



Climate Change and Employment

Impact on employment of climate change and CO₂ emission reduction measures in the EU-25 to 2030

SYNTHESIS



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Introduction

This study was commissioned by the European Commission, DG Environment, as a contribution to improve current understanding of the relationship between climate change and employment. The study was also supported financially by six European governments (Belgium, Spain, Finland, France, Italy, United Kingdom).

The study was carried out by a consortium led by the European Trade Union Confederation (ETUC) and the Social Development Agency (SDA), which includes Syndex, the Wuppertal Institute and ISTAS.

The report first examines the potential consequences for employment of global warming in Europe, which has already begun and will continue. The second half of the report considers the challenge for employment of the transition towards a lower CO₂ European economy by 2030, in four key economic sectors: energy production, transport, the steel and cement industries, and construction/housing.

The study adopts a sectoral perspective. It is mainly at the level of the economic sectors that we may see the emergence of imbalances between supply and demand for jobs and qualifications which will result from the implementation of the adaptation and mitigation measures. Such imbalances may be short-lived, or they may last longer. The global benefit of preventing global warming in terms of employment, which is demonstrated by several studies, may thus mask employment trends which are significant at the sectoral or regional levels.

Climate change represents an unprecedented challenge for employment policies and for the social partners: the anticipated job gains and losses are sizeable, and no sector can afford to ignore the consequences of climate change, whether they be directly impacted by global warming or whether they have to deal with the consequences – either positive or negative – of the measures taken to combat global warming.

If the questions of employment and human resources are not more closely integrated into climate policies, we may expect them to become a major barrier to the economic, technological and societal transformations demanded in order to manage the transition to a more carbon-lean economy and

in order to ensure that societies can adapt to the effects of climate change which are henceforth unavoidable.

This consequently shows that robust action on climate change, made up of both mitigation and adaptation measures, should be based upon two crucial elements: the immediate setting in place of the political options which are most effective in delivering the double dividend of the fight against climate change and the creation of quality jobs, on the one hand; and on the other hand, the introduction of instruments to anticipate and provide socially responsible support for the economic and social changes demanded, and to make workers into the players in that change.

The study is primarily designed for the trade union organisations and the political decision-makers. It will help the former to boost their expertise on the social dimension of the issues around climate change, with a view to the opening of dialogues with the employers' organisations and the public authorities on the impact of the adaptation and mitigation measures on employment, which is something that the ETUC dearly wishes to see. This report is also directed at the European Commission and the European governments, which it should help to secure a broad consensus around the issues involved in climate change, thanks to the identification of its social impacts, both positive and negative.

The study focuses on the European Union, but the conclusions which may be drawn from it nevertheless remain valid for other countries or regions of the world. The indications on the effects of climate change on employment, the transformations of sectoral employment triggered by the mitigation policies, as well as the more general lessons about the synergies and balances to be found between the prevention of climate change and the priorities in terms of employment and social cohesion can probably apply equally to other developed countries, such as those in North America, Japan, South Korea, Australia and New Zealand, the European countries which are not members of the European Union, and the emerging countries which will be the world's major economic powerhouses in the future (China and India).

Employment and CO₂ emissions of the sectors covered by the study

	Current employment (.000, UE-25)	Share of total employment UE-25	CO ₂ emissions (% of total EU emissions)
Electricity production	800	0,2	24
Oil refineries	120	0,03	5,5
Transport	15 000	3,4	26
Steel	350	0,09	6
Cement	53	0,01	5
Construction / Housing	11 000	2,9	23
Agriculture	18 850	5	10*
Tourism	15 000	4	N/A
Insurance, finance	1 000	0,3	N/A

* Greenhouse gas emission

The results of the study

Climate change is seen as a scientific issue and, to a certain extent, as a political and economic matter. The idea that it is also a social issue, involving not only citizens but also all workers, is not yet sufficiently shared

The study reveals a very obvious lack of knowledge about the links between climate change and employment. The shortcoming is particularly pronounced when it comes to the impact of global warming on employment, a subject on which, to the best of our knowledge, no studies are available. This is a worrying state of affairs, because the situation in certain climate-sensitive sectors would demand immediate action on the possible qualifications and reconversions.

The effects of the mitigation policies on employment are better documented, but there are major differences within the European Union, between the Member States which are committed to the fight against climate change, which have information on the costs and benefits of the emission reduction measures upon which they can base their political decisions, and some Member States in which such information is rarely available. The latter case relates to the majority of the Member States which joined the European Union in 2004.

