

The Carbon Trust: A model for fostering low carbon innovation in the transition countries?

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Abstract: This paper argues that fostering low carbon innovation is key to achieving two EU policy goals simultaneously: reducing carbon emissions and being competitive. The UK has ambitious goals in reducing its carbon emissions by 60% in the long term and has set up the Carbon Trust as an independent, non-profit company, led by business but financed by the government. Its mission is to help businesses to cut their carbon emissions and to support the development of low carbon technologies. The aim of this paper is to analyse the Carbon Trust's activities and to discuss to what extent the Carbon Trust approach could be a model for the transition countries in Central and Eastern Europe. The analysis is based on 26 semi-structured interviews, as well as a literature and documentary review. It finds that the Carbon Trust approach is promising, but that there are substantial difficulties in transferring this model to the transition countries.

Keywords: Sustainable energy, innovation policy, Carbon Trust, transition countries

1. Introduction

The EU's Lisbon strategy calls for making Europe the most competitive economy in the world. The EU also wants to be a global leader in tackling climate change and has committed to reducing greenhouse gas (GHG) emissions across Europe by 20% by 2020. Innovation is hoped to contribute to both ambitious goals simultaneously: Innovation is believed to play a major role in tackling long term targets for reducing carbon emissions, because "[t]echnological change supports all the hopes for painless reduction in GHG emissions. It promises the uncoupling of economic growth and fossil energy use" (Thalmann, 2007: 5263). The Stern review on the economics of climate change also notes "that policy to support innovation and the deployment

of low carbon technologies will be a key response to mitigating climate change” (DTI, 2007: 216). Innovation is generally regarded as a key factor for the competitiveness of an economy (Tidd et al., 2005). Low carbon innovation¹ is thus often seen as a win-win situation, tackling climate change, as well as providing potential economic benefits and thus contributing to sustainable development.

Different European countries have developed diverse policy mechanisms to support low carbon innovation. As of yet, there has been limited analysis of such policies or sharing of experience across Europe. The UK is one of the countries which has ambitious long term goals for deep cuts in emissions. The Climate Change Bill makes a legal commitment to reducing GHG emissions by 60% by 2050 and low carbon innovation is hoped to contribute substantially to this goal (DEFRA, 2007). One of the main policy mechanisms through which this long-term promise is supposed to be delivered is the Carbon Trust. The Carbon Trust is an independent company funded by government, which was set up as part of the 2000 Climate Change Programme. Its mission is to accelerate the UK’s move to a low carbon economy (Carbon Trust, 2007a).

The aim of this paper is to describe the Carbon Trust’s activities to foster low carbon innovation and to discuss whether the Carbon Trust could be a model for the transition countries in Central and Eastern Europe. It is based on 26 semi-structured interviews with employees of the Carbon Trust and key stakeholders from government, research, business and environmental groups (for a list of interviewees, please see Appendix), which were informed by and complemented with a literature and documentary review. The paper is based on insights from innovation (policy) studies. Section 2 will describe the Carbon Trust’s activities in the UK. Section 3 will discuss whether the Carbon Trust could be a suitable model for the transition countries in Central and Eastern Europe in developing their energy systems towards sustainability. The final section will present the conclusions of this paper.

¹ Low carbon innovation can take several forms: product innovation (e.g., new technologies to generate electricity with less carbon emissions), process innovation (e.g., improving the energy efficiency of a manufacturing process) or organizational innovation (e.g., energy service companies helping to reduce demand for electricity).

