

Investigating Effects of Green Taxes on Investments in Renewable Energies: The Case of the UK

Lisa Moritz and Hafez Abdo

Nottingham Business School, Nottingham Trent University, Burton Street, Nottingham, NG1 4BU, UK

Received 2014-03-02; Revised 2014-03-04; Accepted 2014-04-04

ABSTRACT

This research paper seeks to explain and analyse the effects of green taxes on investment in renewable energies in the case of the UK. As climate change is challenging the world, different measures and instruments have been implemented to tackle it. The implementation of green taxes on environmental pollution is one example. Even though green taxes aim to reduce greenhouse gas emissions, they also affect investments in renewable energy projects both positively and negatively. Firstly, the topic is seen in the context: The UK energy targets and green taxes are described and the connection between environmental taxes and investments in renewable energies is discussed. This is followed by a discussion and analysis part, which is achieved by collecting and evaluating qualitative and quantitative secondary data that mainly comprises governmental documents, newspaper and academic articles as well as numeric statistics and graphs. It can be seen that on one hand, green taxes, besides cutting on emissions, encourage investment in renewable energies as they put particularly energy intensive organisations under pressure to use more renewable sources, which means that companies will have to change behaviour and fall back on renewables. On the other hand, it can likewise be seen that green taxes come along with negative side effects. This is due to how taxes are implemented and how politicians do not agree on how to handle them. They lead to high energy bills and can have a deterrent effect on investment in renewable energies as companies may choose to obtain more reasonable energy from other countries and sources.

Keywords: Climate Change, Environmental Taxes, Renewable Energy, UK

1. INTRODUCTION

The European Union (EU) requires its member states to reduce carbon emissions by setting energy targets for 2020 and 2050. This reduction in emission is sought by increasing dependants on green energy that is generated through investments in renewable energy sectors. The targets are stated in the 'EU's Renewable Energy Directive' and aim at providing sustainable energy by increasing the generation of clean and affordable energy. In order to meet the EU objective, the UK has developed an energy policy that is hoped to be successful in providing efficient, clean and affordable energy, i.e. sustainable energy to the UK citizens and businesses.

The UK is aiming to achieve significant improvement on the energy sustainability measures by increasing the share of renewables of its energy mix to 15% and to cut down carbon emissions by 34% by 2020 and further to 80% by 2050 (DECC, 2011a; DEFRA, 2013). To achieve these targets, the UK needs to attract an inflow of billions of pounds to be invested in low-carbon and renewable energy projects over the next decade. However, according to Bawden (2012), research shows that investments in renewable energy projects has more than halved in the past three years.

In order to tackle climate change related issues, the UK government introduced a number of measures: Carbon Floor Price (CFP); Vehicle Excise Duty

Corresponding Author: Lisa Moritz, Nottingham Business School, Nottingham Trent University, Burton Street, Nottingham, NG1 4BU, UK

(VED); Industrial Energy Tax (IET); Landfill Tax and Climate Change Levy (CCL). It is aimed that these duties will result in reducing carbon emissions and encouraging investments in renewable energies.

There seems to be lack of studies on the UK energy policy and its effectiveness on promoting investments in renewable technologies and in cutting carbon emissions. Therefore, this study tries to fulfil this gap by highlighting aspects of the UK energy policy and its roles in providing for secure energy supply to the UK; the effects of this policy on reducing emissions will also be analysed. In a nutshell, the objective of this research paper is to critically analyze the effects of UK green taxes on investment in renewable energies in the UK.

The significance of this study arises from the fact that climate change is a global problem that is challenging politicians, which is why the UK government decided to implement green taxes as policy tools to encourage more environmentally friendly behaviour among organisations that emit greenhouse gases. This is to encourage dependence on renewable energy sources that do not emit greenhouse gases. The main problem is that renewable energy projects require significant investments and the UK energy policy seems to lack sufficient stability and this may be affecting investments in green energy projects.

Therefore, this study raises the following question: What are the effects of green taxes on investment in renewable energies: The case of the UK? In order to provide a rich explanation to this research topic and to answer the research question, the following sub-questions emerged and will be answered within this study:

- What are the UK Energy targets
- What are green taxes and what are their objectives
- How the effectiveness of environmental taxes is determined and measured

Answering the research question and initially its sub-questions, will be put forward by putting the research topic in a literature context, explaining the research methodology and methods, followed by analysing and discussing the collected data and finally drawing conclusions and recommendations based on our analysis.

2. LITERATURE REVIEW

Climate change is one of the major challenges the world faces today. Least of all, this can be attributed to the world's ever increasing demand of energy that has been met for decades by fossil fuel which emits much greenhouse gases. In order to tackle climate change, greenhouse gas emission has to be cut and energy taxes

have been used as policy tools to achieve material cuts in emissions. However, cutting global emissions to satisfactory levels requires both national and international action and collaboration.

2.1. UK Energy Targets

The UK government sets out a framework that aims to address energy challenges as well as defining energy targets. At present, the UK energy policy is defined in the 'White Paper on Energy' from May 2007. Besides its intention to tackle climate changes, the UK energy policy is focused on ensuring secure, clean and affordable energy supply (Abdo, 2011). The UK's Department of Energy and Climate Change (DECC) has developed a strategy to meet these targets. It established that the UK has to "save energy, develop cleaner energy supplies; and secure reliable energy supplies at prices set in competitive markets" (HMG, 2007). These broad set targets are in fact broken down into several smaller energy targets as follows: To deliver approximately 20% of the whole UK's energy from renewable sources by 2020; and to reduce UK carbon emission by at least 26-32% by 2020 and another 80% by 2050 (DECC, 2011a).

In order to meet these targets, the UK government wants to support low carbon technologies and hence, implemented the Carbon Reduction Commitment. This is a scheme that applies to companies whose "mandatory half hourly metered electricity consumption is greater than 6,000 MWh per year" (HMG, 2007). The scheme also applies to not-energy-intensive organisations in the public and private sector that do not fall under the EU Emissions Trading Scheme (EU ETS).

