

# Agriculture 4.0: Equipping young NEETs with basic & advanced digital and green skills

## Module 7

### Climate change mitigation and induced structural adjustment in the markets for labour



Developed by LEVILO



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**Disclaimer:**

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## Contents

1. Introduction.....	3
2. Content.....	4
<b>Adjustment in the markets for labour</b> .....	5
<b>Green jobs</b> .....	8
<b>Benefits, risks and needs</b> .....	9
<b>Climate change mitigation in the agricultural sector</b> .....	11
<b>State of the art and future outlook</b> .....	13
Methodology – activities .....	17
References .....	17

## 1. Introduction

Following the analysis of the findings from the literature review and field research activities there is a strong need to train and upgrade rural young people to become attractive, employable and to take up central positions in the circular and regenerative economy.

Adapted training material will be further described and developed for practical implementation within our project. The training material will provide young / women NEETs with a package of digital learning resources designed based on the concept of micro-learning: short and coherent learning nuggets delivered in multimedia formats aiming to promote blended learning methodologies. The digital learning nuggets will include a variety of resources such as interactive games, podcasts, e-learning videos, interactive case studies, infographic resources, etc.

## 2. Content

## **Learning contents**

The module consists of 5 submodules:

7.1 Adjustment in the markets for labour

7.2 Green jobs

7.3 Risks, benefits and needs of induced structural adjustment in the labour market

7.4 Climate change mitigation and the agricultural sector

7.5 State of the art and future outlook

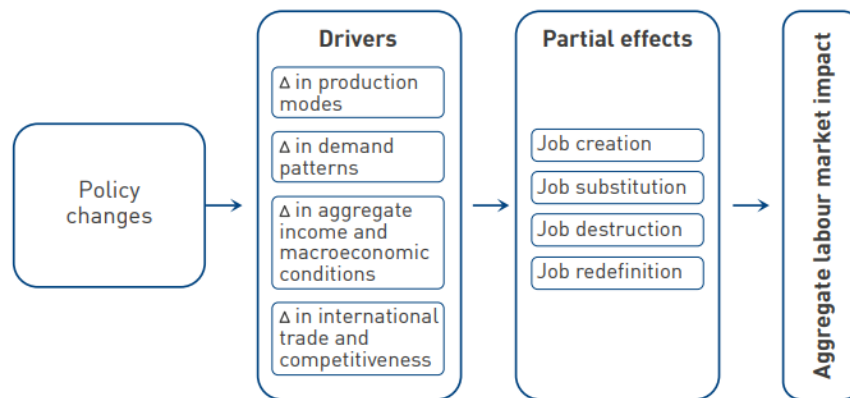
## **Learning outcomes**

The young NEETs will learn about the impact that climate change mitigation and induced structural adjustment has on the markets for labour. This will also give them a sense of why learning green and digital skills is beneficial for their chances on the labour market.

## **Adjustment in the markets for labour**

The fight against climate change and climate change mitigation will have an impact on of different areas of our life so logically, it also impacts the markets for labour. This goes over two ways: policies and consumption habits. Emission reduction policies will profoundly modify energy-intensive sectors as well as sectors linked to fossil fuel energy. This includes industries such as steel, iron, aluminum but also energy-intensive services such as road transport. Since we are discussing climate change mitigation and the induced adjustment in the markets for labour, we will look at how policies influence the structure of the labour market.

Figure 1. Flowchart of policy induced changes in labour market



Source: OECD (2020), Labour market consequences of a transition to a circular economy, Environment Working Paper Nr 162, p. 16.

Overall, the job market experience four changes:

- 1) Job creation opportunities arising from climate policies. This can happen for example through the manufacturing of pollution-control devices added to existing production equipment.
- 2) Job substitution, including changes within sectors, where employment will shift from fossil fuels to renewables. There will be, for example, opportunities for workers in the offshore oil industry to be re-employed in the offshore renewable industry.
- 3) The 3rd point is job elimination, which would imply changes across sectors because there will be no direct replacement for certain jobs. As an example, job losses are expected in the European coal sector and the oil refining industry. Significant employment consequences are expected in coal mining from the closure. Another example would be that the production of packaging materials is discontinued when they are discouraged or banned.

4) Another option is the transformation and redefinition of existing jobs such as many existing jobs (particularly plumbers, electricians, metal workers, and construction workers) will simply be transformed and redefined as day-to-day skill sets, work methods, and profiles are greened.