2. The Carbon Trust in the UK

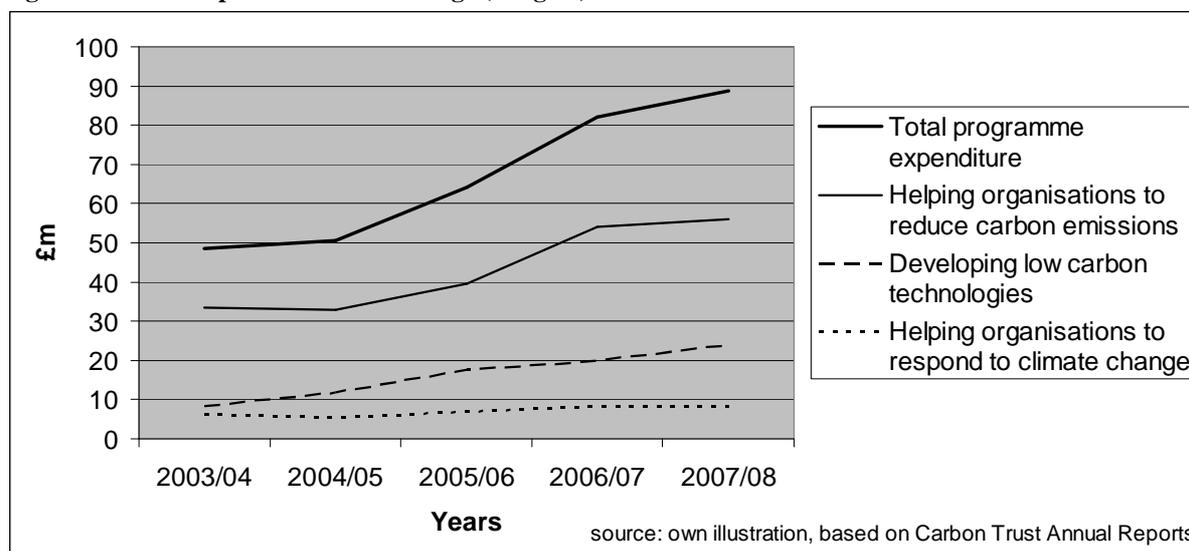
The Carbon Trust (CT) was created in 2001 as a low carbon innovation champion with the then prime minister Blair announcing that: “The Carbon Trust will take the lead on low carbon technology and innovation in this country and put Britain in the lead internationally” (cited in Foxon, 2003: 44). Activities of the CT are aimed at reducing carbon emissions in the short, medium and long term, which needs to be balanced with the aim of improving cost efficiency year by year (Carbon Trust, 2006: 50), as well as developing new low carbon technologies as this will both help to address climate change and also develop vibrant new sectors in which the UK could become a world leader (Carbon Trust, 2007b: 1).

The Carbon Trust is mainly financed by central government (Department for the Environment, Food and Rural Affairs, DEFRA; and the Department for Business, Enterprise and Regulatory Reform, DBERR), but the devolved administrations (Northern Ireland, Wales and Scotland) also contribute some funding. As of March 2007, the CT had 134 employees and received a total grant funding of £115.8m (ca. €1467m) for 2007/08 (Carbon Trust, 2007c).

The CT has been set up as a company limited by guarantee and is thus independent from government in its day-to-day decision making. Its chairman and chief executive have been appointed by government. The senior management team is held accountable by a board. Among its 17 board members are 5 members who represent the governmental departments funding the CT (DEFRA, DBERR, Scottish Executive, National Assembly of Wales, and Invest Northern Ireland), but do not have any veto powers. Its other members represent a “wide range of experience from industry, trade union and non-governmental organisations” (Carbon Trust, 2006: 38). The CT’s board is mainly comprised of business people and civil servants, but has very little representatives from NGOs or academia.

Its main target groups are businesses and the public sector and the CT’s work is organised around five complementary business areas: *Carbon Trust Insights* to inform businesses and policy makers, *Carbon Trust Solutions* to help companies to reduce their emissions, *Carbon Trust Innovations* to help develop low carbon technologies, *Carbon Trust Enterprises* creates new low carbon businesses using existing technologies and *Carbon Trust Investments* finances the best ideas and business plans (Carbon Trust, 2007a: 5). For an overview of its programme spending see Figure 1.

