

Introduction

Energy transformation under pressure

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Our planetary limits demand a radical transition from the resource-extraction-based energy-intensive economic model – dominant since the first industrial revolution – to a model that is sustainable. The world economy, according to Jeremy Rifkin (2011), is entering a new phase which he refers to as the ‘third industrial revolution’ and in which he claims that a fundamental reordering of human relationships – from hierarchical power to lateral power – will take place. Rifkin’s central thesis is that fundamental economic change occurs when new communication technologies converge with new energy regimes; in his new book *Zero marginal cost society* (Rifkin 2014) this author tells us that ‘using less of the earth’s resources more efficiently and productively and making the transition from carbon-based fuels to renewable energies, is a defining feature of the Collaborative Age’.

If we look back to the *first* industrial revolution in England, it becomes apparent that the switch in energy generation was of key importance. As Tony Wrigley (2011) has pointed out, societies limited at the level of their energy use by the annual production of photosynthesis operated within severe and seemingly immovable constraints, whereas those that switched to depending on the stored products of photosynthesis in the form of fossil fuels were released from these constraints. This particular production and growth model is the one that has now reached its limits and, in the transition to a new model, energy again plays the central role.

As current models of growth continue, worldwide, to erode the stocks of natural assets and to undermine services provided by ecosystems, the risks to development are rising. Lack of action to preserve natural capital will lead to increasing expenditure on the production of substitutes. New forms of production and consumption, as well as new approaches to defining growth and measuring human progress, are required if a deterioration of current living standards is to be prevented.

Here and now in Europe, however, we have a slightly different context. In the seventh year of the current crisis one of the greatest challenges facing Europe is how to achieve green transformation targets without abandoning urgent priorities of growth and employment. As a de-growth scenario seems out of the question given the current political agenda, the chosen way ahead is through a decoupling of employment and economic growth from the use of resources, energy and materials.

An imperative if the planet is to remain habitable for coming generations is to limit global warming to a 2°C increase of the average temperature by the end of the 21st century. For this to be achieved, greenhouse-gas (ghg) emissions in advanced economies need to be cut by 85% by 2050 (based on the emission levels of 1990). Since the energy sector accounts for 30% of global ghg emissions, its transformation is key to the successful achievement of this target.

Europe is today locked in a state of ‘secular stagnation’, with chronically high unemployment, increasing divergence between its regions, and a simultaneous lack of progress with regard to environmental sustainability. Rather than the frequently alleged conflict between ‘economic’ versus ‘social and environmental’ sustainability objectives, what we see is under-performance in all three of these dimensions, in other words, the worst possible of all combinations. The current stalemate in this respect demonstrates the failure of European economic policies marked by austerity and cost-based competitiveness adjustment. In several respects the deadlock in European crisis management is attributable to the conflict between long-term benefits and short-term costs and the case of energy transformation offers a clear and exemplary demonstration of such a conflict: while the long-term benefits of ‘zero marginal cost’ energy generation are not questionable, the road leading to this destination entails costs that appear and have to be met in the short and medium term.

This publication aims to take stock of the major challenges facing energy transformation in a crisis-ridden Europe. As we cannot address here all the dimensions of this under-performance, we will focus our attention on one key area of the transition towards a green low-carbon economy, namely that of energy transformation by which we mean not only a fundamental shift in energy generation from fossil fuels toward renewables but also a significant improvement in energy efficiency. Energy transformation has a central role to play in achieving progress

towards a new low-carbon production and growth model; it also has highly relevant employment and distributional effects. The investments it requires are tremendous; they offer a double dividend, albeit with a significant time lag.

In this publication we will consider what is working satisfactorily and what has gone wrong in the energy transformation practices of major European countries. An attempt will be made to locate and describe the main conflicts. The various chapters will also examine to what extent such conflicts are inherent components of the transition and to what extent they can be attributed to mistakes in the design of the policy framework and in the incentive systems applied?

This introductory chapter sets the scene and provides a conceptual framework for the main conflicts faced by energy transformation in Europe today. The collapse of clean energy investment in the last couple of years, in spite of the huge need for investment as defined by Europe's own mid-term climate policy targets, is a very clear sign that something has gone wrong. A conceptual framework represents an attempt to map the major conflicts, while a single salient example focussing on clean energy subsidies points to the key role of a coherent incentive system.