But how will this translate to the whole labour market? In the short term, jobs will be lost in the directly affected carbon-intensive sectors and new ones are created in replacement industries. New jobs are expected to be created in low-carbon sectors which tend to be more labour intensive than conventional sectors. The oftentimes expected net job creation is however likely to diminish as low-carbon technologies become more competitive and technologies mature. As a result, employment gains of this type cannot be sustained over a 10 to 15-year time span.

In the medium term the impact of climate change policy will spread across the economy creating and eliminating jobs as behaviour changes and value chains adjust. The impact on employment will depend strongly on external factors such as input prices (gas, oil, etc.) that determine price differentials between low-carbon technologies and conventional solutions, as well as on the regulation policies that lead companies into adopting more energy efficient production practices. The increases in traditional energy prices along with regulation to the carbon price will improve the competitiveness of renewable energy technologies leading to employment growth in this sector. In the long-term, innovation and the development of new technologies will create opportunities for investment and growth. It is expected that jobs will be created in the research and development of low-carbon technologies. The impact of greening of the economy varies significantly between sectors. There are broadly three main categories of sectors:

- those the operations of which will be significantly reduced and/or halted. These are sectors with “no future” such as for example coal-fired plants and the coal mining sector
- those sectors that have to undergo a profound change – for example the automotive sector
- and those with the biggest potential for job creation – for example sectors included in the circular economy.

This greening of the economy is a clear example of the positive impact that innovation and technological change can have on economic growth and restructuring. However, this also implies that as the green economy grows, there will be an increased demand for highly skilled and

qualified labour capable of undertaking the increasing technological and innovation demands. But green policies also affect labour markets indirectly through supply chains and through changes in overall demand. The consequences of green policies for labour markets working through macroeconomic channels – such as changes in labour productivity and the costs of employment – are often overlooked.

An increased demand for highly skilled and qualified labour can also bring its' challenges with it. But you can learn more about that in MTS 7.3. First, let's define what green jobs are.

### Green jobs

There is a lot of talk about “green jobs” but what exactly are green jobs?

Green jobs can include the production of heat and power from renewable energies, such as wind power and solar photovoltaics, or the increase of energy efficiency. So, green jobs have to do with green energy. Another definition of a green job is a job which is responsible for the emission of a relatively small amount of greenhouse gases per hour of employment.

The OECD/Eurostat definition of green jobs are jobs in the environmental goods and services industry, comprising activities which produce goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems.

When using this definition, green jobs constitute a small but significant share of total employment. In Europe, green jobs make out 1,7% of total paid employment.

However, it is not easy to clearly define “green jobs” because there are some jobs that fall into some sort of grey area. Jobs in the nuclear power sector for example are not included, and these are not generally regarded as green, although they are in a low-carbon industry. Many jobs are not counted as green, despite the nature of the goods and services they help produce. For example, jobs in the car industry are excluded, even though some may be devoted to developing low-carbon vehicles.

Overall, one can say that green goods and services fall into one or more of five groups:



- 1) Energy from renewable sources
- 2) Energy efficiency
- 3) Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse
- 4) Natural resources conservation
- 5) Environmental compliance, education and training, and public awareness.

Employment in such green(able) jobs has increased for all categories, but most strongly in occupations requiring new green skills and retraining in response to new activities and technologies. Therefore, skill requirements and education levels are increasing fast in the green economy, faster than in the economy overall.

There is considerable potential for new green jobs and greener jobs in all sectors of the economy, and substantial need to speed up adjustment processes, notably in agriculture, manufacturing and public services. Means of achieving this include regulation, financial incentives, training support, active labour market policies and education sector reforms. But more on that in the next subtopics.

### **Benefits, risks and needs**

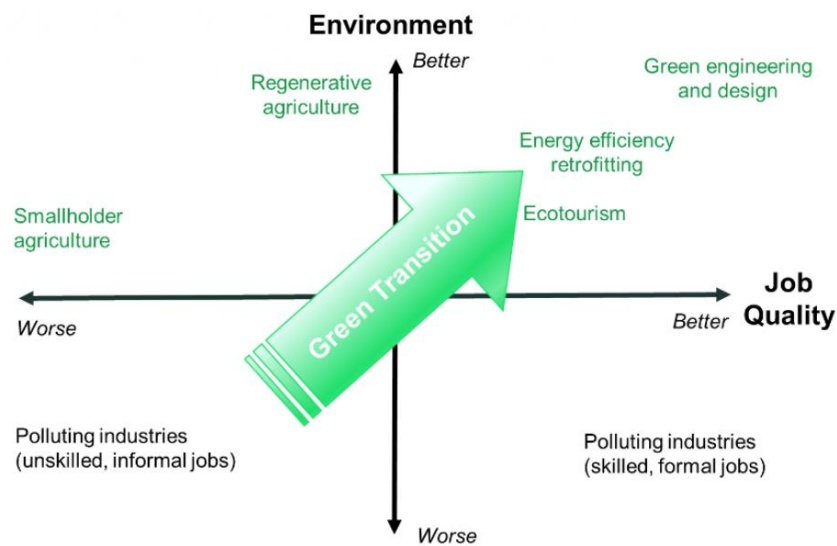
We learned that climate change mitigation and the induced structural impact on the market of labour will lead to jobs losses as well as creations. Such a change in the labour market has its benefits as well as risks. With the greening of the economy, there are also certain needs that need to be addressed within the labour market.