Figure 1. Carbon Trust programme expenditure on helping organisations to reduce carbon emissions (Solutions), developing low carbon technologies (Innovations, Enterprises, Investments) and helping organisations to respond to climate change (Insights).



Source: based on Carbon Trust's Annual reports.

The aim of the Carbon Trust's *Insights* programme is to inform businesses and policy makers about the importance of reducing carbon emissions. It spent £8.4m on these activities in 2007/08 (see Figure 1). Through independent and high quality reports on, e.g., impacts of the EU ETS on competitiveness or suitable policy frameworks to support renewables, the CT hopes to contribute to policy thinking in these areas and its analysis may have helped change policy in some instances. Interviewees, e.g., pointed to the development of the energy efficiency commitment², as well as the government's decision to roll out smart meters as examples where analysis by the Carbon Trust has informed policy thinking (interviews 6, 12). Through its current work on the carbon footprints of production chains, the Carbon Trust also hopes to inform business about the possibilities for supply chain management and help in the creation of credible methodologies for carbon labelling. The Carbon Trust "has built up a strong brand image and raised awareness in the business community and the public sector of the need to reduce carbon dioxide emissions" (NAO, 2007: 6; also confirmed by interview evidence). It is difficult to assess precisely how big the influence of the CT on policy change or changing business practice is.

² The energy efficiency commitment demands that electricity and gas suppliers achieve certain targets for reducing demand in households through measures such as insulation, low energy lighting and energy efficient appliances (IEA, 2007a).

The Carbon Trust *Solutions* programme is trying to directly help companies to reduce their carbon emissions and is where the CT spends most of its resources. In 2007/08 the CT invested £56.2m in such activity (see Figure 1). As part of its *Solutions* programme, the CT offers advice to companies and public institutions on how to save energy or increase energy efficiency (through information booklets, a website and call centre), offers free energy audits for large companies, offers tax breaks for energy efficient equipment (so-called enhanced capital allowances) and gives interest free loans to small and medium-sized companies to purchase energy efficient equipment.

A recent report of the UK National Audit Office (NAO) assessed the impact of the Carbon Trust's activities so far in terms of carbon emissions saved and cost effectiveness. The report states:

In 2006-07, the advice and financial support for measures to reduce carbon dioxide provided by the Carbon Trust resulted in an estimated reduction in carbon dioxide emissions by its customers [businesses and public sector] of between 1.2 million and 2.0 million tonnes, equivalent to a projected net financial saving of between £222 million and £359 million in future reduced energy costs (NAO, 2007: 5).

The projected financial savings over time amount to twice the costs of the measures. The Carbon Trust has been material in helping actors to make these savings, as 60% of respondents to the NAO census state that they would not have implemented the same level of carbon savings without the Carbon Trust. However, the report also points out that “organisations could achieve much greater reductions in carbon dioxide emissions, as less than 40 per cent of the carbon savings identified by the Carbon Trust between 2003 and 2006 have so far been realised” (NAO, 2007: 6). This shows that the advice offered by the Carbon Trust under the *Solutions* programme, although mainly offered for free, including financially attractive conditions for equipment purchase, are facing further challenges to change business practices on a wider scale.

The CT supports the development of low carbon technologies through all the stages of innovation from R&D to promoting deployment (IEA, 2007a: 168). As part of its *Innovations* programme, the Carbon Trust funds RD&D projects in their *applied research* scheme. Through the applied research scheme, universities, local authorities or any business can receive up to £250,000 for research projects “that show genuine innovation, strong potential to reduce UK carbon emissions and a credible route to commercialisation” (Carbon Trust, 2006: 20). The CT