1. The erosion of Europe's leading role in the green transformation

1.1 A collapse of clean energy investment in Europe

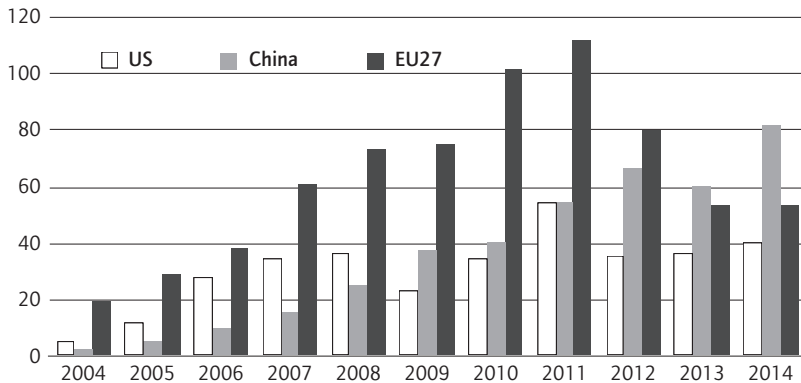
Europe is losing momentum in greening its economy; its former leadership in this area is eroding rapidly.

Between 2004 and 2011 clean energy investment in Europe rose six-fold in relation to its base value in 2004. During this period the EU was outperforming China and the US combined. From 2012, however, there followed a spectacular collapse, the end of which is not yet in sight.

As can be seen in Figure 1, clean energy investment in Europe had already by 2013 fallen 53% from its peak level in 2011. Data for the first three quarters of 2014 (not shown here) reveal that the falling trend for Europe continued unabated: in the third quarter of 2014 clean energy investment in Europe tumbled to USD 9.2 billion – the lowest level in more than eight years – as spending under this heading fell in all of the UK, Italy

and Germany (BNEF 2014). It was only the 2014 fourth quarter investment value of USD 17.8 billion that saved Europe from yet another year of diminishing clean energy investment. Although the total value of investment in 2014 thus represented, at USD 54bn, a slight improvement on the 2013 level of 53.3 billion, this level falls very far short of the Chinese investment effort (USD 82.2 bn). We are speaking of a year in which 310 billion USD was spent globally on renewable energy projects (a 16% increase over 2013) and when China's solar investment hit a historic record. In 2014 Europe provided 17% of the global investment, its share back in 2010 having been still as high as 37%. It took, in other words, a mere three years for Europe to fall back from global forerunner to global laggard in terms of clean energy investment.

Figure 1 Europe is losing ground: New investment into renewable energy, bn USD

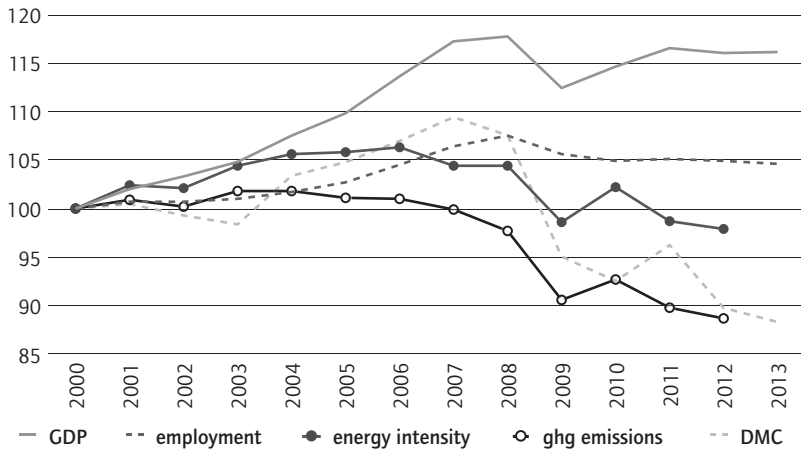


Source: Bloomberg New Energy Foundation, BNEF, 2014, 2015.

Alongside this collapse in clean energy investment, due mostly to austerity and policy uncertainty, it is equally disappointing to see that progress in energy efficiency – a key element on the path to decarbonisation – has been, to say the least, extremely modest. According to Eurostat, between 1990 and 2010 EU27 final energy consumption grew by 7%; for the household sector the increase was 12%. The effects of energy-saving investment, a priority of the EU2020 Strategy which placed the main emphasis on insulation and the retrofitting of buildings, are barely visible and achievement of the 2020 energy efficiency targets is seriously in question. In fact, much of the reduction in greenhouse-gas emissions recorded in Europe was attributable to slow growth and recession. Figure 2 provides an overview of major sustainable develop-

ment indicators as they developed in the period 2000-2013 in the EU28 (this is the period for which all these data are available, encompassing times of both boom and crisis). GDP over this period as a whole showed a 16.1% increase (with a peak of 17.7% in 2008), signifying a meagre yearly average of 1.23%. Employment performance was even weaker – a mere 4.6% increase over 13 years (with a peak of 7.5% in 2008), corresponding to a yearly increase of 0.35%.

Figure 2 Development of GDP, employment, energy intensity, ghg emissions and domestic material consumption for the EU28 (index, 2000=100)



Source: Eurostat, 2015. Note: DMC is domestic material consumption.

