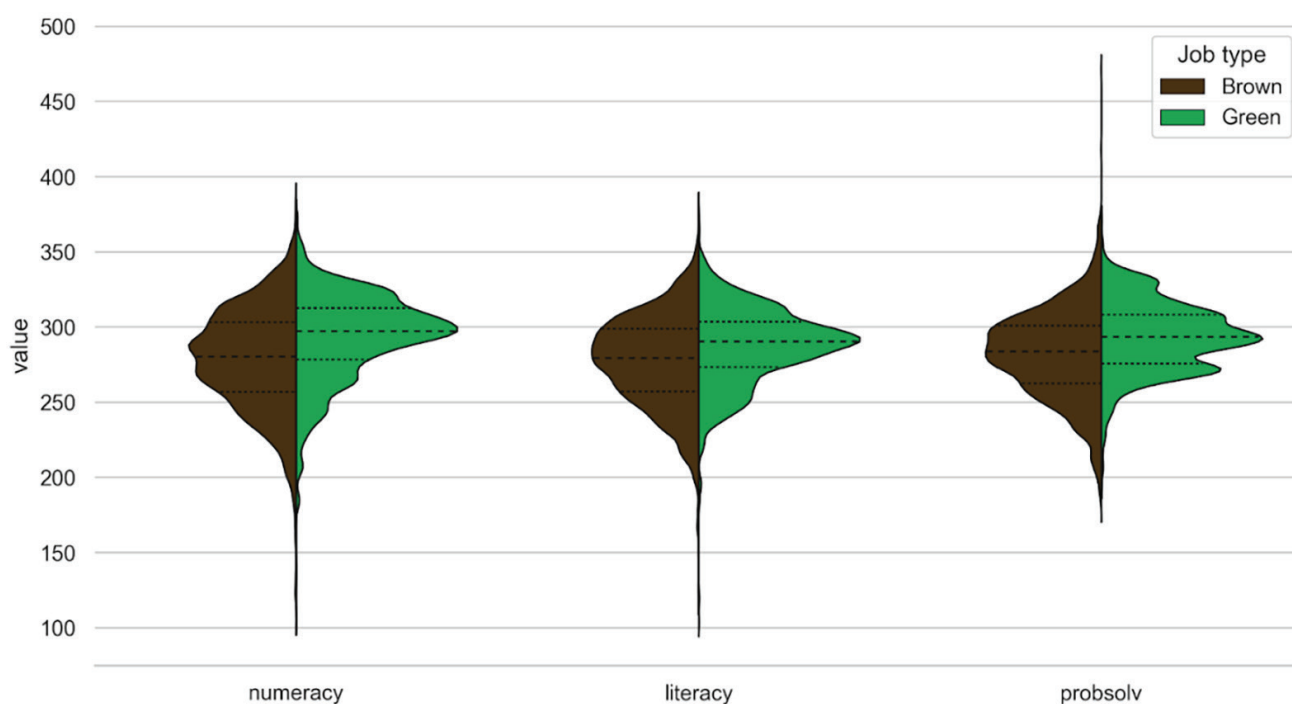
in learning outcomes are more significant among low-skilled workers. The lowest-skilled workers in green jobs have much higher skills than those in brown jobs. Workers in green jobs use skills at work and home more often than do workers in brown jobs.

The skill gap between green and brown jobs is related mostly to differences in years of schooling and partly to the use of skills. On average, half of the difference in numeracy skills between workers in green jobs and those in brown jobs is explained by differences in schooling. People in green jobs have higher numeracy because they are better educated and use these skills more frequently. For low-skilled workers, the skills gap between green and brown jobs is almost entirely explained by years of schooling and skill use intensity. For the high-skilled workers, years of schooling explain most of the gap, while the use of skills is less strongly related.

The EGD will reshape the geography of jobs and wealth between individuals and across countries

Figure O.5: Density Plots Green vs. Brown Jobs

For major adult skills covered in the PIAAC survey



Source: Authors based on PIAAC data.

Mitigating the transition costs will require active labor market programs (ALMPs) for retraining workers whose skill sets are ill-matched to the requirements of green jobs, and support for training new and potential workers in appropriate skills. Many countries have developed retraining strategies, at times linked to income support, for workers displaced by economic transitions (including trade liberalization), privatization, and energy transitions.