A related point is that the current focus is set on reforming the electricity market. It is said that renewable electricity is one key to both tackling climate change and providing cleaner sources of energy. The reforms intends to "secure the investment needed to deliver a reliable diverse low carbon technology mix" (HMG, 2012).

The investment and focus on renewable energy is seen as the ideal solution in overcoming, or at least reducing, UK energy challenges. Nevertheless, it is seems impossible to replace fossil fuel and nuclear power stations by renewable energies all at once. It not only goes beyond the UK's resources, but the energy transition is also very cost-intensive and the UK policy and security goals have to be met simultaneously. Since technologies that generate renewable energy are still relatively new, to enhance renewables' implementation they need subsidy from the private and public sector. The further renewable technologies development the more likely it is for renewables to compete in the market without subsidy. In 2012, the global renewable investment was nearly \$250 billion (IEA, 2013). This

gives an impression of the dimension of investment globally needed and demonstrates that renewable energy still needs a lot of funding and other incentives to prosper and meet expectations. In order for companies to invest in those projects, the respective government of a state needs to provide sufficient renewable investment incentives to attract investors (SPP, 2013).

2.2. UK Green Taxation

To meet its energy targets and at the same time reduce dependency on fossil fuel, the UK government introduced different policy measures and tools. One of these tools is 'green taxes' (also known as 'environmental or pollution taxes'). They intend to encourage businesses to operate more environmental-friendly through the usage of renewable energies that do not affect the climate negatively. By implementing taxation on polluting emissions, environmental damage will hopefully be reduced in the least costly way and polluters will be incentivized to depend to cleaner sources of energies (GOV.UK, 2012).

The UK government announced different excise taxes for various types and sizes of organizations. Among these duties is for instance the Climate Change Levy (CCL), which is a tax on gas, electricity and solid fuel that applies to businesses in the commercial, industrial, agricultural and public services sectors. When applying this tax there are some exceptions for example small companies that do not use much energy can reduce their taxes.

Other environmental taxes that introduced by the UK government are: Vehicle Excise Duty; Industrial Energy Tax; Carbon Floor Tax (CFT); Landfill Tax; and Aggregates Levy (GOV.UK, 2013). Although these taxes are all classified under the same umbrella of climate change they have different aims and apply differently from each other.

Green taxes are only one tool the UK government uses to support the usage of renewable energy and to cut greenhouse gas emissions. For businesses to access renewable energy, these should be made available sufficiently at affordable price, this leads to investors have to be offered a return on their investment: Politicians have to offer reasonable incentives for clean energy generation. Therefore, one of the government's required incentivizing actions was to attract private funding for investments in renewable energy projects. The government seems to have responded to this strategic requirement by establishing the Green Investment Bank (GIB) in 2012. According to a study of Ernst and Young from August 2013, "UK is the fourth most attractive country for clean energy investment [...] behind the US, China and Germany" (BGT,

2013a). Even though investment in renewables in the UK has risen, the sector fears a threat because energy bills of renewable energy subsidiaries have been raising and global investment is declining; the sector faces a challenging period due to the recent financial crisis (BGT, 2013b).

Consequently, it is substantial to implement measures such as green taxes to take action fighting climate change but also, whilst discouraging intensive dependence on fossil fuels, to support investments in renewable energy projects. A number of renewable energy generating options may emit CO₂, such as anaerobic digestion; hence, these projects are likely to be affected by green taxes, even though they aim to reduce the usage of fossil fuel to meet the energy demand. As a consequence, the costs of renewable energy projects will increase and they may lose their competitive advantages. If this is to happen, it would mean less renewable energy would be produced which will again put energy security on its brink.

This raises the question how balanced the UK energy regulations and policy tools in meeting the energy targets are whilst offering sufficient support to renewable energy projects on one hand and the implementation of green taxes that can affect renewable projects adversely on the other are contrary to each other. So far, UK green taxation has been highly discussed in the media. The government's actions have been criticised for causing energy bills to soar since levies are pushing them and henceforth minister debate about the taxes and how the green energy policy should be financed (The Telegraph, 2013). Nevertheless, politicians insist that households will benefit from changing to electricity-saving initiatives on the long-term and will claw the money back (MO, 2013).

The money that was raised through the implementation of environmental taxes should have been used to support families whose homes are in fuel poverty and to implement energy efficient measures such as boiler replacements. Yet, it has been revealed that the majority of that money has been misspent and targeted at the wrong homes, which are not classified as 'fuel poor' (The Independent, 2013). These are two examples that question the efficiency of green levies. Despite that, it is not the idea behind green taxes that is troubling. The taxes are implemented because they provide revenue to the government to subsidies schemes from which the public benefits and also encourage the efficient use of energy (NEF, 2013). However, subsidies come along with unsatisfying side-effects that bother customers.

It can be seen in **Fig. 1** between 1990 and 2012 total carbon dioxide emission has decreased from 592 MtCO₂e to 486.5 MtCO₂e.