Existing studies mainly rely on general equilibrium models, which tend to mask regional and sectoral effects as well as distribution of losses and gains, which in many cases are very relevant to employment. Improving knowledge on the redistribution effects of climate change policies is a prerequisite in order to facilitate an adaptation to climate change induced alterations and to mitigation policies. In that sense, the study has facilitated the opening of a debate, and might serve as a tool for raising awareness and training purposes.

The study has also shown up very different levels of involvement by the trade union organisations vis-à-vis the problems raised by climate change. On the whole the union organisations from the 'old' Member States are better informed about climate change matters and more involved in decision-making, and they take part more often in collective bargaining with employers on subjects relating to climate change or energy than trade union organisations from the new Member States, which are largely excluded from decision-making.

Generally speaking, the low level of interest shown by the economic and social players in the sectors examined by the study is in contrast to

the scale of the issues involved in climate change for those same sectors. Industrialists only very rarely include the problems linked to climate change in their strategic planning, just as they usually fail to evaluate their impact on employment.

Even moderate climate change will affect economic activity and employment in Europe. Some regions and economic sectors are particularly vulnerable. Increased warming will be likely to have damaging consequences.

The first part of the study, which looks at the impact of climate change on employment, focuses on three regions in Europe, the Iberian peninsula, Germany and Scandinavia. Even taking the optimistic assumption of gradual, moderate climate change (of the order of 2°C), economic activity and employment in these countries will be significantly affected. All the sectors examined in the study, namely agriculture, forestry, fisheries, tourism, finance and insurance, health, infrastructures, and energy, will need to cope, to varying degrees, with the effects of global warming. The consequences of this have already begun to be seen, particularly in agriculture and tourism. However, more severe warming would be detrimental overall, with an increased risk of non-linear responses and abrupt changes.

Agriculture, forestry, fisheries

The communities most vulnerable to the effects of climate change are the ones which depend on the primary sectors, such as agriculture, forestry and fisheries, plus, to some extent, tourism. The net impact will be more negative for the regions in the lower latitudes of Europe than for those in the mid- to high latitudes. In southern Europe

and the Iberian peninsula, farm yields might decline significantly because of a combination of water shortages, excessively hot weather and an increase in the intensity of rainfall. The repercussions for employment will be substantial to the extent that some 40% of the population of these regions is strongly dependent on agriculture. On the other hand, moderate warming might generate fresh opportunities in the higher-latitude regions, by allowing new types of crops to be grown or by making new land available for farming.

The increase in forest fires is expected to be detrimental to employment in the forestry sector, in southern Europe especially. By enhancing species migration, climate change can significantly affect fisheries communities. Employment alternatives are commonly scarce in such contexts.

Tourism

Many regional economies rely on tourism. Cool destinations could become more attractive as the climate warms up. In contrast, tourist demand in already warm destinations, typically around the Mediterranean, could see its seasonal peak flattened with fewer tourists in relative terms in summer, but more in spring and autumn. Also, low-altitude ski resorts will be affected by changes in snow conditions, an issue which is further worsened by the fact that ski resorts are mostly located in rural areas where employment substitutes are limited in winter.



Snow conditions, an important issue for the low-altitude ski resort employment.

Insurance – Finance

Insurance companies, and the financial sector in general, are exposed to the impacts of extreme weather events. Increased losses due to damage claims will increase the pressure on insurance companies, particularly small ones, possibly further enhancing the structural changes the industry is currently going through. On the bright side, there might be new opportunities arising due to climate change, such as an increased demand for insurance products and services.

Health

Moderate climate change will affect health, leading in turn to effects on employment, productivity and working conditions. Moderate climate change should reduce cold-related diseases and increase heat-related ones, with a probable net positive balance in Europe. Such an effect is likely to increase overall labour productivity. On the other hand, labour's productivity for activities carried out outside could be affected by more frequent extreme weather-related events. Outdoor working conditions could be worsened in summer, with an increase in the risk of heatstroke. There might be a slight negative impact on employment in the health sector due to the decreased requirements for health services resulting from the overall decrease in mortality. On the other hand, more frequent extreme weather events are likely to increase the need for health services.

Infrastructure

Sea level rise will cause a loss of land, affecting agricultural activities and tourism for instance, if not prevented by costly coastal protection equipment. The increase in both frequency and intensity of extreme weather events will damage infrastructure and buildings.