Greenhouse-gas emission reductions showed a very mixed performance over the period. While there is an 11.3% drop taken over the twelve years as a whole (the latest data available are for 2012), the two sides of the economic cycle show entirely different results. During the period of economic boom ghg emissions were not decreasing (the decrease in 2007 compared to 2000 was 0.01%). The difficulty of decoupling economic growth (while it existed) from pollution, resource and energy use is apparent from the performance in domestic material consumption and primary energy consumption. Between 2000 and 2007 domestic material consumption grew by 9.4% (more than employment), while primary energy consumption grew by 4.4%. It is thus primarily the economic recession that brought a reduction in both domestic material consumption and final energy use.

Although we see some degree of decoupling for the period taken as a whole, as with the 16.1% overall GDP increase we have an 11.7% decrease in domestic material consumption and a 12.1% decrease in final energy consumption (based, in the latter case, on data from 2000 to 2012). These developments fail to provide convincing evidence that a policy-driven transformation process towards a more sustainable economy is underway, while they offer even less indication that the more ambitious 2050 targets are likely to be reached. Moreover, the objective was to decouple economic growth from resource and energy use and not from employment. The disappointing employment performance is also undermining any confidence that a greening of the economy will deliver jobs – for, after all the talk of green jobs, where are they? In the absence of massive investment, we simply will not get there.

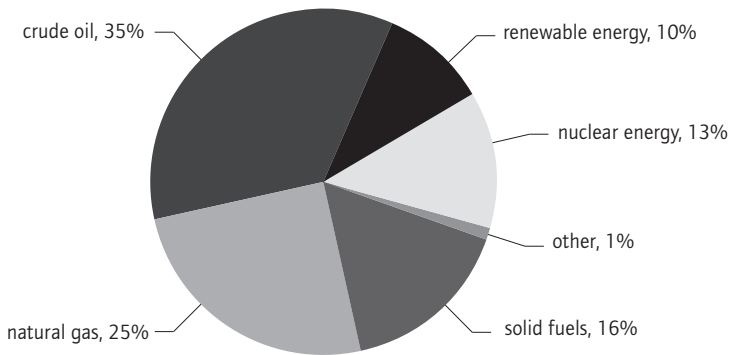
Whether the EU is on track to meet its targets cannot be answered by a simple ‘yes’ or ‘no’. Although improvements can be seen in resource use and resource efficiency (see also EEA 2014b), the pace of change is slow compared to the demanding targets and objectives set by EU policies. Although indicators of resource efficiency showed a steady but slow improvement during the 2000s, this is in contrast to the developments seen in the early 1980s or the 1990s when there were structural breaks or step-changes in the trend of efficiency improvements. Most recent developments show a continuation of the well-established trends that started many years ago. In some cases, the slowdown in economic activity caused by the global crisis has had an effect on trends, bringing them closer to old or new long-term targets than they had been before the crisis. The trend rate of improvement for resource efficiency was 1.9% per annum for the period 2001-11. However, during the period before the economic crisis the trend rate had been lower at around 0.7% per annum, as during the crisis the construction sector was hard-hit, resulting in a significant reduction in the use of low-value non-metallic minerals. Looking at the period before the crisis, there was a partial decoupling of material consumption from economic growth; inclusion of the period of the crisis, however, gives absolute decoupling over the fuller period.

In the case of energy, for example, a challenging gap has emerged between the projected level of primary energy consumption in 2020 and the EU target of a 20% decrease by the same year. For greenhouse-gas emissions, the EU27 will meet the 2020 target, but the strategic targets for 2030 and 2050 are likely to be difficult to achieve (EEA 2014a) and will require a radical change in efficiency trends. For the totality of sectors

considered, the indicators of resource intensity (efficiency) did not further improve their long-term trends during the mid-crisis years, while in some cases they slightly worsened.

Even if the EU is on track with its renewable energy target by 2020, the composition of its energy consumption by type of fuel is overwhelmingly based on fossil fuel, as illustrated by the figures for 2011 shown in Figure 3. Most polluting solid fuels still made up a larger part of EU27 energy consumption than did renewables.

Figure 3 Gross energy consumption by type of fuel EU27, 2011



Source: Eurostat 2012.

1.2 Climate policy targets 2030: lack of ambition

Does the 2030 framework for climate and energy policies adopted by the European Council at the 2014 October Summit offer a way of turning this situation around? Can the employment risks posed by climate change, as documented by the IPCC Fifth Assessment Report on Climate Change (see the AR5 Employment Summary by the ETUI and ECF, Scott 2014), be effectively addressed and a corresponding investment offensive launched? Can Europe credibly push large global polluters such as China and the US to conclude an ambitious global agreement at the COP21 UN Climate Change Conference in Paris?