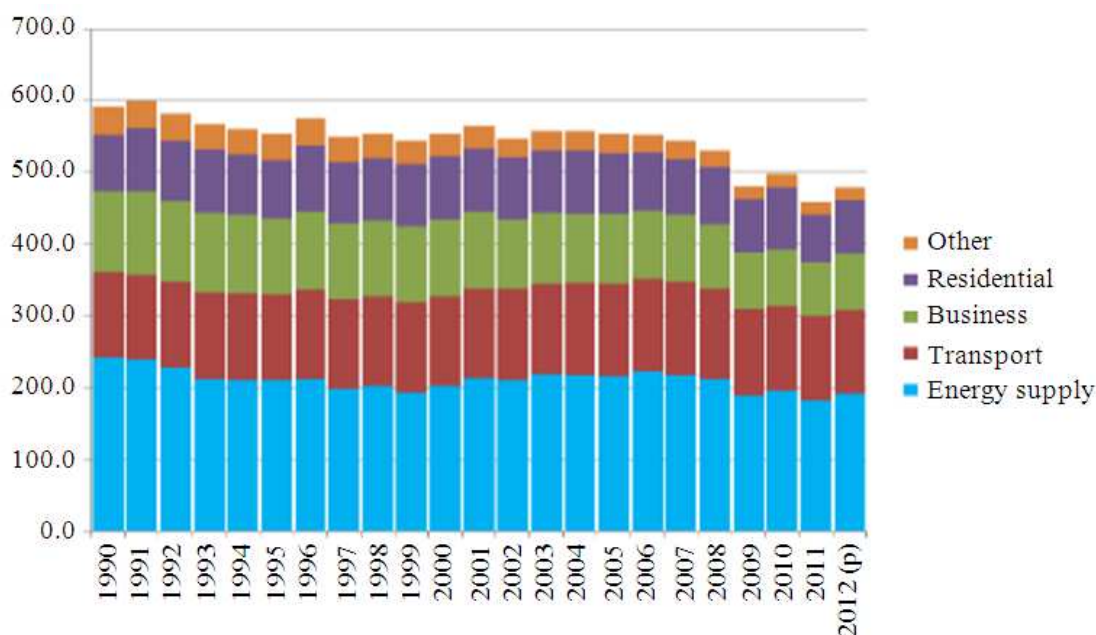


Fig. 1. Carbon dioxide emissions by source, 1990-2012 (provisional) Source: DECC (2013c:5)

The increase of CO₂ emission between 2011 and 2012 is down to a greater use of coal for electricity generation; however, CO₂ emissions have slightly decreased (about 0.2%) by the second quarter of 2013 (DECC, 2013c). This may show that the government's energy policy has been efficient in the long-term and that its measures, such as green taxes, have been effective in reducing carbon emissions.

Still, politicians do not agree on green taxes. As it is obvious that environmental taxes also cause negative effects and Ministers argue much about them in public as well as promising to keep and repeal levies, it can be assumed that green taxes or the way they are implemented may not be satisfactory efficient in realizing the government's other energy targets. Also, it should be kept in mind that UK green taxes only apply to organisations within the United Kingdom. This means if prices of local produced renewable energy are too high, it might be cheaper for energy-intensive companies to import from foreign suppliers or even move business activities abroad. This however, cannot be the government's intention because it weakens the UK's economy (Abdo, 2013).

3. METHODOLOGICAL APPROACH AND DATA

In order to answer the research questions properly, this research uses the case study approach; the UK is

treated as a single case. The advantage of a case study is that it aims to give a rich understanding of the context of the research and generates answers to questions asking why, what and how. It gives the opportunity to explain and analyse a phenomenon, in this case the effects of green taxes on investment in renewable energy within the UK, that has not been considered likewise and therefore refers to the uniqueness of the research (Saunders *et al.*, 2012).

Even though conducting interviews or making questionnaires would be possible methods to collect data, since they provide the possibility to do research that is directly related and straightly used to answer the research question. Secondary data, especially documents and official statistics are considered sufficient data sources that will allow answering the research questions. The data is available online from governmental and other trusted official sources, which allows a quick and easy access to the required data.

The analysis tackled public documents, especially governmental ones to define the framework of the research and to receive input for the discussion part. Since governmental sources are official sources, they can be considered trustworthy even though the data has been generated by another party. They allow to make comparisons and to look at data and changes over a period of time since the data is historic and constantly

updated. This is particularly important since the research object is very topical and subject to continuous changes.

In order to discuss the research questions, media outputs, mainly newspaper articles, are part of the qualitative analysis. Since green taxes have been a hot issue that has been a topic to the press over the last few years. However, various newspapers have different political orientations and authors different views on topics, which may influence the direction of the discussion and analysis in a certain way. Therefore a wide range of sources has been taken by the authors into account and these were compared to each other to give the best possible view on the research topic.

Within the data collection process, quantitative data, like existing numerical statistics, particularly from the DECC and the Office for National Statistics were collected. Consequently, even though secondary data has its limitations, its characteristics meet the requirements of this particular research project most effectively and is therefore the most appropriate way to answer the research question.

4. ANALYSIS AND DISCUSSION

The UK is committed to supplying 15% of its total energy consumption from renewable sources by 2020, as stated in the EU's Renewable Energy Directive (OJEU, 2009), this level was later upgraded to approximately 20% (DECC, 2011a). **Figure 2** below shows UK's renewable energy production until 2009 and makes projections to 2020. It also shows the contributions required by the Renewable Energy Directive in order to meet the target the UK stated targets.

The graph visualizes three different estimations of future energy production, including a low, central and upper approximation. The projections indicate that it is possible for the UK to achieve the Directive's target, assuming that the central or upper estimate of production will occur (AEA, 2010). However, the graph also displays that the UK still has a long and tough way ahead to achieve its renewable energy targets and needs to further support investments in renewable sources if it seeks to meet its environmental and energy security goals.

The three main energy sectors in the UK are electricity, heat and transport. The government worked out a scenario for each sector to be achieved by 2020 in accordance with the overall target. It sets out the amount in per cent to which part the energy should come from renewable sources:

- 10% in transports
- 12% in heat; and
- More than 30% in electricity (DECC, 2009)

The UK government has separate plans and measures to achieve these targets and the transport sector seems to be the focus of the government policy as this sector contributes to the highest level of carbon emissions.

4.1. Implementation of Green Taxes

Green taxes have widely been implemented across the UK and other European countries over the last 20 years as measures to help achieving energy and climate change targets. The main purpose of environmental taxes is to reduce greenhouse gas emission, which refers to a change in energy consumption behavior. At the same time, green taxes can raise significant tax revenue which can be further used to provide for environmental tax reforms or instruments that aim to reduce environmental impacts (GFC, 2009).

4.2. Effectiveness of Green Taxes

Debating the effectiveness of environmental taxes raises the question of how to measure effectiveness and to what extent green taxes lead to environmental enhancement. This is not an easy undertaking as many different factors influence the effectiveness.