also runs an *incubator scheme* offering advice to new companies in commercialising their R&D and attracting commercial investment. Incubator companies get flexible consultancy support of up to £60,000. So far, 40 companies have been supported with approx. £2m in total. The companies which receive help are mostly start-ups or spin-offs from Universities or industry, such as Oxford Catalysts which received support through the CT-ANGLE incubator providing a market analysis, help with a long-term management plan and identifying potential partners (Carbon Trust, 2007b: 4-5). In addition the CT runs *technology acceleration projects*, which are aimed at identifying regulatory, financial and technical barriers to the growth of technologies. This may include conducting trials and demonstration projects, carrying out engineering assessments and helping to accelerate technologies 'down the cost curve' (Carbon Trust, 2006: 22). The CT currently has 5 technology acceleration projects with a total budget of £25m over 5 years. These are biomass heating, small scale combined heat and power (CHP), advanced metering, low carbon buildings and marine energy. The aim is to accelerate the development of these technologies on a commercial scale (Carbon Trust, 2007a: 8).

The Carbon Trust has also expanded its role in commercialising low carbon ideas based on proven technologies by establishing Carbon Trust Enterprises Ltd. (CETL). The first company it set up was a heat energy networks company, which will "identify, develop, finance and operate a series of heat energy networks across the UK" (Carbon Trust, 2006: 22) to transfer industrial waste heat to heat consumers nearby. The company, called 'Connective Energy', was established in July 2006 in cooperation with Doosan Babcock Energy and the Triodos Renewable Energy Fund (Carbon Trust, 2007a: 11). It aims to construct 10 heat pipelines for the utilisation of waste heat over the next three years, targeting a potential £1b UK market. The Carbon Trust also set up a company developing renewable energy projects on public sector land called 'Partnership for Renewables'. The Carbon Trust invested £2.5m in its Enterprises programme in 2006/07 (Carbon Trust, 2007c: 19). It is an unusual but welcome activity, as setting up new businesses using existing technology is usually outside the realm of government activities for supporting innovation, but this is possible for the CT as an independent organisation. This support for social (in this case organisational) rather than just technological innovation is very welcome from a socio-technical point of view, as technology development on its own will not be enough to achieve a transition towards a low carbon energy system (Verborg and Geels, 2007).

To complement the other innovation programmes, the CT also directly co-invests in new low carbon technologies. With its *Investments* programme the CT aims to address a lack of private finance for small scale investments, between £250,000 and a few million pounds (Carbon Trust, 2007a: 12). In 2005/06 the CT invested £2.1m in two new companies and thus widened its venture capital investment portfolio and made follow-on investments in two companies. The CT hopes that “acceptable investment returns should be generated from the portfolio over time” (Carbon Trust, 2006: 46). Overall the first six equity investments totalled £6.7m in technologies such as fuel cells and offshore wave generation and it is pointed out that this investment has also helped to leverage further private sector investment worth £67m (Carbon Trust, 2007a: 12). The Carbon Trust prides itself on a good reputation in the community investing in clean technology and through its co-financing of investment often functions as ‘the last pound on the table that makes the deal work’ (interview 12). The support of the Carbon Trust lends credibility and reputation to technology developers and increases the chance of attracting investors (interview 16, 18). This is also confirmed by companies which received incubator support from the Carbon Trust (Carbon Trust, 2007b).

Together, the *Innovations*, *Enterprises* and *Investments* programmes of the CT are aimed at maximising “carbon savings over the medium and long term by supporting the development and deployment of low carbon technologies” (NAO, 2007: 22). According to this report “[t]he Carbon Trust has estimated that its support given to emerging technologies up to March 2007 could reduce emissions by between 13.7 million tonnes and 20.7 million tonnes a year by 2050 at a cost of between £3 and £5 a tonne” (NAO, 2007: 23). In total the Carbon Trust spent £24m in 2007/08 on supporting the development of low carbon technologies (see Figure 1).

The Carbon Trust seems to be a unique and promising organisation charged with the task of fostering innovation to help the UK to move to a low carbon economy. Foxon and Pearson (2007: 1547) have argued that the CT as a public-private institutional structure advances the procedural and institutional basis for the delivery of the UK's sustainability innovation policy by combining public funding and business expertise. Connor (2004) praised the early low carbon innovation programme of the Trust as “the most interesting departure from historical UK policy relating to innovation”, because it covers technological development at all stages of maturity and hopes to remove barriers to these technologies by applying specific funding to solve particular problems they might encounter.