In general, climate change mitigation will lead to an increase in employment, at least over a short period of time. However, the newly won job demand might not be in fields where jobs are lost or create demand that cannot be covered. Industry highlights lack of certain medium-level qualifications, which should be addressed optimally through a combination of public incentives and industry actions.

With new demands, there will be new skills necessary. In the renewable energy and energy efficiency sectors, there will be a shift of skills to new jobs, increasing the importance of

information aggregators, data managers, and digital and electrical hardware manufacturers. In short, digital skills rise in importance. Medium-skilled level professionals will be in demand for operation, maintenance and decommissioning functions. Properly trained, skilled employees are an important precondition for further growth of employment in the environmental protection sector. However, it is not enough to modify vocational and academic training for young people entering the labour market for the first time: it is also essential to promote life-long learning.

In most countries, job reduction in the central scenario will affect ‘Blue collar and farm workers’ most. This job category is largely employed in energy sectors and energy-intensive industries, which are the most impacted sectors. Workers generally benefit from policy, such as a carbon tax, when the revenues from are used to lower income taxation. Workers in the categories ‘Service and sales’ and ‘Managers and officials’ generally benefit most in terms of wage income, since these job categories are more represented in sectors that are the less affected by the policy (such as services).



Source: <https://blogs.worldbank.org/jobs/making-green-transition-work-labor-markets>

There are voices saying that with the greening of the labour market, there should also be a just transition to make fair and good jobs, not only green jobs. This call for a “Just Transition” signals the importance of minimizing negative repercussions from climate policies and maximizing positive social impacts for workers and communities.

Climate change adaptation and mitigation presents various opportunities to address instances of sectoral and occupational segregation, to narrow wage and skills gaps in certain sectors and occupations, to promote inclusive social dialogue, to improve working conditions, and to enhance social protection. At the same time, adaptation-related transformations and the redefinition of jobs and workplaces can further improve skills, and reduce health and safety. Due to the under-representation of women in technical jobs such as manufacturing, construction, energy and installation sectors, the move towards a green economy may unintentionally exclude women. This should be prevented through training and recruitment of women for green jobs. Moreover, the creation of new labour market opportunities can help formalize the various jobs performed by women in the informal economy.

The roll-out of increasingly ambitious climate action will coincide with other megatrends, such as automation and digitalization that are likely to have major impacts on future skill needs. Preparing workers for new occupations and tasks in a green economy is important. While these changes are expected to affect a minority of European workers, they will be substantial for specific occupations and sectors.

In general, developing specific new green skills may be less important for the overall transition to a greener economy than the continuous improvement of existing transversal and specific skills, including digital skills.

There is a contrast in skill composition between new and emerging green jobs on the one hand and non-green 'green rival' jobs on the other. This contrast is significant for all sectors, notably manufacturing, construction and transport, which have high proportions of workers in low-skilled employment in non-green jobs. This illustrates the skills challenges of the transition to the green economy and the need for significant upskilling in these sectors.

### **Climate change mitigation in the agricultural sector**

Since this course aims to provide you with green and digital skills for the agricultural sector, we will have a look at the impacts of climate change mitigation in the agricultural sector.

Let's start with why it is necessary: Climate change will affect agricultural food systems in all countries, including exporters and importers as well as those at subsistence level. Changes in mean rainfall and temperature as well as the increase in extreme events will affect agriculture, livestock, forestry as well as fisheries. Many impacts, such as increased land degradation and soil erosion, changes in water availability, biodiversity loss, more frequent and more intense pest and disease outbreaks as well as disasters need to be addressed across sectors.