The factor or the size that responds to a tax is determined by its price elasticity. This describes "the proportional change in demand for a taxed good caused by a change in price" (GFC, 2009). Price changes in general have an impact on the demand. If the price for energy increases over the years, then an increase induced by taxes will lead to higher tax revenue and reduced environmental impacts. Price changes therefore affect the demand for the product, which also has an impact on the UK economy. Apart from market price changes, factors like growth or contraction of incomes and the economy challenge the measurement of the effectiveness of environmental taxes. It can be pointed out that the different factors that influence measurements are complex and not easy to determine, which is why in this analysis conclusions about the effectiveness of green taxes will be drawn from developments seen over the years as well as current changes and impacts which are derived from statistics, reports and articles. In order to generate answers towards the effectiveness of green taxes, the following question should be considered: What would the situation be like if environmental taxes would not have been implemented (GFC, 2009).

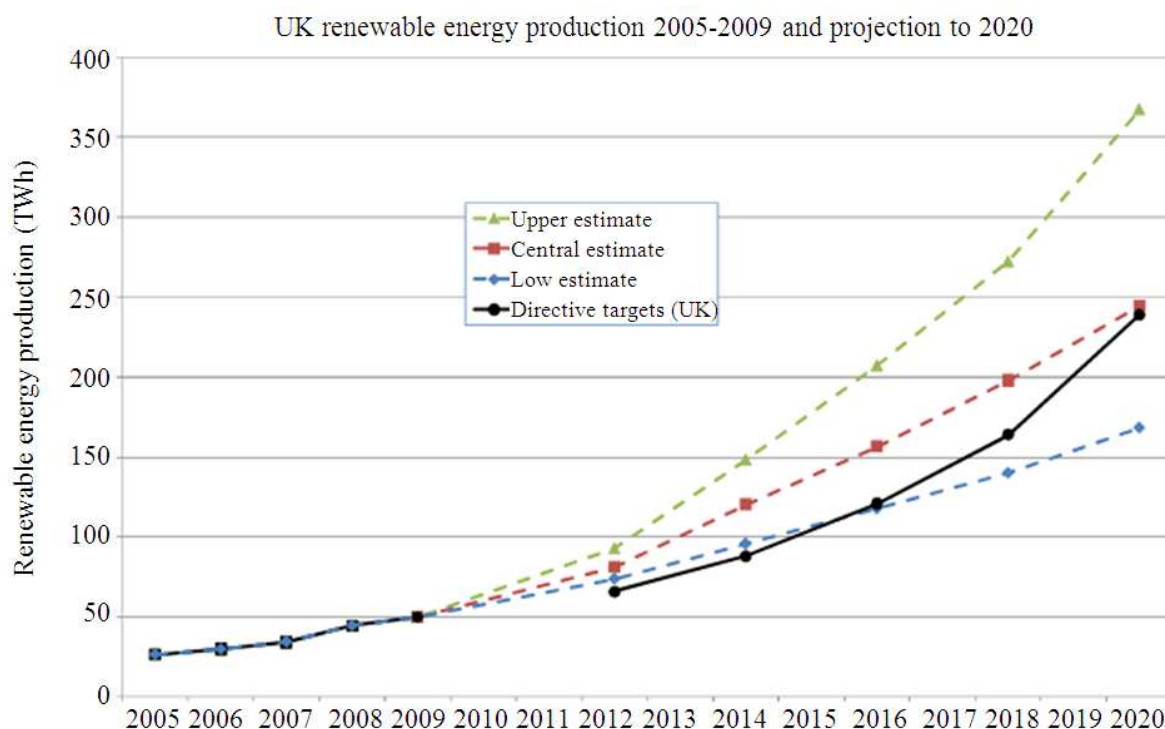


Fig. 2. Source: DECC (2011b, online)

4.3. Industrial Energy Tax

A positive effect of green taxes that confirms the policy instrument for environmental improvement can be seen when looking at the long-term development of UK government energy tax revenue. Revenue from energy taxes comprises Duty on Hydrocarbon Oils, Vat on duty, Climate Change Levy, Fossil Fuel Levy, Renewable Energy obligation and Gas Levy (ONS, 2013). Total government green tax revenues is depicted in Fig. 3 for the period 1993-2012.

The figure shows an increasing trend of government revenue from energy tax, even though revenue has slightly decreased in 2012 and shows a revenue of £33,200 million, which is a equivalent to 0.9% decrease on 2011 figure. This is mainly due to a reduction in hydrocarbon oil duty. Between 2010 and 2011, industrial energy tax revenue increased by 1.8%. In 2012, energy tax made out more than 60% of the total environmental tax revenue (Fig. 6) (ONS, 2013). This says that the UK government is making significant revenues from environmental taxes. If these revenues are well utilised into subsidies into renewable investments the country would make significant progress on green energy targets.

4.4. Vehicle Excise Duty (VED)

One of the main energy consuming sectors in the UK is transport (DECC, 2009). Therefore, the government introduced several transport taxes that impacted and still impact the environmental situation. Among them was the Vehicle Excise Duty (VED) in 2002. After introducing the tax, business mileage reduced by approximately 300 million miles per year over the period 2002 and 2005. Overall, carbon emissions from road transport have decreased up to 1.5% (GFC, 2009). Figure 4 shows tax revenues from VED over the period 1993-2012.

It can be seen in Fig. 4 that in 2012, a tax revenue of £5,873 billion was reported. This is the highest tax figure recorded since 1993. Since the series started in 1993, a continuous positive trend can be seen, except for the years 2000 and 2001. The trend shows that the implementation of the duty has been successful in raising revenue over the years.

With the publication of the Finance Bill 2012, VED rates for light passenger vehicles, motorcycles and light goods vehicles increased (GFC, 2009). This is to keep the buyer's attention to the environmental impact of their vehicles and make them aware of the pollution they cause (DT, 2011).