The proposed aim of increasing the share of renewable energy to at least 27% of EU energy consumption by 2030 can hardly be considered ambitious. Yet, in the absence of binding national targets, implemen-

tation of this aim by ‘open method of co-ordination’ is set to fail unless clear guidelines on how it is to be achieved in practice are provided by the EU. The 30% energy savings target proposed by the European Commission in January 2014 was already insufficient to reach the 2050 goals, providing a clear demonstration of lack of ambition. Yet the European Council subsequently watered this target down to 27%. The package as a whole fails to reflect the new policy direction that would have been needed to induce investments and generate employment – two of the priorities announced by the Juncker Commission.

Energy efficiency has always been one of the weak points of European climate policies; the 2020 targets are not going to be reached, and now the 2030 targets reflect a business-as-usual policy approach that also omits to set binding targets. The 40% target for reduction of greenhouse-gas emissions fails to take account of the fact that, to a very considerable extent, past ‘achievements’ on this score were merely attributable to sluggish growth or recession. Decoupling economic growth from resource and energy use must be the guiding principle and the proposed new package does not provide ambitious enough support for this important objective.

What is more, no consistent and comprehensive policy framework is visible. The proposed 2030 targets may well fall short of the ambition inherent in other Commission initiatives – such as the announced objectives to advance the concept of a ‘circular economy’ (European Commission 2014) and the creation of green jobs (European Commission 2014).

Given this lack of ambition inherent in the 2030 targets, the answers to all four questions posed above must be ‘no’: no turning point compared to a business-as-usual strategy; no trend change in either employment creation or investment, and a less than likely breakthrough agreement at the COP21 Summit in Paris in December 2015.

Such is the pessimistic diagnosis at a time when there would seem to be an emerging consensus in Europe that, in the absence of a powerful kick to revive anaemic investment – both public and private – the European economy is not going to manage the turnaround required for sustained growth. With 26 million currently unemployed, the EU faces the hardest employment challenge in recent history; in several of its member states the situation on the labour market is nothing less than catastrophic.

2. Climate policy targets are also investment targets

It does not require a lengthy search to identify reasonable investment projects on which a sensible EU investment plan could rely. We need look no further than the mid-term EU climate policy objectives, the EU2020 Strategy, and Commission documents like the Energy Roadmap 2050, to see that the need for green investment had already been clearly established. The lack of ambition reflected by the 2030 climate policy targets can be also seen as a loss of opportunity to boost green investments. Energy security – which is again high on the agenda with the newly emerging geopolitical tensions – supplies pointers in the same direction. There can be no doubt whatsoever that large-scale investment in the European energy production and distribution infrastructure is necessary.

Calculations by the EIB (EIB and Bruegel 2012) illustrate that Europe's own long-term climate policy objectives already determine the need for additional annual investment of between 1.2 and 2.1 per cent of EU27 GDP (or between EUR 220 and EUR 380 billion) compared to the 2011 investment level. A major part of this investment should be devoted to energy-saving measures. In a recent publication the European Commission also estimates that the transition towards a more secure and sustainable energy system will require major investments in generation, networks and energy efficiency, estimated at some €200 billion annually in the next decade (European Commission 2015a).

Climate targets in this regard are also investment targets, as an ambitious climate policy can be translated into investment need. There is nothing really new in all this: the current need for investment is a clear consequence of policy targets that were identified and defined several years ago. The only question is why this is not happening; why such vitally necessary policies are not being wholeheartedly pursued. The 2030 climate and energy policy framework seems to fall short, both quantitatively and qualitatively, of these objectives. Through these omissions Europe once again makes it apparent that its direction lies along the 'low road' to competitiveness, where competitiveness is regarded in terms of low wages and cheap energy. Setting climate policy targets that betray a compromised ambition, and failing to implement already defined policy objectives, signify accumulation of an investment gap which means that the once clearly leading role of Europe in low-carbon industries is being swiftly eroded. In the following paragraphs we indicate some of the major developments in key low-carbon technology fields.

2.1 Energy grid

In context of the energy grid the European Commission has been identifying a number of projects grouped under the TEN-E (Trans-European Networks – Energy) umbrella. These projects entail extending the European gas pipeline network as well as interconnecting member states' electric grids, which will improve the effectiveness of the internal energy market and allow long-distance transportation of electricity, in particular when produced from renewable energy sources. Developing 'smart grids' is particularly important to facilitate the integration of renewable electricity supply and improve load balancing. The European Commission has estimated that over the decade leading to 2020, EUR 70 billion will be needed for gas pipelines, storage, liquefied natural gas (LNG) and reverse flow infrastructure, and EUR 140 billion for high-voltage electricity transmission systems. Compared with the investments delivered during the past decade, the current decade needs a rise in investment of respectively 30% and 100% in gas and electricity networks. In addition, more than EUR 120 billion have to be invested in additional renewable energy supply capacity if Europe is to achieve its 2020 target (European Commission 2011).