But countries must also work on demand. They should provide companies with information and financial support to invest more profoundly in their workers' foundational and task-specific skills. Firms are unlikely to offer the more demanding and long-term training that focuses on foundational skills (numeracy, literacy, and socio-emotional skills) without subsidies to cover additional training costs. Several countries have competence centers to encourage companies and individuals to participate in adult education and training and provide more formal recognition of achieved qualifications.

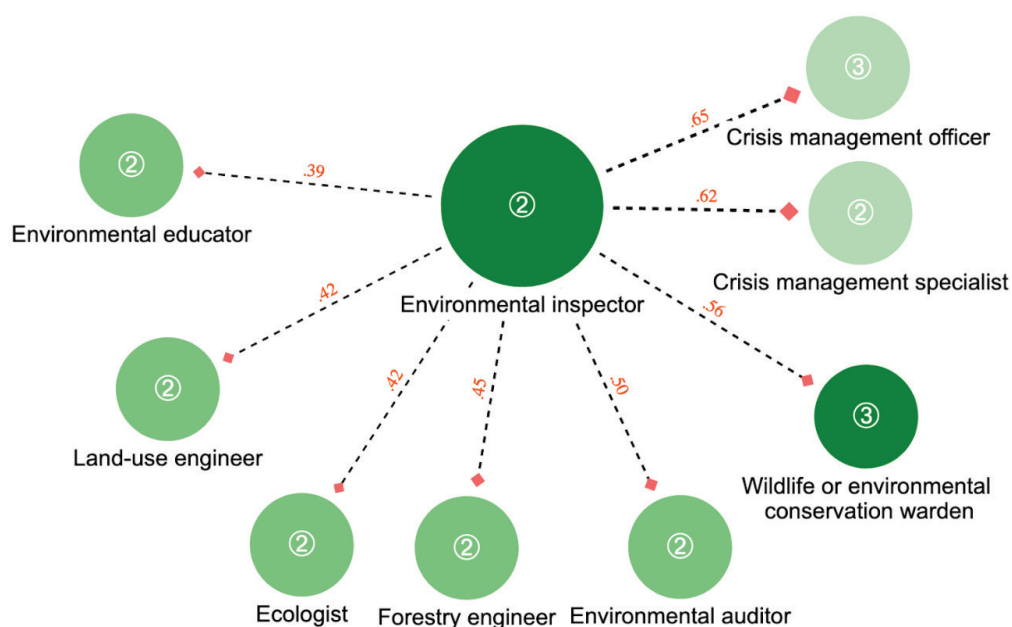
Public employment services will play a crucial role

Job matching by government programs and labor market agencies will require a shift in approach to support workers in finding jobs during the green transition. Green and brown jobs also differ in

return to skills. In Poland, for example, returns to skills are 5 percent higher in green jobs than in brown jobs. Current tools focus on boosting labor demand and matching workers with companies based on existing skills. Innovative tools are required. Tools that focus on measurable skills necessary for green and brown jobs, along with specific information on what is required for transitioning to green jobs. An effective transition thus requires a deeper evaluation of workers' skillsets and the potential for green transition pathways.

Identifying the transition paths with the smallest differences between the skills required for brown versus green jobs would reduce the investment required to move from a brown to a green job. Using similarity indices (task level) along with the PIAAC data (skills level) allows for pinpointing the occupations with the most feasible brown-to-green transition. Poland provides an example of brown-to-green job transitions (Figure O.6). Environmental engineers tend to possess higher or similar skills than workers occupying similar jobs and at the same time are paid less. This mismatch would make it very difficult to meet the growing demand for environmental engineers by retraining workers from similar occupations. Instead, the skills gap could be narrowed by applying a policy mix aimed at human resources development and wage subsidies (for example, by recycling carbon tax income).

Figure O.6: Green Job Transitions Example from Poland



Note: Color represents green core index (0.1: e.g. Crisis management officer, 1: e.g. Wildlife or environmental conservation warden), values on edges reflect similarity scores, numbers in bubbles refer to major occupation groups.