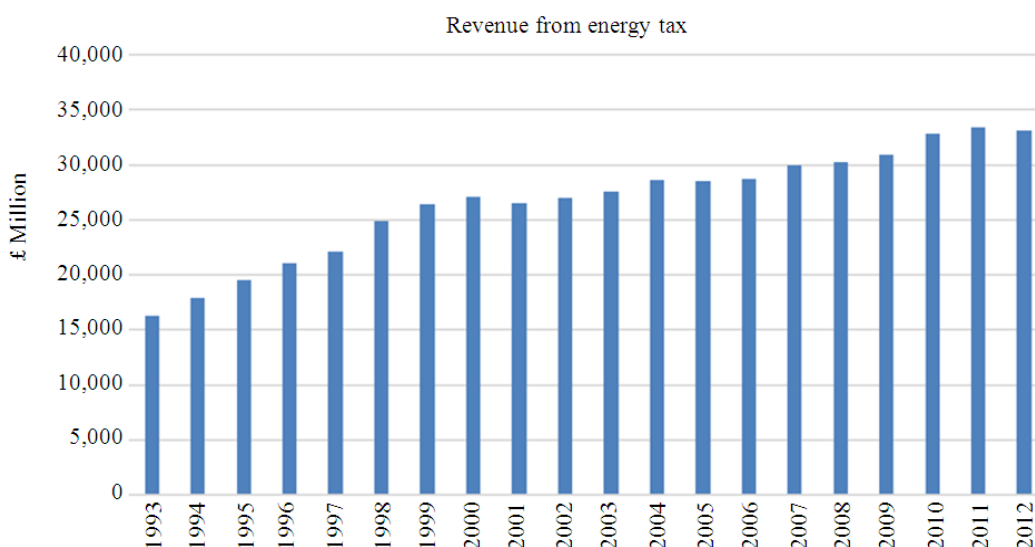


Fig. 3. Source: Office for National Statistics (2013, Online)

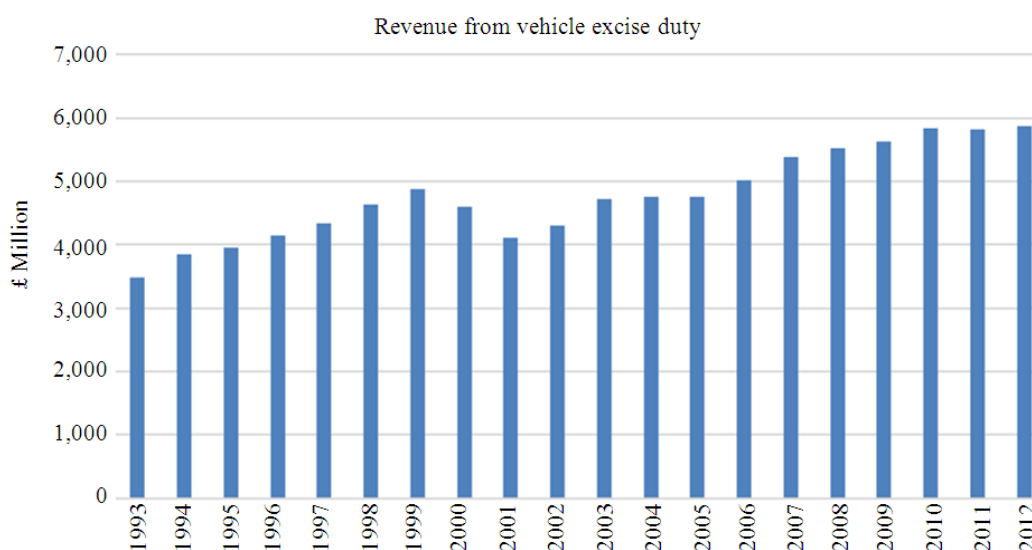


Fig. 4. Source: Office for National Statistics (2013, Online)

The new rates on first vehicle licence for vehicle are shown in **Table 1** and relate as follows to CO₂ emissions. It can be seen from the table that the more CO₂ a vehicle emits the more VED it attracts. However, to decide on the effectiveness of these rates in changing consumer behaviour when it comes to buying new vehicles, data about historical vehicle sales in the UK would be needed, this unfortunately was not available to the author.

4.5. Landfill Tax

Another tax that was implemented and has effects on the environment is landfill tax. It is a tax on the disposal of waste and it aims to encourage producers of waste to produce less and receive more value from the waste. For instance through composting or recycling it, as well as to operate more environmentally friendly in general. The tax rate depends on the weight of the produced waste.

Table 1. Rates on first vehicle licence for vehicle Source: Legislation.Gov.UK (2012)

Co ₂ emissions figure		Rate	
(1) Exceeding (g/km)	(2) Not exceeding (g/km)	(3) Reduced rate (£)	(4) Standard rate (£)
130	140	110	120
140	150	125	135
150	165	160	170
165	175	265	275
175	185	315	325
185	200	450	460
200	225	590	600
225	225	805	815
255	--	1020	1030

After the taxes were introduced in 1996, overall landfilled waste decreased by 25%. This says that the tax had a positive effect on reducing waste, but more waste reduction through better waste management should be sought.

Fig. 5 shows the landfill tax waste tonnage declared per quarter for current and previous financial years. It can be seen that the implementation has been certainly successful as the amount of tonnage of waste has been constantly decreasing from the second quarter of 2003 onwards until 2013, when looking at the standard rate (HMRC, 2013). The lower rate refers to less polluting waste as listed in the Landfill Tax Order 2011. This refers to e.g. non-hazardous waste or waste with low potential for greenhouse gas emission (HMRC, 2013).

4.6. Environmental Tax Revenue

One of the benefits of implementing green taxes is that they can bring substantial revenues, which the government can further use to support the transformation of the economy to a more environmentally friendly one. **Figure 6** presents the UK's environmental tax revenues over the period 1993-2012.

The graph shows environmental tax revenues for 2012 of £44.5 billion, which exceeds the previous year figure of 2011 by £0.2 billion. This is due to an increase in other environmental taxes (including rail franchise premia and air passenger duty) by £5.4 billion (+8.5%) and an increase in road vehicle tax by £5.9 billion (+0.9%) (ONS, 2013).

From the examples mentioned above, it can be seen that environmental taxes contribute to the achievement of the energy targets and environmental objectives in general as they are environmentally effective. The implementation of the taxes has not stopped or reversed the energy trend but further supported the changing into a greener economy. Simultaneously, taxes have generated large revenues which the government can further use to support and supplement the development of a more environmentally friendly economy.