As described above, the CT operates a novel variety of funding types to support innovation and covers different forms of innovation, such as product innovation, process innovation and organisational innovation. It not only offers standard R&D or demonstration programmes funded by grants which often do not lead to sufficient price-performance improvements, but also offers direct equity investment in promising companies, such as fuel cell developers, sets up new businesses and provides targeted engineering and consulting support for new players such as spin-offs and start-ups. It is too early to forecast the success of the CT's work with regard to the development of medium to long term technologies. However, the strategy to explicitly tackle technological problems to drive down costs through targeted, proactive support of R&D and to tackle other barriers in key areas through a variety of support mechanisms seems to be promising. The expectation is that all of the renewables technologies will move down the learning curve in the future (see e.g. Gross, 2004) and the Carbon Trust is hoping to accelerate this process. Overall, the Carbon Trust seems to be a very useful approach for fostering low carbon innovation. The question thus is whether the Carbon Trust could be a potential model for the transition countries in Central and Eastern Europe of supporting low carbon innovation and promoting sustainable development in their economies.

3. The Carbon Trust: A model for the transition countries in Central and Eastern Europe?

The considerations made here are only preliminary, as the author is not an expert on transition countries. What the following section is merely hoping to do is to throw up some questions which need consideration with regard to potential lessons for these countries from the Carbon Trust model. The five issues I would like to focus on are: the capabilities for low carbon technology in the transition countries, the potential sources and scale of funding available for supporting such innovation, the role of international cooperation in this area, the differing political and cultural background in transition countries and some issues regarding the political desirability of emulating the Carbon Trust model.

An important aspect that needs consideration is the scientific and technological capabilities of a country. The sectoral innovation systems approach emphasises the importance of firms developing and utilising a sector's technologies (Geels, 2004). As the Carbon Trust model very much aims at establishing international leaders in low carbon industry sectors, the

question is: which options are there for the transition countries based not only on their scientific and technological capabilities, but also on the availability of local resources (e.g. wind speeds)? In which fields do these countries have a promising position and could they take the lead in specific areas of technological development? In general, activity in the development of clean energy technology seems to be rather low in Central and Eastern Europe, as altogether this region only attracts 3% of the European venture capital deals in clean energy (Carbon Trust, 2007d: 11). Also, because of EU state aid rules the Carbon Trust cannot target specific companies with its programmes, so the success of its activities depends on entrepreneurs and firms actively coming forward with ideas. However, if the main policy goal is the diffusion of existing technology and innovations from foreign countries, other policy instruments might be more suitable.

In the UK the Carbon Trust was set up as one of the measures of the 2000 UK Climate Change Programme (DETR, 2000). An important element of this climate change programme is the climate change levy (CCL). The CCL is a downstream tax levied on the non-household use of coal, gas, electricity and non-transport LPG. It was designed to be revenue-neutral and most of the revenue is being recycled back to levy payers through reductions in employers' national insurance contributions, but a small share of the revenue is used to fund the Carbon Trust to stimulate energy efficiency and the development of low carbon technology (Dresner et al., 2006; Pearce, 2006). This has ensured a relatively stable flow of resources to the Carbon Trust, as this recycling was part of a political deal to boost the acceptability of the levy to business (interviews 6, 12). If the model of the Carbon Trust was to be transferred to other countries, one of the central questions is where the resources would come from? To re-channel existing spending on science and technology might not be an appropriate solution. One potential source of funding could be the auctioning of a share of EU ETS allowances in the future, as planned by the European Commission. This might ensure a continuous flow of resources. The second question regarding funding is whether it would be at an appropriate scale to make a material impact? It is difficult to determine what an appropriate scale is. To be successful, the minimum requirements seem to be that the funding is sufficient to cover all crucial areas which could lead to reduced emissions (electricity, heat and transport) and within these areas to cover technologies at different levels of maturity. Prioritisation will be necessary to avoid spreading resources too thinly to make an impact.