But the agricultural sector is not only a victim but also a cause of climate change. While carbon dioxide emissions from agriculture are small, the sector accounts for about 60 percent of all dinitrogen monoxide (N<sub>2</sub>O) and about 50 percent of methane (CH<sub>4</sub>) emitted, mainly from soils and enteric fermentation. The GHG impact through radiative forcing of N<sub>2</sub>O is 300 times that of CO<sub>2</sub>. Methane and nitrous oxide emissions increased by 17 percent from 1990 to 2005 and are projected to increase by another 35 to 60 percent by 2030, driven by growing nitrogen fertilizer use and increased livestock production. Increases in agricultural emissions are expected as population and economic growth increase food demand.

Mitigation of climate change is a human intervention aimed at reducing these sources or enhancing the sinks of greenhouse gases. Agriculture and forestry provide, in principle, a significant potential for GHG mitigation. And that might lead to job creation:

Three out of four jobs worldwide are heavily or moderately dependent on water. Adaptation measures, such as investment in the infrastructure required for the conservation, treatment and supply of water, can increase both the number and quality of jobs across the economy. Reforestation and afforestation are further effective adaptation measures because of the ability of forests to regulate water flows, act as barriers against storm surges and protect against erosion and mudslides. At the same time, the many other ecosystem services provided by forests create jobs and economic value.

Structural changes in the food and agriculture sector are for example through a more sustainable food production or changes across the whole food chain and development of alternative food (seafood alternative to high-carbon food). Other changes include the development of precision agriculture, organic farming, agroecology, agro-forestry and stricter animal welfare standards, as well as eco-schemes to reward environmental and climate performance. This will lead to declining

employment in traditional farming but then again to potential job creation in alternative agri-sectors and new jobs in the former farmlands, for example in organic farming or eco-tourism. In the agricultural sector, key environmental issues are inefficient energy consumption, land use change and expansion of agricultural frontiers, lack of technical, financial and political instruments so that emission reductions targets are reached, pollution of the environment partially caused by fertilisers as well as an inefficient water use. Trained individuals in the field of agricultural production should provide technical knowledge for new practices, such as organic farming and agroforestry, technical knowledge for the application of energy-efficient technologies in the agriculture sector, efficient use of water and irrigation technologies; use of information and communication technology in agriculture, including satellite and precision farming technologies. These are some skills that you will be informed about in the DG-VET project.

### State of the art and future outlook

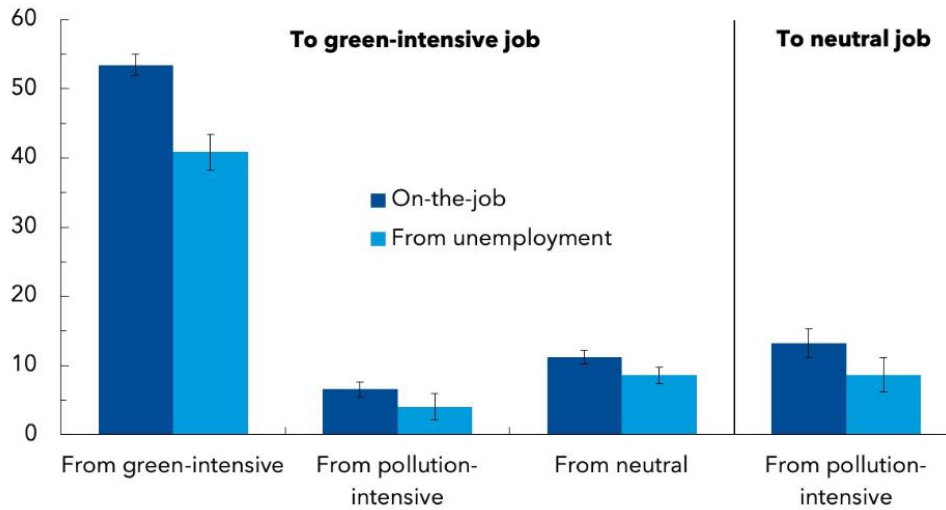
So, you've heard about the impact of climate change mitigation and structural adjustment in the market of labour in theory. But let us look at it in a more concrete way.

The expansion of renewable energies such as solar, wind, geothermal and agroenergy will have a positive impact on employment. The manufacture, installation and maintenance of solar panels should create in the entire world 6.3 million jobs by 2030, while wind energy production should create more than 2.1 million jobs. 12 million jobs will be created in biofuels-related agriculture and industry by 2030. On the other hand, an overall assessment of direct employment indicates that in the former EU28, coal mining activities provided jobs to about 237,000 people (around 185,000 are employed in coal mining and about 52,000 in coal-fired power plants). There are also indirect jobs related to coal mining which include power generation, equipment supplies and services. These numbers of jobs vary significantly across countries: in coal-fired power plants there are about 100 jobs in Sweden to around 13,500 in Poland. The expected direct job losses in power plant operation due to coal-fired power plant decommissioning in the coming decade could reach around 34,000 jobs, that is 64% of the estimated current employment in this activity.