Energy

The warming will reduce energy requirements for space heating and, on the other hand, increase electricity needs for air-conditioning in

summer, causing a mixed positive and negative impact on employment in the energy sector. Climate change will also affect energy generation. The hydropower potential could increase due to more affluent precipitations in northern Europe. On the down side, low stream flows in summer restrict the capacity of thermal, hydro and nuclear power plants.

The idea that the climate change is also a social issue, involving not only citizens but also all workers, is not yet sufficiently shared

Overall impact

In Europe, the balance of impacts is expected to be more negative at low than mid- and high latitudes. The regions of southern Europe and the Iberian peninsula will be the most seriously affected, because of the major role played by primary activities in their economies. In Germany, a balance of positive and negative impacts on economic activity is foreseen. Central Europe in general is particularly exposed to extreme weather events, especially floods. In Scandinavia, the impacts of climate change on economic activities at national level are anticipated to be slightly positive, although masking possible significant adverse effects in regions mainly depending on climate-sensitive resources.

When we talk of a potentially positive impact of climate change, for example the availability of fresh land in the higher latitudes for farming purposes, it is important to bear in mind that these new opportunities come at a cost, as well as being limited. The ability to capitalise on the positive opportunities depends on many factors, such as the technology and qualifications availa-

ble, the structure and organisation of the market, for example. Moderate climate change will bring health implications, leading in turn to effects on employment, productivity and working conditions. Transition costs and the movement of population that is required are often ignored or under-evaluated.

The measures to enable the European Union to reduce its CO2 emissions by some 40% by 2030 do not globally destroy jobs, but they do substantially change the supply and demand of jobs and qualifications within and between sectors

The second part of the study looks at the potential repercussions on employment of a reduction of some 30% to 50% in the European Union's CO2 emissions by 2030, in four key sectors of the European economy: energy production (electricity production, oil), energy-intensive industries (steel, cement), transport, and building/construction. The study combines two approaches: on the one hand, the production of sectoral employment projections for 2030 according to various scenarios of mitigation measures and policies, by reference to a scenario describing the continuation of the current trend ('Business as Usual' or BAU), and on the other, case studies in eleven European countries, relying on an analysis of the existing studies and interviews with the players involved. National reports are available on the ETUC's website (www.etuc.org).

Based on sectoral results, two conclusions of a general nature may be drawn. First, the findings of this study do not dispute those of research using macro-economic modelling, which concludes that there will be a limited positive impact on employment from climate change, provided appropriate economic policies are put in place. According to an estimate of the employment content of the emissions reduction options, the overall balance of jobs in the branches that will expand and in those where activity will be reduced does not appear negative and may even be positive. Compared to the trend scenario, the

overall net gain in employment for the sectors covered by the study would be of the order of 1.5%.

Second, the large-scale redistribution of jobs that will result from the implementation of climate policies will occur within rather than between sectors. At first sight, that seems to be a positive element, because it is considered to be easier for workers to change companies within the same sector than to find work in a different sector. Job changes within a sector can, for example, mean lower retraining costs for workers and shorter search periods. On the other hand, job movements are likely to take place in all sectors. Jobs will be created in companies that can take advantage of opportunities created by climate policies and jobs will be lost in companies that cannot adapt. That should make it harder for policy-makers and the social partners to identify threatened jobs and new jobs.

For example, the boom in renewable energy sources brings added value and new jobs that can be capitalised on both by newcomers in the sector (large power and oil groups, SMEs) and traditional power companies.

Finally, three main dynamics are identified which underpin the employment trends generated by the climate measures and policies:

- A transfer of jobs from power generation activities to activities relating to energy efficiency and the reduction of power consumption, i.e. power-using sectors investing in the efficiency and reduction of their consumption and energy services.
- A transfer of jobs from goods transport by road and the private car to public transport activities for freight (rail and navigable waterways) and passengers, as a result of readjustments in the modes of transport and reduced growth in freight activity.
- Substitution effects within equipment industries, with jobs created by the design, engineering and construction of equipment for power generation from fossil fuels and private road transport (trucks, cars) being replaced by jobs in the equipment sector for renewable sources of energy (wind, solar energy)

and co-generation, for energy efficiency goods and services, possibly nuclear energy, and rolling stock. A good example of this inter-sectoral trend is the foreseeable switch from combustion to electric engines, with jobs in electrical construction replacing those in mechanical engineering and smelting works.

Of course, the changes brought on by climate policies are closely interwoven with those resulting from other dynamics at work in the different sectors, in particular globalisation and technical progress. This suggests that climate change must be integrated into all European Union policies, in particular industrial, trade and employment policy.