4.7. Investments in Renewable Energies

If the UK wants to meet its energy targets it has to lower the costs of renewable energy and increase deployment. This may not be an easy process as large scale investments require significant funds which could be a problem to be secured. In this context, the UK government has already implemented various financial support mechanisms, such as the Green Investment Bank. The total investments needed in order to meet the energy target of 20% will likely run into hundreds of billions of pounds (DECC, 2011b). The Government's Energy Bill for instance set the target to attract the £75 billion of investment that is needed by 2020 for new low carbon power generation (Yeo, 2013). To secure these funds, the government is required to provide stable energy policy that incentivizes long-term investments in renewable energy projects.

The electricity market is a good example that shows how the investment requirement is challenging politicians due to uncertainties of secure and sufficient forms of energy generation. Every single form of electricity generation comes along with risks over certainty, price and delivery. These factors represent a challenge to encourage huge investments in times of uncertainties, while the government has to ensure energy security, affordability and decarbonization. That and the fact that most of the UK's electricity still comes from nuclear power stations, have led the government to introduce an electricity market reform (DECC, 2012).

Consequently, investments from different sources are needed. This includes investments from the public sector (government loans and levies) and the private sector (Asset Finance, Venture Capital/Private Equity, Public Markets), (PIRC, 2011). Another way of scaling up renewable energy projects could be crowd-funding (This is where "businesses and projects are directly funded by large numbers of people putting in relatively small amounts of money" (Friggens, 2013).

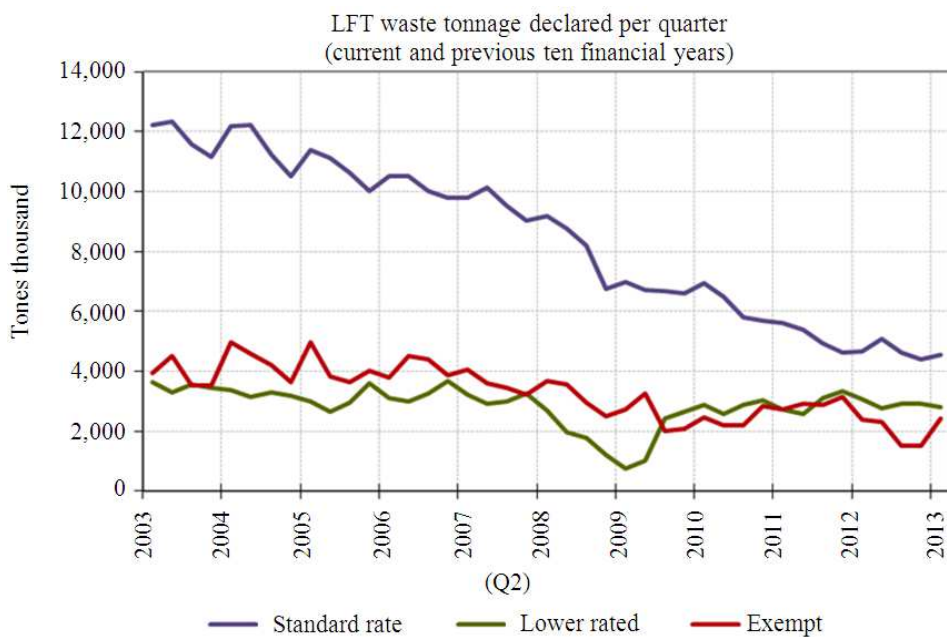


Fig. 5. Source: HMRC (2013, Online)

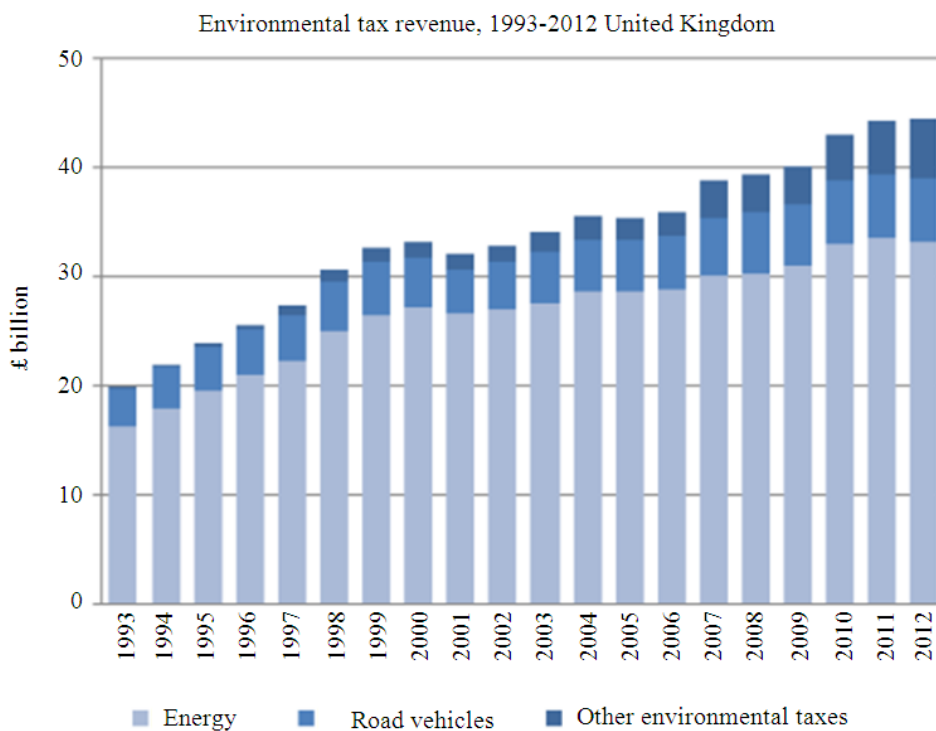


Fig. 6. UK Environmental Tax Revenues (1993-2012) Source: Office for National Statistics (2013:42)

In Germany, this way of financing has already proven to be effective. Approximately 46% of Germany's renewable power capacity is owned by private investors. Consequently, this could be a good opportunity for the UK to secure finance for more renewable energy projects (Friggens, 2013). In spite of the many actions taken by the UK government the country ranks 7 in the top 10 renewable generators in the world, this says that much still needs to be done to enhance investments in clean energies. Fig. 7 shows a ranking in clean energy investments and the movements among the top 10 countries in investment from 2011 to 2012.