Skilled labor will flow from lagging regions to more prosperous ones

Skill and wage analysis can yield important insights for green employment policy. Enabling engineers to start a career in the renewable energy sector might require ALMPs, such as offering hiring subsidies to firms and institutions seeking to retrain renewable energy engineers. For the green job of environmental inspector, skill and wage gaps across related jobs are less prominent, suggesting the potential for transitions from several current occupations, such as crisis management officer or forestry engineer (see Figure O.6). But because upskilling would still be required, targeted supply-side measures such as vocational training would be necessary. In a third example, workers in the greener occupation of environmental engineer possess on average similar or higher skills than workers in similar current jobs but are paid less. This mismatch would make it difficult to meet the growing demand for environmental engineers simply by retraining workers from similar occupations. Such job transfers could be encouraged by policies for human resource development combined with wage subsidies.

Social assistance and health services can mitigate some of the transition costs

Social protection programs will be important in identifying and assisting the many vulnerable households adversely affected by the rise in energy

prices during the green transition. Information systems need upgrading to improve the effectiveness and efficiency of social protection programs. Better social registries can more accurately identify vulnerable individuals to ease the impact of energy price rises on the poor without encouraging greater fossil fuel consumption. Temporary income support will be required for workers who lose jobs and cannot transition to new jobs or attain new skills for their current job. Conditional or unconditional cash transfer programs may also have a role during the green transition. Early retirement and bridge pensions could assist those who lose jobs, though they must be carefully designed and targeted to avoid disincentivizing work.

Mental and physical health services are needed to respond to the labor market disruptions during the green transition and to help workers cope with weaker employability and a loss of employment. Ensuring that everyone has access to adequate health protection and psychological support is essential to prevent catastrophic and impoverishing health expenditures and to encourage the use of appropriate health services. This may require government financing of healthcare or public health protection systems intended for the most vulnerable—for example, subsidies that even cover contributions for social health protection.

Mitigating the transition costs will require Active Labor Market Policies for retraining workers for the requirements of green jobs, and support for training new and potential workers in appropriate skills

Job matching by government programs and labor market agencies will require a shift in approach to support workers in finding jobs during the green transition

HD policies to adapt individuals and households to a sustainable economy

Households and workers must adapt to an equilibrium characterized by low carbon emissions and a significantly larger circular economy. This long-term process starts by recognizing man-made climate change and the damage we have done to our planet. This is the starting point for transitioning toward more sustainable behaviors and consumption patterns. Education at all levels should incorporate information on climate change and sustainable behavior. In addition, the education sector can contribute with research and innovation focused on generating the technology needed to eliminate carbon emissions, reduce the consumption of natural resources, and find clean alternatives to energy production.

Workers will need strong foundational skills to seize the opportunities created by the EGD

In the medium term, education systems should provide all students with fungible skills to enable life-long learning to perform different tasks in an increasingly dynamic labor market. Foundational skills will prepare the workforce to take on emerging occupations. ILO (2018a) asserts that skill development and training are essential for appropriately implementing adaptation strategies, such as changes in infrastructure that contribute to the net-zero emissions goal of the EGD. Furthermore, the case study for the Slovak Republic, which accompanies this report, finds that education will play an essential role in preparing the workforce to take on green jobs, primarily through the development of foundational skills and attitudes. The study discusses that regardless of changes in labor demand, core skills

such as learning ability, effective communication, leadership, and decision-making are soon expected to be critical for occupational mobility.

People with strong foundational skills will be more capable of learning new skills and thus obtaining green jobs. Recent evidence shows the importance of foundational skills—numeracy, literacy, and socio-emotional skills—as the basic pillars enabling life-long learning. Lack of foundational skills dampens individuals' capacity to acquire or upgrade their professional competencies, preventing them from adapting to changing labor market conditions. PISA 2018 results indicate that around one in five 15-year-olds in the EU are low achievers (21.7 percent in reading, 22.4 percent in mathematics, and 21.6 percent in science) even though there are considerable differences among EU member states. In this context, the demand for foundational skills is set to increase with the greening of the economy, technological progress, and further integration of international markets (World Bank 2018).

