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SUMMARY:

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The difficulty of monitoring global finance

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The concept of "climate finance" covers all financial flows aimed at developing activities intended to reduce carbon emissions and to bring about adaptations made necessary by real or expected climate change (hereafter mitigation and adaptation). Climate finance is crucial to the transition of our economies, and it has become a major issue of the United Nations Framework Convention on Climate Change (UNFCCC) negotiations. The financial issue came to the fore during the 2009 Copenhagen conference, when developed countries committed to jointly mobilise USD 100 billion of climate finance per year by 2020 for the benefit of developing countries.

Historically, the public sector has played a major and constant role in developing climate finance through investment, domestic public policies or development aid. When government budgets tightened due to difficult economic times, attention was naturally drawn to the private sector. With a total investment potential evaluated at USD 20 to 30 trillion per year (Credit Suisse AG, 2014), private sector mobilisation is crucial to reach the financial critical mass necessary for a transition toward low-carbon economies. The International Energy Agency (IEA) estimates that USD 675 billion should be invested each year in low-carbon energy sources before 2035, so as to reduce emissions and to limit global warming to 2°C (IEA, 2014), a threshold beyond which it appears unavoidable that climate change will have a very harmful impact on our societies (IPCC, 2014).

It is important to make the distinction between climate finance in general and the rich countries' USD 100 billion pledge made at the Copenhagen conference. Climate finance in general includes all North-South, North-North and South-South climate finance flows. As for the Copenhagen pledge, it only involves North-South climate finance. This paper focuses on the latter, as it is crucial to track and quantify the mobilisation of these USD 100 billion to evaluate whether developed countries have held up the commitment they took on during the Copenhagen conference. Indeed, it is the fulfilment of this particular commitment that receives all the attention and epitomizes disagreements between states. It is still unclear what exactly will be the concerned industries, the list of recipient states, and the very scope of this "mobilisation". This lack of cohesion between states raises three important points: (i) the need to clearly define concepts, (ii) the need to refine the methodologies used to quantify mobilised climate finance flows, and (iii) the need for greater transparency in the achievement of this goal.

1 – Climate finance: a polysemic concept

At the global level, the tracking of public and private climate finance flows makes it possible to assess efforts to help the transition toward low-carbon, climate resilient (LCR) economies. Concerning the mobilisation of the USD 100 billion, tracking makes it possible to get the measure of North-South efforts to make the transition toward LCR economies. But most importantly, tracking is essential to evaluate the fulfilment of commitments taken on during the Copenhagen conference for the benefit of developing countries.

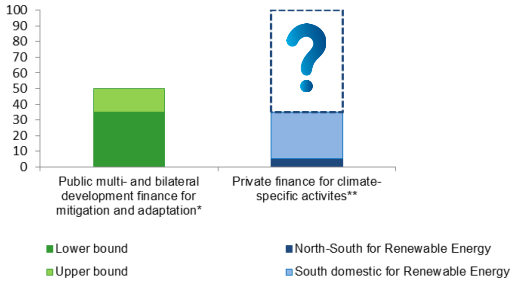
At present, there is no international consensus on how to define climate change mitigation and adaptation activities, or on what "mobilisation" actually means. The Copenhagen Accord itself has not helped to clarify these concepts, as it states rather vaguely that developed countries "commit to a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries. This funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance" (UNFCCC, 2010). Thus, a common definition is absolutely necessary to track and quantify such climate finance.

To this day, stakeholders of the UNFCCC, which was expected to provide the reference

framework on the matter, still have not settled upon an official definition of climate finance - though its Standing Committee on Finance recently suggested to include in it "all financial flows whose expected effect is to reduce net greenhouse gas emissions and/or to enhance resilience to the impacts of [...] climate change" (UNFCCC Standing Committee on Finance, 2014).

Until now, most attempts at improving the availability, quality and coverage of climate finance data have dealt with public financial transfers from developed countries to developing countries; yet it has been estimated that the bulk of flows come from the private sector (Buchner et al., 2012). This highlights the lack of a consensus, both on the flows to be considered as part of the Copenhagen Accord, as well as on the tracking tools to be developed. Identifying which activities, interventions and instruments fall within this commitment requires mainly a decision at the political level; nevertheless the tracking and analysis of climate finance flows must be refined, so as to make informed assessments about the headway on the Copenhagen target.

Figure 1. Climate finance to and in developing countries – USD billion commitments (3-year average)



* Combination of (i) a 3-year (2010, 2011, 2012) average of climate ODA based on Rio marked OECD Development Assistance Committee statistics, and (ii) of a 3 year (2011, 2012, 2013) average of mutlilateral climate development finance based on the joint reporting by multilateral development banks

** 3-year average (2010, 2011, 2012) based on private finance transactions recorded in the Bloomberg New Energy Finance database for wind, solar, marine, small hydro, biomass and geothermal.