It can be seen that the UK remains on rank 7 with a total of \$8.3 billion of green investment in 2012. It shows that the UK is an attractive country for renewable investments but there is still potential to rank higher which corresponds with the need to encourage higher investments as worldwide investments declined by 11% to \$269 billion after the record of \$302 billion in 2011. UK clean energy investment was at its peak in 2011, showing an overall investment of approximately \$10 billion, whereas investments fell to \$8.3 in 2012 (PCT, 2013).

The fact that the UK is on the right track to become one of the top 3 countries in clean investment can be seen in a study of Ernst and Young from August 2013 (Fig. 8), who ranks the UK higher than Bloomberg due to revised projections of electricity growth and new finance deals. The UK received a score-uplift and has become more attractive for clean energy investment.

This may also contribute to the latest higher ranking in investment that renewable energy projects experience currently. They have gained attractiveness since current returns from the savings market are low. The revolution of renewable energy projects underpins the fact that they offer quite predictable flows of revenue, partly from subsidies and partly from electricity prices. Moreover, running costs of green energy projects are relatively low. It is the installation that leads to high costs. Since the demand of clean energy is increasing, investors see their chance in investing in long-term projects and the investment-potential of the transformation into a greener economy (O'Connor, 2013).

	2012 (In billions of dollars)	2012 Rank	2011 (In billions of dollars)	2011 Rank
China	65.1	1 ↑	54.1	2
United States	35.6	2 ↓	56.8	1
Germany	22.8	3 =	31.3	3
Rest of EU-27	16.3	4 ↑	17.7	5
Japan	16.3	5 ↑	9.3	8
Italy	14.7	6 ↓	30.1	4
United Kingdom	8.3	7 =	10.0	7
India	6.9	8 ↓	12.5	6
South Africa	5.5	9 ↑	0.03	20
Brazil	5.3	10 =	7.8	10

Fig. 7. Top 10 countries in clean energy investment source: The PCT Charitable Trust/Bloomberg (2013:18)

Rank	Previous ranking	Market	RECAI score	Macro drivers			Energy market drivers			Technology-specific drivers		
				Macro stability	Ease of doing business	Total	Prioritization of renewables	Bankability of renewables	Total	Wind	Solar	Other technologies
1	(1)	US	75.4	64.8	71.1	68.6	57.6	76.0	68.7	68.8	78.0	52.9
2	(2)	China	71.9	67.5	46.3	54.7	60.6	63.4	62.3	76.7	79.6	58.4
3	(3)	Germany	69.6	75.6	61.5	67.1	70.1	74.0	72.4	58.4	59.6	45.9
4	(5)	UK	62.1	79.2	76.4	77.6	59.5	69.8	65.7	58.8	38.9	36.0

Fig. 8. RECAI scores and rankings at August 2013 source: EY (2013)

4.8. The Effects of Green Taxes on Investment

It can be seen that green taxes generally contribute towards the energy targets. Nevertheless, to meet the agreed energy targets, renewable energy projects need to be developed further and more projects have to be put forward, which is very cost-intensive. Hence, it is crucial that investment in renewable energy projects rises and the government makes incentives to encourage further investment. There is a connection between green taxes and investment in renewable energies as environmental taxes affect renewable energy projects as well. The following part intends to discuss how they are related to each other and in what way they affect each other.

If the UK government wants to encourage further investments from the private sector, the critical factor is investor confidence and stability of energy policy (Carrington, 2013). The implementation of green taxes caused extremely high energy bills. Looking at the breakdown of the average household fuel bill in 2013 displays that green taxes make up approximately 9% of the bill, which is £112 of a total average bill of £1,267 (before Warm Home Discount (WHD) rebate) (DECC, 2013b). For single households but also for companies this is a great addition to their normal bill, which is why the taxes are highly discussed since they lead to confusion and may have a deterrent effect on investors (Carrington, 2013). Prime Minister David Cameron promised to review green taxes. Yet, it seems like politicians and ministers are not sure what exactly they want to look at when reviewing environmental taxes. Cameron for instance stated that every levy is up for a review, whereas Greg Barker, minister in the DECC, stated that it will not be looked at investment incentives for renewable projects because they are essential for the government's long term investment programme. The inconsistent messages will not only drive up uncertainty but also the cost of investment which can cause damage to the UK's economy and infrastructure (Carrington, 2013). This may cause investors to halt or contemplate their investments as higher uncertainty leads to less investor's confidence which is essential for encouraging investment.

Furthermore, the UK's six largest energy companies, such as British Gas and E.ON complained about increasing bills and blamed them on external costs, including green taxes (BBC, 2013). Even though, it was replied that wholesale prices have not increased but decreased over the time, bills are higher which may mean that companies are loading environmental obligation onto the customers (OBPR, 2013). Not only does that contribute to the fact that uncertainty of

investors increases, high bills could also result in companies obtaining their energy from foreign countries to cheaper conditions or to moving abroad. If this is the case, investors are likely to expect lower returns on their investment and would probably consider other investment opportunities since many investors tend to only look on return on investment and are neutral to the subject itself (O'Connor, 2013).

5. CONCLUSION

Based on our analysis, it can be concluded that investments in UK renewable energies could be a rather safe business. This investment supports long-term projects that the industry will prospectively need and benefit from; and the UK government will want to develop further to meet its renewable objectives, so this investment should provide a win-win situation to the industry and the government alike. Climate change has made its progress in the UK and if the country wants to enhance the progress further, policy and investments incentives need to be well utilised.

Green taxes seek to encourage more environmental-friendly behaviour by being levied on emissions. UK green taxation seems to have been effective in cutting emissions. However, although green taxation pursues to meet the energy targets, it puts particularly energy intensive companies under pressure to use more clean energy. This is how the implementation of environmental taxes affects investments in renewable energy projects positively. This is because more companies will demand clean energies to avoid paying green taxes. The UK aims to generate 20% of its required energy from renewable sources by 2015; this percentage will probably increase over the years because renewable energy has already proven to be efficient and reliable sources of energy.