Another important consideration is whether the transition countries should opt for the Carbon Trust model as a national champion for low carbon innovation or rather focus on international cooperation, e.g., at EU level, between transition countries or among OECD countries as suggested by the International Energy Agency? If there are limited opportunities for national funding, one should avoid spreading resources too thinly. International cooperation seems to make sense, since it is likely to lead to “better returns on R&D investment through the sharing among participants of financial outlay, workload and results” (IEA, 2007b: 41). However it might also negate one of the main reasons for establishing a Carbon Trust: to produce economic wealth from low carbon technologies for the country involved. International cooperation will, by its very nature, produce benefits for all partners. Both options need not be alternatives, but presumably will compete for funding.

It is important to consider the differing cultural and political traditions of countries in Central and Eastern Europe in deciding whether the Carbon Trust approach could be a useful model for them. I would argue that the degree of independence of the Trust in the UK is probably difficult to ‘sell’ in most other contexts. Setting up such an organisation as a business needs some sort of ‘entrepreneurial’ spirit in policy makers, a strong belief in market forces and implies the outsourcing of funding decisions to delivery bodies to ‘get on with the job’. The agenda of liberalisation and its faith in the power of markets remains strong in the UK. Liberalisation and globalisation remain the dominant political drivers at macro level (Shackley and Green, 2007). One question is whether this approach would be politically acceptable in any of the Central and European transition countries? The political influence of the government on the activities of the Carbon Trust is low, although the Carbon Trust is funded by government. This also poses questions about legitimacy, which have not really been raised in the UK, but might lead to resistance to this model elsewhere.

Finally, is the Carbon Trust model a socially and politically desirable approach to stimulating low carbon innovation? It seems the understanding of the Carbon Trust is based on a very technocratic model of technology and governing innovation. Its activities show little engagement with civil society. The CT sees it work as ‘politically neutral’, but policy and choices regarding technological development are arguably political and sustainability as a goal is contested. Critics argue that what is environmentally and socially benign cannot be ‘technically’ determined, but is a matter of political choice (Shove and Walker, 2007). A good

example of conflict is given by the recent discussions about the sustainability credentials of biofuels in terms of their wider social and environmental consequences. If these matters are political, then is it desirable to ‘outsource’ decisions on which technologies to support to a business with limited democratic accountability? Although the social and political acceptability and embedding of technologies are crucial factors in their wider deployment, the Carbon Trust does little to foster societal engagement with its activities (cf. interview 14). A technology-push approach might lead to protest from societal groups, which could hamper the deployment of technologies (see e.g. Verbong and Geels, 2007). The work of the Carbon Trust is also (necessarily) focussed on reducing carbon emission as the key metric against which the organisation is judged, together with economic goals such as the creation of low carbon industry, not on social aspects (e.g. fuel poverty) or wider environmental aspects of sustainable development (other than carbon emissions, e.g. loss of biodiversity).

4. Conclusion

This paper has analysed the Carbon Trust in the UK as a novel organisation fostering innovation aimed at achieving a low carbon economy. The aim of this paper was to describe the Carbon Trust’s methods of fostering innovation and to discuss to what extent the Carbon Trust could be a model for the transition countries in Central and Eastern Europe.

In summary, the activities of the Carbon Trust consist of a variety of well-targeted ways to stimulate the development of low carbon technologies and help organisations to reduce their carbon emissions. Pursuing a combination of both strategies is seen as very helpful. Technological development is supported not only through grants for applied R&D, but also through direct equity investment in promising start-up companies, setting up new low carbon businesses using existing technologies and by providing targeted engineering and consultancy support for new players. The Carbon Trust also contributes to the rising awareness of emissions in companies and public organisations and offers help in cutting emissions by advising managers, as well as providing loans or tax breaks for the purchase of energy efficient equipment.