Investments in new renewable energy production capacity, after weathering the beginning of the economic crisis fairly well, from 2011 collapsed, as was shown in Figure 2. There is ample room for a quick rebound in the deployment of new renewable energy production capacity in Europe – but this would require that the investment blockade caused by one-sided austerity policies and uncertainties within the climate and energy policy framework be eliminated. The dividends, were such policies to be seriously implemented, would be higher growth and employment creation, a greater probability of fulfilling long-term climate policy commitments, and a greater degree of social justice.

Fulfilling the TEN-E and renewable agenda entails the completion of large-scale infrastructure projects that would provide a boost to the European economy in the short term. Indeed, such investments would trigger activity in the civil engineering sector, a sector that experienced steep decline after 2008 and has not yet recovered. This sector also has a relatively high labour intensity of 7.7 jobs per million euros of activity when compared to 4 jobs per million euros for the manufacturing sector (Timbeau et al. 2014).

2.2 Wind energy

If the EU fails to mobilise the necessary investments for developing its low-carbon industries while its main competitors are moving dynamically ahead, the erosion of European competitiveness in this area could end up at a long-term disadvantage, with massive consequences for future European jobs. Beside the general trends in green investment (as shown above), the case of the specific individual clean energy segments clearly demonstrates the opening of an investment gap between Europe and the most dynamic regions of the world (EY 2014).

Onshore wind energy has become a cost-competitive source of energy in many regions, and is set on a trend for worldwide deployment. The industry employed 834,000 people worldwide in 2013, including about 328,000 in Europe and 356,000 in China. Europe has played a pioneering role in terms of R&D and market development, and still today accounts for 38% of cumulative installed capacity. It is a major player in global manufacturing of wind turbines and components, with a trade surplus of EUR 5.6 billion in 2010, mainly in wind turbine and component manufacturing. However, European companies will face increasing competition with the rise of large Chinese manufacturers. Similarly, Europe is leading innovation and market take-off for the offshore wind industry. This challenging industry would benefit from cooperation on the global scale for innovation and project financing. Such prospects could, however, be jeopardised by the recent significant fall in renewable energy investment in the EU (affecting mainly solar PV and wind energy generation). Europe's policy framework may not be well-adapted to further growth of the renewable energy sector, there being a lack of certainty regarding long-term targets and support mechanisms that could present a risk of 'investment leakage'. China, in the meantime, has sustained its investment efforts and is now the world's top investor in renewable energy.

According to the Global Wind Energy Council (GWEC), annual energy capacity in wind energy has grown worldwide at a steady rate of around 30% per year over the last 10 years. Onshore wind energy is increasingly competitive with newly built conventional power plants, both in Europe and on every other continent, with prices as low as USD 50/MWh. Wind power represents 2.9% of global electricity consumption and generates revenue of EUR 50 billion for the sector. At the end of 2013, six countries had over 10,000 MW of installed capacity: China (91,412 MW); the US

(61,091 MW); Germany (34,250 MW); Spain (22,959 MW); India (20,150 MW); and the UK (10,531 MW). The EU accounted for 38% of global cumulative capacity in 2013, but its share was eroding.

Regarding its job potential, the International Renewable Energy Agency (IRENA) estimates that the global wind industry employed 834,000 people in 2013 with China having taken the lead:

- 356,000 jobs in China
- 328,000 in the EU (42% of which in Germany)
- 51,000 in the US
- 48,000 in India
- 32,000 in Brazil

Wind turbine and component manufacturing is the most intensely traded segment of the wind energy value chain. It represents 36.7% of added value in the EU, compared to 20.5% for service providers and 42.8% for developers. Yet turbine and component manufacturing represent 85% of the wind sector's exports.

Driven by strong manufacturers in Denmark, Germany and Spain, the EU's wind energy sector exports were EUR 8.8 billion in 2010, for a trade surplus of EUR 5.6 billion, mainly driven by turbine and component manufacturing. Given the sluggish investment activity, Europe's continuing leading role in wind energy is increasingly coming under pressure.

2.3 Solar energy

Solar energy still has a long way to go before becoming a significant component of the energy mix. In the EU, where the share of solar PV in the mix is by far the largest, solar energy represents 3% of overall electricity demand and 6% of peak demand. Markets worldwide have so far tapped into only a small part of their potential. Although the European Union is still the world's leading region in terms of cumulated installed capacity, with 57% of global cumulative capacity, since 2010 the market has taken off in Asia and the US, while in Europe it came under pressure.

The global PV market has shown continuing dynamism and by 2013 had achieved a record of almost 40 GW installed capacity. The most striking evolution over the past two years took place in Asia. China was the leading market in 2013, with 11.8 GW of additional installed capacity. Japan has

also entered the field with 6.9 GW connected to the grid, followed by the US with 4.8 GW additional capacity. At the same time the European market has faced a drop in installations and the EU's share fell from 75% of the world's installed capacity in 2011 to 59% in 2013. Europe installed 11 GW during 2013, less than half of its record performance reached in 2011 (22.3 GW installed), driven mainly by Italy and Germany.