A growing literature shows that there are cost-effective interventions to improve foundation skills. Early childhood education interventions targeting children ages 0–3 and providing them with the necessary nutrition, early stimulation, and meaningful interaction are highly effective, especially among disadvantaged children. Providing information about the benefits associated with years of schooling and learning has proven to change behaviors and improve students' efforts and learning outcomes. Selecting, training, and incentivizing teachers and school directors within a coherent and transparent teacher career path improves student learning. Finally, using technology to personalize the learning experience can also be a highly cost-effective intervention (World Bank 2018, 2020).

To ensure foundational skills for all students, EU MS must modernize their technical, vocational education, and training (TVET) systems. Half of all

students enrolled in upper secondary education in the EU in 2019 (17.5 million), were enrolled in a vocational track; and at least 2 million of them, were enrolled in work-based programs. Therefore, TVET institutions are central in the skill-formation process in EU countries. Identifying the professional competencies that will be demanded in the future and adjusting the provision of TVET services accordingly is poised to become more challenging, making many training programs ineffective (Kluve et al. 2019; McKenzie 2017).

TVET graduates with professional competencies might enjoy favorable labor market outcomes in the short term but having more robust foundational skills seems to produce better results (Hanushek et al. 2017). According to PISA, TVET students perform significantly worse than general education students in reading, math, and science (Figure O.7). Moreover, exam-based placements into general versus vocational secondary education (tracking), common in Europe, introduce an equity angle of TVET. In many EU MS, vocational systems do not provide a labor market advantage over general education graduates. Therefore, the tracking system that usually complements TVET in the European education systems could reproduce or even exacerbate existing inequalities, dampen social mobility, and weaken the social contract, particularly in changing market conditions. This is particularly important, as TVET students often come from disadvantaged backgrounds compared to their peers in general education (Figure O.7).

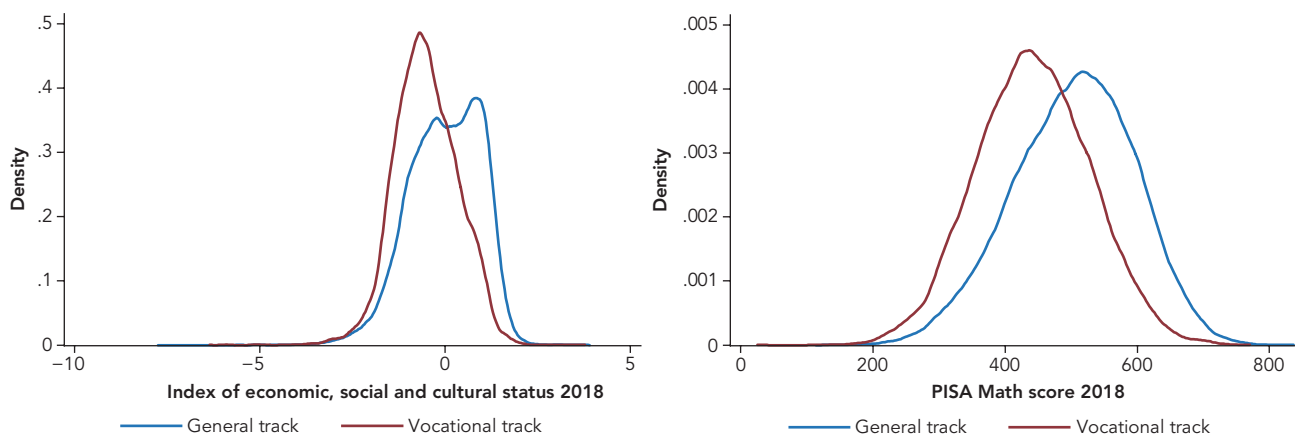
Through research and innovation education can produce the technology needed to curb emissions

Universities are a unique place for experimentation and learning and generating new knowledge and technological solutions for the green transition. Universities can support green innovation and technology development in different ways: through knowledge (from research) and new skills; by engaging in R&D and innovation partnerships with industry or public actors; and by supporting the transferring of new knowledge and technologies to industry and society (McCowan et al. 2021; Radinger-Peer and Pflitsch 2017).