The paper also posed the question: what can be learned from the experience with the Carbon Trust for the transition countries in Central and Eastern Europe? Five issues have been

highlighted which are important when thinking about using this model for supporting low carbon innovation. They relate to the capability for low carbon technologies, the availability of sufficient funding, as well as differing political and cultural conditions. The potential role of international or regional cooperation in this area has been highlighted and some critical issues regarding the political desirability of emulating the Carbon Trust model have been discussed.

A more detailed analysis of the applicability of the Carbon Trust model in other countries would need to look at the country specific situation much more closely than was possible in this paper. A useful starting point would be to analyse the political goals for the sustainable transformation of the economy (e.g. what level of emission cuts are desired and by when?) and the capability for innovation in the energy sector (available resources, capabilities, infrastructure, networks, institutional setting, etc).

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Appendix

List of interviewees

Position of interviewee	interview	interviewee code
Policy advisor of business association	19.10.07	1
Member of senior management of the Carbon Trust	16.01.08	2
Former senior civil servant at DETR (now DEFRA)	13.03.08	3
Senior civil servant at DBERR	08.02.08	4
Member of the Carbon Trust steering board	08.02.08	5
Head of policy in environmental organization	03.03.08	6
Former senior servant at DETR	06.03.08	7
Former ACBE member	31.01.08	8
Senior researcher	05.02.08	9
Senior civil servant at DBERR	08.02.08	10
Member of the Carbon Trust board	12.02.08	11
Senior civil servant, DEFRA	14.02.08	12
Civil servant, DEFRA	14.02.08	13
Representative of organization promoting alternative technology	05.02.08	14
Representative of business association	11.02.08	15
Managing director of marine device developer	18.02.08	16
Senior management of the Carbon Trust	19.02.08	17
Technology manager, the Carbon Trust	19.02.08	18
Senior civil servant, DBERR	13.02.08	19
Senior researcher	28.02.08	20
Lecturer in renewable energy policy	22.02.08	21
Business member of the Carbon Trust board	03.03.08	22
Senior management, the Carbon Trust	05.03.08	23
Senior management UKERC	12.03.08	24
Professor for Energy policy	17.03.08	25
Former senior management of the Carbon Trust	10.03.08	26

Carbon Trust: model wspierający innowacje na rzecz niskiej emisji dwutlenku węgla w krajach podlegających transformacji?

Streszczenie:

W niniejszym artykule przedstawione zostały argumenty, zgodnie z którymi popieranie innowacji zakładających niską emisję dwutlenku węgla jest kluczowe dla osiągnięcia równocześnie dwóch celów polityki Unii Europejskiej: ograniczenia emisji dwutlenku węgla oraz utrzymania konkurencyjności. Wielka Brytania wyznaczyła sobie ambitny cel zmniejszenia w długim okresie emisji dwutlenku węgla o 60% oraz ustanowiła *Carbon Trust* jako niezależne przedsiębiorstwo non-profit, prowadzone na zasadach rynkowych ale finansowane przez rząd. Jego misję stanowi pomoc światu biznesu w ograniczeniu emisji dwutlenku węgla oraz wspieranie rozwoju technologii niskiej emisji. Celem poniższego artykułu jest analiza działalności *Carbon Trust* oraz omówienie, do jakiego stopnia podejście *Carbon Trust* może być traktowane jako modelowe dla podlegających transformacji krajów Europy Środkowo-Wschodniej. Analiza opiera się na 26 częściowo ustrukturalizowanych wywiadach, jak również na przeglądzie literatury i dokumentów źródłowych. Prowadzi ona do wniosku, iż podejście *Carbon Trust* jest obiecujące, jednakże istnieją poważne trudności w przeniesieniu tego modelu do państw podlegających transformacji.

Słowa kluczowe: zrównowazona energia, polityka innowacyjna, Carbon Trust, kraje podlegające transformacji.