In this context, some financial institutions, such as multilateral and bilateral development banks, provide definitions and data on public financing aimed at mitigation and adaptation. They also report private climate finance flows that are associated with their interventions. Hence most existing definitions of "climate" projects or activities - which form the base of data collection work - were developed in relation to public climate finance (Caruso and Jachnik, 2014).

It is important to bear in mind that these definitions were created to identify public funds devoted to mitigation and adaptation. At present, such definitions are not suitable for measuring private climate finance flows, for which available information is lacking. Admittedly, when it comes to renewable energy projects, data coverage for private finance is relatively good. This is because identification is made easier due to renewable energy technologies' inherent link with the fight against climate change. In most cases though, commercial databases do not include qualitative and contextual information required to identify activities that contribute to progresses in mitigation and adaptation (Caruso and Jachnik, 2014). As for adaptation activities in which value-added depends entirely on the context, the lack of data is even more severe. Thus, to quantify real climate finance flows more accurately, exhaustive databases must be set up in which climate-specific activities in relevant sectors, in particular the private sector, can be identified and isolated.

The main challenge will be to clarify the methods used to assess mobilisation in climate finance in general as well as in the more specific context of the Copenhagen Accord. Given the present shortage of complete and systematic data, it is crucial to investigate alternative methodological options for evaluating private climate finance and its mobilisation by public players. This assessment must be both qualitative (was the intervention successful in mobilising funds) and quantitative (what is the total amount of funds mobilised by this intervention). Mobilised amounts can differ significantly, depending on which definitions and tracking methods are used.

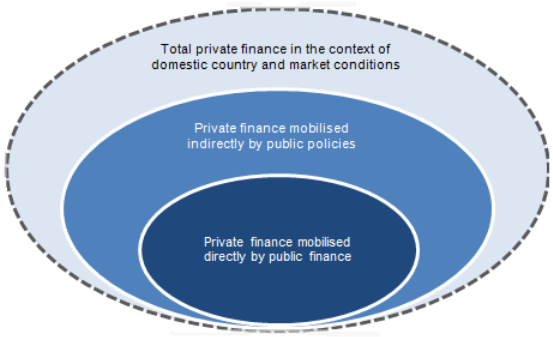
2 – Understanding mobilisation

In the absence of a standard definition of what "mobilising" climate funding actually means, institutions combating climate change use different methods to determine whether an intervention has mobilised climate funding. Summarizing the main methods used, one could

define as "mobilised" any investment in mitigation and/or adaptation activities made after a direct or indirect public intervention. The problem with this definition is that it is very difficult to tell the extent to which a particular public intervention was able (more than another) to mobilise private financing.

In climate finance vocabulary, the concept of "leverage" is a first step in the right direction. Here this term refers to the ability of a public intervention to mobilise private capital, either through the funding of projects, activities or specific programs (loans, guarantees, etc.), or through indirect support to various sectors through public policies (feed-in tariffs for renewable energy, for instance) (Smallridge et al., 2012).

Figure 2. Private finance mobilised by public interventions



Sources : Jachnik et al. (2015), *Estimating mobilised private climate finance : methodological approaches, options and trade-offs*, OECD, Adapted from Haščič et. al. (2015).

Even so, though leverage is easy to define, it remains very difficult to quantify. As the World Bank points out (*Ease of doing business*, 2013), it is unquestionable that direct funding of specific projects by public players encourages private investment; yet other factors such as the country's economy or political situation also play a substantial role in attracting investments. That being so, with respect to the Copenhagen commitment, it is difficult to measure the causal link between public interventions in developed countries and the mobilisation of private financial flows in developing countries.

In the absence of a quantifiable causal link, would it not be better to talk about co-financing? Some public financial institutions calculate leverage as a ratio between the volume of public financing provided and the total volume of co-financing. For instance, multilateral development banks report an estimated ratio between 2 and 8 (Tanaka, 2012). However, this solution is unsatisfactory, since the types of public-private co-financing that frequently occur in climate projects funding don't necessarily involve any leverage whatsoever. Even if leverage were to be defined, actual ability to quantify it remains limited - which makes it difficult to track the progress of developed countries in complying with their joint commitment.

A better understanding of these mechanisms would make it easier to track efforts to offset the lack of investment in the transition, as well as improve transparency on the achievement of the developed countries' commitment. On a broader level, a more detailed analysis of these mechanisms would contribute to making public interventions more effective in mobilising private capital.

3 – Are we on the right track?

In the run-up to the 2015 Paris conference on climate, during which an international climate agreement could be signed, tension is building up about assessing developed countries' headway on their commitments. Since 2011, states and public financial institutions have ramped up efforts to measure the effect of their interventions on private capital mobilisation. Nonetheless, as recent studies have shown (Caruso and Ellis, 2013; Illman et al., 2014; Srivastava and Venugopal, 2014), most methods currently used are simplistic and inconsistent.