Fostering academic entrepreneurship and the acceleration of spinoffs (from science and research institutions) is also an important channel through which universities can support green technology development and diffusion. Improving funding opportunities for technology development and early-stage funding for clean tech startups as well as incentives for academics to participate in such activities are key to this development.

In deploying R&D partnerships, new approaches and new mindset are required, notably regarding inter-disciplinarity in research and strengthened collaboration with non-academic actors (Trencher et al. 2014) and foreign organizations (Kwieck 2021). Delivering green innovation solutions often requires mobilizing a large range of competences and disciplines.

Figure O.7: Difference in Socioeconomic Status and Learning Outcomes in EU Member States, TVET versus non-TVET Students



Source: World Bank computations using PISA 2018.

Another way through which universities can support green technology development is through **testing and demonstration of new solutions**. By serving as “living laboratories” or test beds for new green technologies (for example, in renewable energy, sustainable construction, electric mobility, and urban smart grids, among others), universities can help assess the feasibility of innovations and their potential scalability to cities or industries.

The green transition requires improvements in skills training for technology adoption and ensuring advanced human capital in future R&D projects and demands. In addressing these challenges, delivering the pool of STEM graduates is central. Likewise, a strategy for advanced human capital (MSc and PhDs) is critical in deploying and implementing large new research and development projects. Finally, enhancing international cooperation in education and research will be central for EU countries to fulfill new national and European policy commitments.

Universities play a crucial role in conducting research activities and transferring knowledge and new technologies to industry and public actors. As such, they can contribute meaningfully to addressing green innovation and transformation needs. Specifically, universities can contribute to green innovation through education (new skills); by creating new knowledge (from research); and by engaging in innovative partnerships with public, private, and civil society actors.

Finally, public research actors—both universities and public research organizations—have a major role in facilitating the adoption of new green and sustainable technologies through social innovation projects. This means supporting people and organizations to co-create, learn, adapt, and scale green solutions to social problems, such as working conditions, health, transport, and heating.

Education can create awareness and shift consumer demand for green products

Cultural barriers, particularly a lack of consumer interest and awareness, are significant barriers to advancing the circular economy in Europe (Eckert 2020). A high percentage of the population with only primary or lower secondary education is associated with a lower waste recycling rate. In contrast, tertiary education positively influences the recycling rate (Pelau and Chinie 2019). Improved education can facilitate the adoption of green technologies in multiple ways.

For instance, in Poland, the broad consensus of the need to reduce GHG emissions has been supported by teaching in schools. Climate change issues have been integrated into pre-primary, primary, and secondary school curricula, and higher education. The national report “Climate Education in Poland” (Education 2021) discusses tools used to present climate change issues in schools and analyzes basic requirements in education related to climate change. At the university level, the Warsaw-based Collegium Civitas offers an MBA course in climate and energy policy management, which presents the EGD as a long-term EU project. Climate education is provided in modern science centers, such as the Copernicus Science Center in Warsaw. And the national environmental strategy provides a comprehensive environmental climate and energy policy management. A 2021 opinion poll conducted by a national Center for Public Opinion Polls in Poland found that 74 percent of the population supported the goal of gradually leaving the coal-based energy sector, while only 19 percent felt that energy production should be based mostly on coal.

Incorporating issues related to climate change and green behavior into school curricula is a necessity for all EU countries. While some related topics

Universities play a crucial role in conducting research activities and transferring knowledge and new technologies to industry and public actors

Incorporating issues related to climate change and green behavior into school curricula is a necessity for all EU countries

are already included in most countries' learning programs, they do not provide a sufficient basis for understanding complex global challenges. For EU students, the understanding of climate change, can be hampered by their understanding of science. While EU students report that the environment is critical, they also feel they cannot do much about it. For example, in PISA 2018 nearly 70 percent of 15-year-olds in Germany said that looking after the global environment is essential for them. Still, only around 40 percent said they could do something about the world's problems. In Hungary, more than 80 percent of 15-year-olds worry about the global environment, but less than half feel they can do something about it. Thus, students will greatly benefit from learning about the green transition and global environmental challenges and being provided with tools to affect issues at the local, national, and global levels.