These job gains as well as the job losses need to be met with smart policies. The economic restructuring brought about by combating climate change, will require significant policy and

regulatory intervention in order to minimize the risks and maximize the opportunities as market forces alone will not be able to provide a platform for change. As a result, policy makers face a two-fold challenge: managing transition and enabling green growth. Transition assistance will be of particular importance for regions with high concentrations of high emission producing-industries - as has already been expressed by trade union federations - and will require adopting active labour market and social protection programs and policies. Concrete measures include job training, tax credits for lower-income workers, green infrastructure and R&D investment push, and a carbon tax. However, policy makers must also develop strategies for coping with employment losses in the sectors that will suffer from green growth policies, remembering that this may include sectors hit by higher real prices for currently carbon-intensive inputs such as electricity, aluminum and cement.

That the job gains will equal out the losses is not always realistic since they do not have to happen to the same people. The probability of an individual moving from a pollution-intensive to a green-intensive job is between 4 percent and 7 percent. The odds are slightly better for someone moving from a “neutral” job to a green job, which are 9 percent to 11 percent. In contrast, the chance of finding a green-intensive job, if your last job was also green, is much higher at around 41 percent to 54 percent. This doesn’t mean that workers in pollution-intensive jobs have no chance of finding greener employment, but they may need some help.



Source: EU Statistics on Income and Living Conditions; Mexico National Survey of Occupation and Employment; Occupational Information Network; US Current Population Survey; Vona and others (2018); and IMF staff calculations.

Note: Probabilities are calculated based on transitions across three job types among job switchers. Jobs are defined as green-intensive if its green intensity is positive and its pollution-intensity is zero, and vice versa for pollution-intensive jobs. Neutral jobs have both green and pollution intensities of zero. 'On-the-job' is a transition where the worker is hired into a new job while employed. 'From unemployment' is a transition where a worker is hired after a spell of unemployment following their previous job. The x-axis indicates the environmental properties of the worker's previous job. Whiskers on the bar depict the 90 percent confidence band.



This explains why it is so important to craft labor-market policies that can help shift the balance toward greener jobs and ease the transition for workers. That means boosting workers' ability to find greener jobs—through offering training programs—and reducing the incentives to stay in more pollution-intensive occupations. Governments need to take into account that changes are likely to occur in different locations at different times. Job losses may be immediate, while job creation will take more time. It is important to note that jobs will not appear in the same industries that have experienced job losses. In this situation the right approach is to give workers opportunities to find a new job. Restructuring and modernization processes will become widespread. In order to accompany these processes, it is crucial to maintain labour market mobility and flexibility as well as support effective job-to-job transitions to sustainable employment/professional activity. Labour mobility has a special importance in the current context as green transition will lead to decreasing certain industries, for example related to extraction and processing of fossil, which tend to be concentrated in specific regions. As a result, local labour markets may experience a sudden increase of unemployment, while a majority of job

seekers will have the same, often obsolete, skills profile. Governments need to support employers in job creation, adapting business models to the changing environment and promote entrepreneurship.

The challenge is to ensure a positive impact of greening policies on employment, and that better performing education and training systems and improved employment policies actually support the greening transition by ensuring a good match between skills and jobs throughout the green transition. The green and digital transitions are interlinked and mutually reinforcing, which is why the DG-VET project laid its focus on green and digital skills.



## Methodology – activities

7.1: Video on what climate change mitigation is:

<https://www.youtube.com/watch?v=7yHcXQoR1zA>

7.2: Green jobs: <https://www.youtube.com/watch?v=2uHdj6d1rSs>

Interactive quiz: which type of green job is fitting for you? <https://greennewcareers.org/quiz/>

7.3: Interactive climate opportunity map (for the US but I think it is still relevant to visualize the effects on employment):

<https://watson.brown.edu/climateopportunitymap/>

7.4: Climate change mitigation and agriculture:

<https://www.youtube.com/watch?v=UmMMei7Z45o>

Interactive chart about climate impact of agricultural sector present and future per country:

[https://www.eea.europa.eu/data-and-maps/daviz/agricultural-emissions-by-eu-member-state-1#tab-chart\\_3](https://www.eea.europa.eu/data-and-maps/daviz/agricultural-emissions-by-eu-member-state-1#tab-chart_3)

7.5: Graphs showing the 4 trends concerning environmental jobs:

<https://www.weforum.org/agenda/2022/10/climate-change-environmental-jobs/>

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