Over and above the quantitative aspects, climate policies should contribute to rising demand for increasingly educated and qualified workers, not only in terms of technological developments, but also in innovation. This is a general evolution of the economy and is also valid for the process of combating climate change. The integration of new low-carbon information and communication technologies (design and management of control systems in building and transport) and research into new products and services (new composite materials in wind energy) will require high-level qualifications.

It is crucial that the potentially ‘winning’ sectors, such as building, electrical equipment manufacturing, renewable energy, logistics and intermodal transport, evolve positively at the social and wage levels in order to create attractive jobs for job seekers. Indeed, there is a risk — which is not limited to climate policies but is also valid for the information and communication technologies sector — that jobs developed in newly-created companies may be perceived by workers as

The choice between these options can depend on the results of social dialogue which, by identifying opportunities and encouraging vocational transitions, can strengthen the positive aspects of the necessary changes.

less well paid and offering less secure working conditions than jobs in well-established branches, in particular the traditional operators of the electricity sector. That is the case for certain companies in the renewable energy or energy services sector.

On the other hand, the new service occupations can offer better working conditions than certain difficult manual trades. For example, jobs related to energy audits could offer redeployment possibilities for older workers in the construction sector.

The choice between these options can depend on the results of social dialogue which, by identifying opportunities and encouraging vocational transitions, can strengthen the positive aspects of the necessary changes.

Employment in the energy production sector is sensitive to energy-saving policies. Globally, however, the net effect of energy savings on employment would be positive

The oil sector in Europe might experience a sizeable decline in employment, amounting to some 20,000 jobs out of a total of 120,000, if the constraints on refinery emissions were to be tightened up in the future without adequate accompanying measures. The point is that various options are open to the refinery sector in limiting the investments needing to be made in Europe to reduce emissions, by relocating productions and developing imports, essentially in the form of diesel.

The electricity generation sector, which has undergone major restructuring initiatives over the past decade, resulting in a regular reduction of its staff numbers, will experience profound changes in terms of employment in the coming decades as it adapts to the necessities of combating climate change. The reduction of demand for energy, a priority measure of EU climate policy, should have automatic repercussions on direct employment in the operation and maintenance of power plants. A reduction in electricity consumption of some 16% compared to the reference scenario could cause the loss of a maximum of 20% of direct jobs. Within this overall trend, jobs related directly to renewable energy would fare well, growing by around 50%. Jobs in gas and nuclear energy would remain stable or progress, depending on the scenario considered. The coal sector would lose 50% of its jobs compared to the reference scenario.

A distinction should be made between jobs created directly by the operation and maintenance of power plants, and those created indirectly.

If jobs generated indirectly are considered (by investments – the manufacture of equipment and the construction and installation of power plants), all sectors are driven by a growth dynamic of around 23%, superior to the level seen in the reference scenario. For the turn-on stability period of the new electricity generating sectors, the combined effect of the two dynamics is positive because the erosion of direct employment is more than offset by gains in the capital goods industry. Given the long useful life of such equipment, however, job losses are not likely to be offset on a sustainable basis.

Such changes will likewise involve a change to the needs in terms of qualifications within the electricity sector, which will not come cheap. For example, the operators working in the old electricity production plants will not be able simply to switch to an electricity plant using renewables, and these are in any case often located somewhere entirely different.

Two unknowns remain and may considerably impact on these results. On the one hand, our evaluations underestimate the jobs that could be sustainably created in the electricity sector through the provision of energy services to meet consumers' growing energy efficiency requirements. On the other, it is very difficult to predict the impact on the maintenance of jobs in the coal sector of a massive deployment of carbon capture and storage technologies in the 2020s.

Be that as it may, it is important to note that the net impact of energy savings on employment would be positive. The jobs lost in the coal sector would be largely compensated for by employment gains resulting, on the one hand, from the options that allow energy savings, given the highly capitalistic and low labour intensity of the energy production sector, and on the other, from the redistribution of savings on the energy bills of businesses and households. Such jobs are also harder to relocate and are created mainly in small local companies.

A well-designed climate policy can make a contribution towards the maintenance of employment in the energy-intensive industries in Europe. However, this demands a redefinition of the European Union’s existing climate policy

The climate policy that the European Union has set itself for the decade ahead might – unless we are careful now – have significant negative social consequences in the energy-intensive sectors which are already largely internationalised and where jobs are more and more open to relocation, such as steel or cement manufacture.