According to IRENA (2014), the global solar PV industry employed a workforce of 1.4 million in 2012, which increased to 2.3 million during the following year. The distribution by region of this 2.3-million global workforce in 2013 shows the massive dominance of China and underlines Europe's subordinate role:

- 1.6 million jobs in China (up from 0.3-0.5 million in 2011);
- 220,000 in the EU (including 56,000 in Germany, down from 110,000 in 2011);
- 143,000 in the US (up from 119,000 in 2012).

While China created over a million jobs in the solar energy sector in two years, Europe was losing employment.

These trends show that investment – or its lack – also strongly affects the competitive position of European low-carbon industries. Europe's low-carbon industry – from renewable energy to smart energy solutions and electro-mobility – is losing ground to Japan and the US, while China is catching up. European leaders seem to worry about carbon leakage for 'old' industry, missing the point that in so doing they open the doors to 'low-carbon leakage', as pointed out by former German Environment Minister Jürgen Trittin (Euractiv 2014). Indeed, business-as-usual climate and energy policy targets do not provide proper incentives for innovation and investment and this has its opportunity costs (Summerton et al. 2014). Europe's leading market position is, however, being gradually challenged by Asia and the Americas.

3. Renewables support in practice: the key role of a functioning incentive system

In terms of the regulatory framework, support policies for renewable energy generation also play an important role. There exist three possible strategies for replacing fossil sources by renewable energy technologies that are currently not competitive. One is to subsidise the current

renewables until they become competitive; the second is to make undesired technologies (fossil or nuclear fuel) uncompetitive either by taxation or regulation; the third is to grant public support to innovation in renewable energy technologies.

In pursuit of the main objectives of decarbonisation and import substitution, a number of different support policies have been implemented across member states with considerable changes over time. Differences are often due to different priorities. For example, if the goal is decarbonisation, then emission pricing might play a more prominent role; if the concern relates rather to industrial policy, then R&D subsidies might be preferred; if it is security of supply that is seen as most important, then deployment may be the focus. In fact, every support mechanism produces substantial distributional effects that are subject to intense political debate (Figure 3 refers to these distributional conflicts). A research paper by Bruegel reviews a broad spectrum of combinations of support policies across countries. It is pointed out that Germany and Italy spent on R&D less than 0.5 percent of the budget for public support for the deployment of renewable energy technologies (Zachmann et al. 2014) and that no country applied an analytical approach for determining the policy mix best suited to the varying rationales.

The experts at Bruegel used an alternative measure – the so-called ‘revealed comparative advantage (RCA) – to estimate the relative progress actually achieved by individual countries in making the solar panels and wind turbines produced in their country competitive on the global market. Through econometric simulations the authors found that R&D spending on wind technology seems to encourage patenting in that area, albeit with rather long and variable time-lags for the effect of R&D on patenting. The most important finding of the study was that the effect of R&D spending on wind technologies is substantially augmented when the deployment of wind turbines on the continent is high. The clearest result for competitiveness is that deployment is indeed increasing the competitiveness of the corresponding technology. A sustained increase in domestic deployment of wind turbines increases the RCA ranking in wind turbines by about one position in the case of Germany. For solar panels too there is a clearly positive impact; countries which deploy more solar panels will also be exporting more of them in the future.

We see, in other words, that it is necessary to move beyond an uncoordinated support mechanism in order to identify support structures

that are resilient and efficient. In this respect, given the magnitude of the spending (about EUR 48 billion spent on deployment and EUR 315 million spent on R&D support in the five largest EU countries in 2012), investing more in ex-ante and ex-post evaluation of renewable energy technology support schemes is a necessary precondition for success.

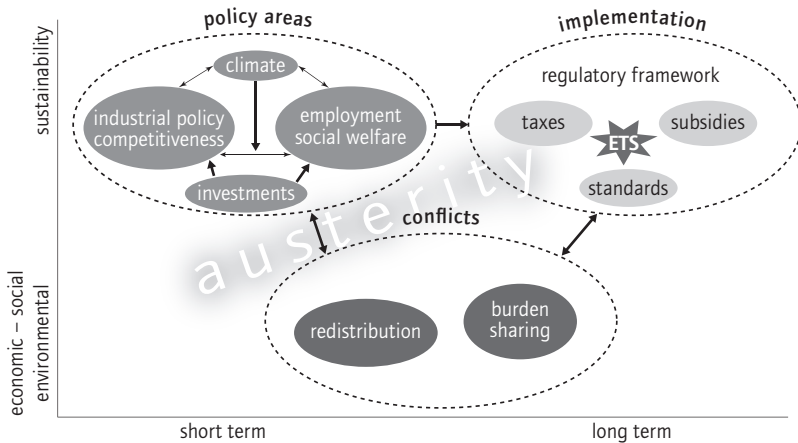
4. The main dimensions of the apparent conflicts in the field of climate and energy policy