This underlines the importance of ensuring that students have a basic understanding of the science of climate change, of steps to encourage discussions and exchanges of opinions—together with fact-checking—and of facilitating students taking local actions related to the environment. Education should be used to build ecology awareness in new generations. Learning about sustainable behavior should be incorporated across subjects and grades of study. After regular classes, the school infrastructure can serve as the cultural center for promoting a sustainable lifestyle and green transition for the broader society. This practical usage of assets demonstrates a sustainable way of thinking.

Efforts by educational programs to increase awareness of behavioral consequences, perception of environmental issues, and collective interest for common well-being can encourage behaviors that contribute to reducing GHG emissions. Incorporating an increase in awareness of behavioral consequences in education programs can influence the adoption of green behavior (Minelgaitė and Liobikienė 2021). The value-belief-norm theory holds that values influence attitudes and responsibility toward environmental issues and pro-environmental

behavior (Minelgaitė and Liobikienė 2021). In addition, the literature shows that self-interest and interest in the well-being of others can influence green behavior, the latter positively and the former negatively. Environmental concerns have a positive and significant relationship with pro-environmental behavior (Mayekar and Sankaranarayanan 2019). Minelgaitė and Liobikienė (2021) find that for Lithuania that in 2011, concern over others' welfare and perception of environmental problems were the most positively influential on pro-environmental behavior. In 2020, self-interest and awareness of behavioral consequences showed a negative and significant impact. Similarly, Al Mamun et al. (2018) find that in low-income households, eco-literacy and self-efficacy influence attitudes toward green product consumption, and attitude and perceived behavior control influence intention towards green products. Tanner and Wölfling Kast (2003) find that proper knowledge to identify pro-environmental versus harmful products influences green consumerism. Furthermore, evidence shows that education related to environmental sustainability is related to substantial reductions in carbon emissions. If education that empowers students with knowledge and agency is not expanded to the millions of girls out of school in developing countries, society loses out on their valuable contributions (Kwauk and Winthrop 2021). Information dissemination and citizen involvement in green economy transition policy design are necessary to achieve long-term success and contribute to the fulfillment of EGD policies.

The focus of the EGD should be the wellbeing of people

Making the green transition sustainable requires addressing sources of household and worker discontent. The EGD will reshape the spatial location of firms and jobs, and thus the concentration of wealth across European regions. This reconfiguration will have deep social implications, especially in the

context of the rising territorial polarization across Europe in the last decade or so. The interplay between inadequate local endowments and exogenous global trends could exacerbate this territorial polarization.

The EGD can accelerate the trend of increasing spatial divides. In the absence of the proper complementary HD policies, people in lagging regions can become increasingly reluctant to support environmental policies needed to reduce GHG emissions and decelerate climate change. In vulnerable regions, there is already evidence of a backlash against measures to save the planet. Therefore, the best approach for limiting the negative impacts in lagging regions is to apply place-sensitive measures that leverage each region's socioeconomic potential for contributing to the achievement of environmental targets (Iammarino et al. 2019).

A just and successful transition to a greener economy will require substantial upskilling and reskilling of the current labor force. Policy actions are required in two primary areas to provide more effective career guidance. One is to strengthen the teaching and upgrading of foundational skills with a priority on socio-emotional skills, and another is to provide data-driven career guidance and targeted upskilling through ALMPs that facilitate transitions

between brown and green jobs and focus on increasing workers' capacities and connecting workers to jobs (Bulmer et al. 2021).

Making the EGD effective requires laying the proper policy groundwork. While top-down approaches are necessary, the EGD alone cannot take EU countries through to a circular and more sustainable economy. A sustained and just transition requires national and subnational policies to be aligned and ready to support climate actions and human development measures in education, health, and social protection. Much more work needs to be done. There is ample evidence that the current fragmented human development policy frameworks in many high income countries—which consider, in a separate way, the needs of vulnerable groups, local risks, and funding and evaluation timelines—are inadequate to prepare societies for climate action (Panic and Ford 2013).

To restate this report's central message: A sustainable green transition is impossible without a successful human transition. Therefore, human development policies must be at the core of decoupling economies from natural resources, adapting individuals and societies for the new green economy, and mitigating the transition's unintended consequences for everyone, especially the poor and vulnerable.



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