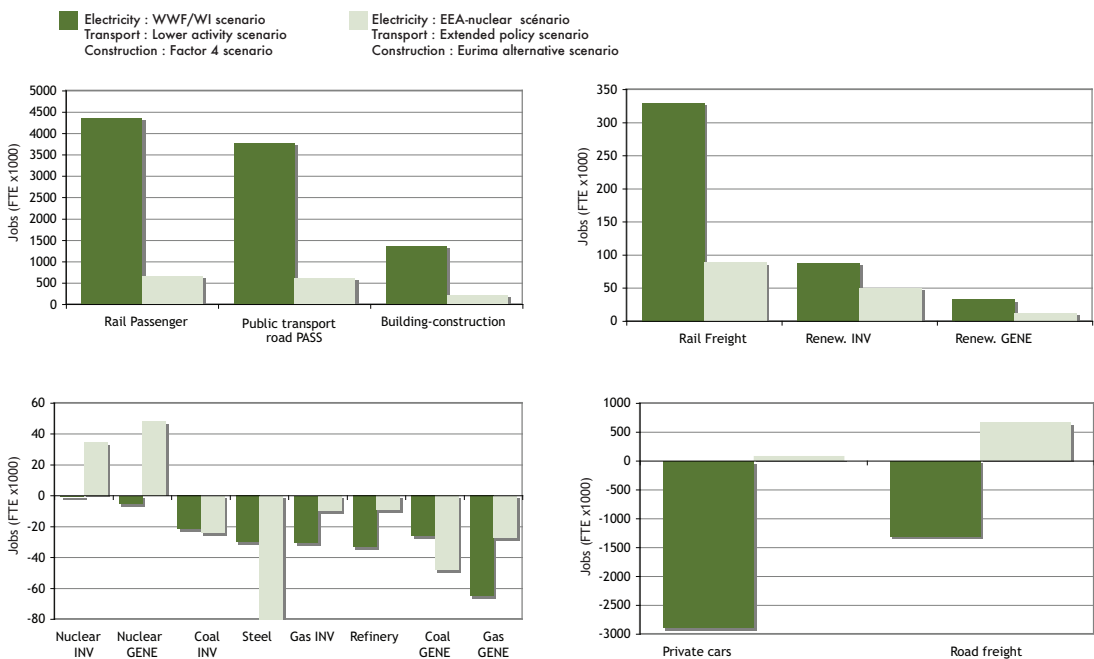
The steel industry could see losses amounting to some 50,000 jobs out of a total of 350,000 across the EU-25, as a result of relocations of the liquid phase towards low-cost countries not applying limits on CO₂ emissions. There would also be losses of carbon emissions towards those same countries. If we were to witness few formal

relocations, these might on the other hand take the form of a lack of fresh investment in Europe (an ‘investment freeze’) or an increase in the level of insecurity of jobs in Europe.

We should not conclude from this observation that the emissions trading system applied to these sectors needs to be rethought. The point is to emphasise that these industries deserve specific attention and a coherent strategy, something which is lacking at the moment. Indeed, while it exists, the risk for employment remain connected to the fact that the sector is not putting enough effort into research and development. However, the technologies are available, and the financial resources already earmarked.

This risk could be lessened by mobilizing the enterprises concerned and putting into place, in parallel with binding measures to combat the greenhouse effect, an industrial policy that combines public aid for research and development programmes, training programmes and an

Figure: Net effect on employment – Policies and measures scenarios vs. BAU scenario
(difference in number of jobs; NB: scales differ from one graphic to the next)



adjustment mechanism on imports not covered by climate change regulations.

What is more, it is important to note that the EU's drive to reduce greenhouse gas emissions cannot continue to be built primarily on industry and the energy production sector.



The energie-intensive industries deserve a coherent strategy, something which is lacking at the moment.

Transport: huge potential for job creation in transport by alternative means to road vehicles (lorries, cars, motorbikes), with risks for the automobile sector and road freight

The transport sector is seen as a difficult one as far as combating climate change is concerned, due to the strong trend growth in its CO₂ emissions and its considerable weight in the European economy and employment. Around 15 million jobs relate directly and indirectly to transport in the EU 25, i.e. more than 7% of

European employment, largely in road transport. Yet the study shows that it is possible to stabilize transport emissions in 2030, with reference to 1990, while creating 20% more jobs overall compared to the reference scenario. By reducing the volume of traffic by the order of 10% and creating more balance through greater use of rail and public transport, the number of direct and indirect jobs in rail and public transport (tram, bus, underground, bicycles) would be multiplied fourfold compared to the reference scenario.