However, green taxes can also have the contrary effect on investment, which is underpinned by current negative reviews in the press. This is mainly due to the fact that politicians are not united behind the purpose and the implementation of their taxes and do not spread consistent messages. This problem resulted from effects green taxes have caused and politicians have not considered appropriately when implementing the taxes. Inconsistency and disagreement may cause a loss in confidence among investors and will lead them to not further invest in renewable energy projects. Therefore, the UK energy policy should take into consideration the effect of stabilised taxation regime on investments and employ the right strategy tools to incentivise more investments in different renewable options.

It is safe to conclude that green taxes themselves have a positive effect on investment and on meeting the energy targets. However, it can be seen that the way they are implemented causes negative side effects, which counteracts the initial intentions of the instrument. Hence, it is not only the measure itself that determines whether its impact on the whole is positive or negative and can meet the government's expectation, but more important how it is implemented. The intention behind the implementation of green taxes is good but politicians partly failed to implement them properly or to communicate the effects environmental taxes may cause to the public, which weakens the positive effect green taxes can have.

If the affected ministers would come together, work out their differences and would be clear about the benefits on one hand and regulate the side effects on the other, investors would know what comes towards them and could make their investment decisions on a fair and true basis. This may lead to higher investments in renewable energy projects as this is a market with great, long-term potential, which green taxes could increase further.

This study faces some limitations regarding data and scope. Data was mainly collected based on secondary sources and it may have been good to use both primary data in forms of interviews and secondary data. However, since the objective is to evaluate the effects of green taxation on investments in renewable energies in the UK, the authors felt secondary data is sufficient to achieve this. In terms of scope, the study focused on the UK which may be seen as a limitation. The authors consider this study in fact a pilot for a wider study that will be using a mixture of primary and secondary data will cover a number of European States as well as a number of renewable options.

6. REFERENCES

- Abdo, H., 2013. Exploring the effectiveness of the green deal and the carbon price floor as policy tools for decarbonising the UK's future economy and securing electricity supply. *J. Oil, Gas Energy Law*.
- Abdo, H., 2011. UK energy security: challenges, threats and solutions. *Energy Sci. Technol. J.*, 1: 38-53.
- AEA, 2010. *Analysis of Renewable Growth to 2020*. AEA.
- Bawden, T., 2012. Investment in renewable energy has halved in just three years, says alarming research. *The Independent*. UK.
- BBC, 2013. Who are the big six energy companies facing MPs?
- OBPR, 2013. Big Six energy firms hide behind green taxes during appearance before MPs. *Express*.
- BGT, 2013a. Bloomberg: Clean energy investment decline is 'worrying. *Blue and Green Tomorrow*.
- BGT, 2013b. UK is fourth most attractive country for renewable energy investment. *Blue and Green Tomorrow*.
- Carrington, D., 2013. The Guardian, Chaos over 'green tax roll back' is creating investor hell. *Guardian News and Media Limited or its Affiliated Companies*.
- DECC, 2012. Electricity market reform: Policy overview. DECC.
- DECC, 2009. Energy markets outlook. DECC.
- DECC, 2013b. Statistical release-2012 UK greenhouse gas emissions, provisional figures and 2011 UK Greenhouse Gas Emissions, final figures by fuel type and end-user. DECC.
- DECC, 2013c. UK Greenhouse gas emission-quarterly statistics: 2nd quarter 2013 provisional figures. DECC.
- DECC, 2011a. UK renewable energy roadmap. DECC.
- DECC, 2011b. Planning our electricity future: A white paper for secure, affordable and low-carbon electricity. Presented to parliament by the secretary of state for energy and climate change by command of her majesty. CM 8099. Department of Energy and Climate Change.
- DEFRA, 2013. Energy from Waste: A guide to the debate. DEFRA.
- DT, 2011, Vehicle excise duty. Department for Transport, politics.co.uk.
- EY, 2013. RECAI Renewable energy country attractiveness index. EY.
- Friggens, S., 2013. the energy collective, what is the potential of renewable energy crowdfunding.
- GOV.UK, 2012. Definition of environmental tax published. GOV.UK.
- GOV.UK, 2013a. CRC energy efficiency scheme. GOV.UK.
- GOV.UK, 2013b. Guide-Green taxes, reliefs and schemes for businesses. GOV.UK.
- GFC, 2009. How effective are green taxes? Green fiscal commission.
- HMG, 2012. Draft energy bill. HM Government.
- HMG, 2007. Meeting the energy challenge-a white paper on energy. HM Government.
- HMRC, 2013. A general guide to landfill tax. HM Revenue and Customs.
- HMRC, 2013. Landfill Tax (LFT) Bulletin October 2013. HM Revenue and Customs.
- IEA, 2013. Medium-term renewable energy market report 2013. International Energy Agency.

- Legislation.gov.uk, 2012. Finance Act 2012-Chapter 14. Legislation.gov.uk.
- MO, 2013. £286 green tax on energy bills: But ministers insist 'efficient appliances' will SAVE us money. Mail online.
- NEF, 2013. Why the argument for green taxes is as strong as ever. NEF.
- O'Connor, R., 2013. The ecologist, small investors pile billions into UK renewable energy.
- ONS, 2013. UK Environmental Accounts. Office for National Statistics.
- OJEU, 2009. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC. OJEU.
- PIRC, 2011. The Green Investment gap-an audit of green investment in the UK. PIRC.
- Saunders, M., Lewis, P., Thornhill, A., 2012. Research methods for business students. Italy.
- SPP, 2013. Ed Dacey reiterates that renewable investment incentives are safe from 'green levies review. Solar Power Portal
- The Independent, 2013. Green tax goes to wrong homes, says think tank. The Independent
- PCT, 2013. 2012 Who's Winning the Clean Energy Race? The Pew Charitable Trusts.
- The Telegraph, 2013. New Green tax threat in energy bills 'deal. The Telegraph.
- Yeo, T., 2013. The guardian, MPs must back decarbonisation target in energy bill vote.