The investment malaise manifest in Europe's green economy, as we have described it, is only partially attributable to the paralysing effect of austerity policies. Although the tightening of public budgets has certainly had a direct effect on public investment in the green economy, given that austerity defines the basic background against which policies are implemented and their effects unfold, such public investment represents only a part of the total and, as we have seen, green investment in the business sector has also suffered huge setbacks due, to some extent, to the recessionary macroeconomic environment (also a by-product of austerity policies) but also to the general philosophy of European crisis management that is so predominantly focussed on cost competitiveness. Energy costs are seen, alongside labour costs, as a main pillar of competitiveness for both enterprises and national economies and, in such an environment, the short-term costs of energy transformation are increasingly regarded as a factor that will adversely affect competitiveness. Some other circumstances, meanwhile, have further contributed to the investment blockade. Most importantly, the inconsistency and the design failure of the regulatory framework of climate and energy policies are factors that largely contributed to the uncertainty that has led to a paralysis of long-term investment.

A conceptual framework indicating the main conflicts in terms of 'economic', 'social' and 'environmental' sustainability is proposed in Figure 4 below. The dimensions under which we examine the effects and interplay of these policies are 'economic – environmental – social'. The time horizon plays a decisive role in all elements of the framework, in particular in assessing the cost/benefit effects of individual policies and measures.

It became clear in 2012 that there exists, in relation to energy transformation, a whole cluster of conflicts within which issues such as

Figure 4 The main conflicts and the interplay of policy fields in climate and energy policy



Source: author's illustration.

austerity policy, public and private investment, energy transformation (climate) targets, and employment and social issues (e.g. fuel poverty) have become intertwined in a potentially explosive mix. Current practices in Italy and Spain (see Chapters 3 and 4 of this publication) – displaying a sudden reversal of earlier progress towards renewable energy generation – tend to illustrate ways of reaching the worst outcome in all three dimensions; yet even the recent experiences of Germany (see Chapter 2 in this publication) with its '*Energiewende*' offer a rich catalogue of possible conflicts that need to be addressed – and not by Germany alone! Figure 4 thus represents an attempt to illustrate the complexity of these relationships, the interplay of which leads to a state of regulatory uncertainty that is reflected by large-scale investment aversion in the business sector.

The relevant policy areas are climate policy, industrial policy, employment policy and investment policy. Climate policy targets have a direct effect on investment (as most climate policy targets also entail definition of investment targets); yet their effect on national or European industry will depend on whether or not they are underpinned by relevant industrial policy initiatives. In cases where climate policy is not accompanied by an appropriate industrial policy, it may well be the case that progress in PV installation will not have a positive effect on the

domestic PV industry insofar as the capacity increase is covered by imports, as the example of Italy (Chapter 3 of this publication) shows. How competitiveness relates to other policy areas depends to a major extent on the time horizon and the way we interpret competitiveness. Most of the current conflicts between European policymakers and industrial lobby groups (Voest Alpine 2014) in the energy policy field reflect these interpretations. For short-term competitiveness, especially if it is defined as cost competitiveness, a higher energy and carbon price is seen as detrimental. However, a higher carbon price that would be essential to provide incentives for a green transformation and clean energy investment contributes to innovation and would thus make industry more competitive in the longer run.

Regulatory inconsistencies and design failures in the implementation of climate and energy policies can be well illustrated by the way the EU Emission Trading System (EU ETS) affects national energy transformation policies. The German energy transformation has been one of the most ambitious European efforts to replace fossil- and nuclear-energy-based power generation by renewables and to achieve ambitious targets in reducing ghg emissions. If the results are ambiguous, this is to a large extent due to the malfunctioning of the EU ETS. Between 2000 and 2013 annual electricity generation by renewable energy had grown by 114 Terawatt hour (TWh) in Germany, while electricity produced by nuclear power had sunk by 72 TWh, with fossil fuel generation for the domestic market also reduced (Baake 2014). Yet electricity generation from fossil fuel remained at the same level and ghg emissions from electricity generation did not improve (319 million tonnes in 2000 and 317 million tonnes in 2013).

One essential factor behind this was that Germany became an exporter of electricity with an export surplus of 34 TWh in 2013 mostly through the export of fossil-fuel-generated electricity; the malfunctioning of the EU Emission Trading System was the main reason behind this unwelcome development. The price of a tonne of CO₂ emission allowance in 2008 was EUR 22 which meant that modern gas-powered electricity generation was cheaper than coal-fuelled. Due to the crisis and the abundance of CO₂ allowances, the price of a tonne of CO₂ emissions had collapsed to EUR 6 to 7 by the end of 2014. With this low carbon price, polluting lignite-powered electricity generation outprices less polluting hard coal and both push the relatively clean gas-powered electricity out of the market. To counteract these negative effects CO₂ allowances need

to be withdrawn from the market; and yet a Commission initiative to this end backed by the European Parliament was blocked by a coalition of member states in the European Council and a reform of the ETS along the suggested lines is not now to be expected until the next decade.