In contrast, the employment dynamic in the road transport of freight, while still positive, would subside by some 50% compared to the reference scenario. Employment in the automotive sector, moreover, could show a decline of the order of 60% compared to the reference scenario, with numbers employed remaining stable for the period as a whole (2000 to 2030), notably under the impact of the increase in added value related to the dissemination of clean technologies, which could give the European industry a significant technological lead.

The building/construction sector represents a very important source of employment, but it has to tackle the challenges of training in 'sustainable building' and innovation

The building and construction sector represents a very important source of jobs to be created thanks to the prevention of climate change. Thermal renovation of existing buildings, in particular older housing, is an option extremely intensive in direct employment, mostly non-relocatable because it is connected to a territory or to regional or national markets.

The extension of the scope of the EU directive on energy performance of buildings would create a further 30,000 to 90,000 man-years in the EU 15 compared to the reference scenario,

on top of which will come another 90,000 man-years in the new Member States. The job gains compared to the reference scenario are in excess of one million man-years in the case of works corresponding to high energy quality (50 kWh/m²), or 10% of European employment in the sector.

The launch of an initiative on the thermal renovation of social housing and subsidized housing would have a particularly important leverage effect because it would result in action on a lot of housing and a lot of emissions in a brief period of time. What is more, such activities are likely to create additional social benefits: the integration of the long-term jobless or socially-impaired persons, easing of the energy bill and improved living conditions for less favoured households.

The direct jobs created are of relatively low qualification level. However, the building and public works sector will have to take up the challenge of training its workers in 'sustainable building' and the sector is not reputed for being highly innovative on R&D or dynamic on worker training and qualification.



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Employment transition programmes' with adequate funding, negotiated with the social partners, need to be set in place in order to anticipate, control and manage the social changes linked to the CO2 emission reduction actions, so as to ensure that workers are both able to adapt, and offered security.

Recommendations

This study points out the policy options most effective for earning the double dividend of combating climate change and creating jobs. It also recommends the mechanisms that should be developed to accompany the changes needed and to ensure that workers are active players in such change.

Economic and environmental policies

Climate policies must be clear, certain and foreseeable, to result in the investments that will create many of the jobs predicted in the study. Over and above setting targets for reducing CO₂ emissions, as was done at the European Council in March 2007 for 2020, binding measures must be implemented in a few key sectors not included in the EU emissions trading scheme, first among which must be transport, housing and the tertiary sector.

Supplementary research needs to be rapidly undertaken, especially in the developing countries, to deliver an understanding of the potential repercussions of climate change and prevention

policies on employment.

Substantial public financing must be mobilized to achieve the wide range of public and private investments required by climate change mitiga-

Conclusions and prospects

This unprecedented study sheds fresh light on the links between climate change and employment. It turns out that global warming, which is often reduced to its physical and economic consequences, represents a major challenge for sectors and regions employing large numbers of workers. In order for the transition to a carbon-lean economy to be made, as the European Union has pledged, some far-reaching changes in employment, qualifications and working conditions will need to be made. Enhanced coherence between climate policies and employment policies is crucial if we are to ensure that climate policies have significant positive effects on employment and that restructuring operations are managed in a socially responsible manner. This is also necessary if an ambitious European policy on combating climate change is to be rooted in a broad social consensus.

With that in mind, some more detailed territorial and sectoral analyses are necessary today in order to identify the type and scale of jobs which are particularly vulnerable to the effects of climate change and the mitigation policies, as well as the opportunity jobs set to be generated, and to help in designing appropriate policies.

Moreover, to supplement this study, it would be helpful to look at the lessons drawn from successful examples of reconversions of workers, businesses or sectors in the context of the process of transition towards a carbon-lean economy.

Partners of the project *“Impact on employment of climate change and CO₂ emission reduction measures in the EU-25 to 2030”*:

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Social dialogue and collective bargaining instruments adapted to the stakes of climate change should be widely developed. The study recommends the opening of a tripartite European dialogue (employers, unions and public authorities) on the implementation of adaptation and mitigation policies. The experience of the round tables on implementation of the Kyoto Protocol existing in Spain clearly shows that there is no obstacle in principle — on the contrary — to greater involvement by the social partners in these matters.

The governments and the EU should give rights to workers' representatives, in particular in European works councils, so that they are entitled to be informed, consulted and able to participate in decisions around climate change.

A European Observatory on the economic and social upheavals linked with climate change should be set up, tasked with supporting the development of industrial relations in this new area.





European Trade Union Confederation [ETUC]
Confédération européenne des syndicats [CES]