Since 2009, the EU ETS has experienced a growing surplus of allowances and international credits compared to emissions, a development that has significantly weakened the carbon price signal. In January 2013, at the start of phase 3, the surplus stood at almost two billion allowances, double its level in early 2012, and by the end of 2013 it had grown further to over 2.1 billion. The surplus has been caused by several factors, principally the economic crisis and high imports of international credits. While the rapid build-up is expected to end as from 2014, it is not anticipated that the overall surplus will decline significantly before the end of phase 3 in 2020. It is expected that there will be a structural surplus of around 2 billion allowances during most of phase 3, a fact which threatens to undermine the functioning of the carbon market.

If these imbalances are not addressed, they will profoundly affect the ability of the EU ETS to meet more demanding emission reduction targets in the future. As a short-term measure, the Commission is postponing the auctioning of 900 million allowances until 2019-2020 in order to allow demand to pick up. This 'back-loading' of auctions is being implemented through an amendment to the EU ETS Auctioning Regulation (European Commission 2015b). Back-loading does not reduce the overall number of allowances to be auctioned during phase 3, affecting only the distribution of auctions over the period. In 2014, the auction volume will be reduced by 400 million allowances, in 2015 by 300 million, and in 2016 by 200 million. At the same time, the Commission released the list of industries that are granted free emissions allowances up to 2019 in order to prevent 'carbon leakage'. These industries would receive nearly four billion free allowances up to 2019 at an estimated value of EUR 39 billion (Greenpeace 2014). Greenpeace claims that the allocation of free emission allowances was calculated at a carbon price of EUR 30, whereas the Commission's impact assessment forecasts an average carbon price of EUR 16.5 for the 2015-2019 period. The case of the EU ETS thus illustrates that a narrow interpretation of short-term economic interests prevents the overhaul of the emissions trading system that would be necessary for its proper functioning.

We have argued here that managing the transformation process towards a low-carbon economy, and in particular the transformation of energy

consumption and production away from fossil fuels toward renewable forms, requires a comprehensive policy framework and a determined but balanced implementation practice. The past six years of economic crisis have demonstrated clearly that, in the absence of such a framework and without a clear long-term commitment, short-term economic interests will prevail. The combination of austerity policies, adjustment policies that regard competitiveness in terms of price and cost competitiveness (to be achieved by low wages and cheap energy) and the lack of a consistent regulatory framework lead to the situation in which Europe finds itself today, namely, a lack of progress in all three – ostensibly conflicting – policy fields: economic, climate (energy) and social. We have shown that Europe is losing ground in its once highly valued climate policy leadership, that investment into clean energy, both public and private, is collapsing; and that other regions of the world are taking over the leadership in developing low-carbon technologies and benefitting from the job creation to which this leads. We have referred also to the potential conflict field in terms of climate, energy, industrial and employment policies, and have seen that a malfunctioning European Emissions Trading System and an inappropriately designed public support scheme also contribute to the investment aversion displayed by the business sector. A fair and transparent burden-sharing among the main economic actors, such as state, business sector (employers and employees) and households is missing in financing the green transformation; instead this field becomes a playground for short-term lobby interests.

In the following chapters of this publication further insight will be provided into the difficulties faced by energy transformation in Europe during the period of the crisis. Three country studies address the main conflicts, each of them approaching an exemplary case from a different angle. Chapter two highlights the ‘model case’ represented by the German *‘Energiewende’* by means of which Europe’s economic powerhouse struggles to find its way to reach its own ambitious targets while handicapped by serious setbacks due above all to conflicts over burden-sharing. Chapters three and four describe the experiences of two countries that were early forerunners in renewable energy deployment but, after being severely hit by the crisis, are today having to cope with major setbacks. The example of Italy (chapter 3) points to the lack of policy coherence and, in particular, to the absence of industrial policy that played a key role in derailing a promising experiment in energy transformation. The Italian case shows also how several years of recession

can undermine a formerly existing consensus over burden-sharing. Spain (chapter 4) provides an explicit case of how austerity and political lobbying power on the part of major energy companies can undermine the whole regulatory system for promoting renewable energy generation, thereby jeopardising years of progress and hundreds of thousands of jobs, as well as energy security. Chapter five examines the case of energy efficiency and, in particular, the retrofitting of buildings, pointing to the lack of progress and describing some of the factors that are preventing it. Chapter six takes a conceptual look at the employment effects of the green transformation, while chapter seven draws some conclusions.

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