Despite the lack of definitions and methodologies, some studies have tried to gauge private climate finance flows. The upside concerns climate finance as a whole (i.e. climate flows in general). Estimates report unexpectedly large flows. The Climate Policy Initiative (CPI), a think-tank, inventories climate investments by using commercial data from Bloomberg New Energy Finance (BNEF) along with data from public institutions. Its latest report, published late 2014, estimates that USD 331 billion were invested in mitigation and adaptation activities (CPI, 2014). This estimation reveals the dynamism of economic players in the matter, which damps down the impression of inertia conveyed by the negotiation process. Most of the progress

involves projects aimed at mitigating climate change, such as renewable energy, which represents USD 193 billion.

As for the commitment to mobilise USD 100 billion for developing countries, progress appears more limited. This same study estimates that only USD 34 billion were transferred from developed countries to developing countries. However, the CPI remains cautious about these estimates. On the one hand, it evaluates at USD 170 billion at least the additional public and private investments that were not taken into account for lack of usable data, in particular in the field of energy efficiency. On the other hand, the study uses a very large definition of climate finance: all investments made in some sectors (railways or forestry, for instance) are considered to be climate finance flows, even though all investments made in those sectors do not necessarily have an impact in terms of mitigation or adaptation.

Despite the limits to our knowledge of climate finance, these amounts are well below current needs at all levels. USD 331 billion is very little when compared to the USD 675 billion of additional yearly investments needed just in the energy sector to keep the temperature rise below 2˚Celsius (Nelson et al., 2014), and all the more so when compared to overall finance flows worldwide. As for the estimated USD 34 billion flowing to developing countries, they fall very short of the promised amount, and the study does not show whether they were mobilised or not.

For all the uncertainties surrounding these estimates, the rough orders of magnitude suggest that the private sector's contribution to the development of mitigation and adaptation activities could be decisive. Development banks - both bilateral and multilateral - have the ability to trigger a very significant multiplier effect with their investments in environmental projects, though the effect is difficult to measure. This ratio could be a good clue to the leverage potential of public interventions. In this way, it could be possible to achieve the Copenhagen goals by taking into account private investments in a broader manner.

Conclusion

The lack of clear UNFCCC directives on climate finance definitions and tracking methods makes it difficult to gather comprehensive and comparable data on private finance flows and, albeit to a lesser extent, on public interventions. Even with a more robust conceptual framework, precisely identifying the mechanisms of private capital mobilisation of public interventions would remain a complex task, given the abundance of players and intervention tools involved in the development of climate activities. Still, a better outline of climate finance and its players, activities and mechanisms such as leverage, would not only result in more precise estimates of climate finance; it would also lead to a better understanding of its mechanisms, which in turn would increase the effectiveness of public interventions.

At the last UNFCCC Conference of Parties, which took place in Lima in December 2014, China and India both voiced their disappointment over the developed countries' weak efforts to develop climate finance. According to these two countries, the very slow progress of the Green Climate Fund, dedicated to funding climate activities in developing countries, was particularly telling. Developing countries consider that the Green Climate Fund's capitalisation of USD 10 billion falls short of what is needed to rise to the challenge. As for developed countries, they would like to stand by their commitment at lower cost, and thus rely heavily on private investment. Considering that the preliminary text drafted at the Lima conference did not shed any light on how to fund the transition, these positions portend a difficult road to the Paris conference this year, where a universal agreement should be signed for the post-2020 climate regime.

The path towards green economies

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The 2014 Global Green Economy Index provides interesting data about a range of countries and their performances in creating a green economy. At the top of the list, Sweden lies highest with a performance rank of 68.1. The United Kingdom has a rank of 54.6, placing it in 20th position (Dual Citizen, 2014). In light of these differences, this article will aim to investigate the different results that have been obtained in Sweden's and the UK's push towards a green economy. The first section analyses how each country has responded to greenhouse gas emissions, in particular Carbon dioxide emissions. Moving on, the second section looks into how these countries differ in their deployment of renewable energy sources followed by a short brief on the different economic approaches that have been taken over the past years.

Part 1 - Greenhouse gas emissions

The Department of Energy & Climate Change (DECC) belongs to the British Government and the objective of the DECC is to ensure that the United Kingdom is equipped with clean and inexpensive energy supplies. The other role of the DECC is to encourage countries across the globe to put an end to climate change and reduce the harmful effects that are seen internationally. Data from statistical reports by the DECC suggests that the United Kingdom's approaches in tackling climate change has been difficult during recent years. In 2011, the UK's total greenhouse gas emissions were approximately 563.2 million tones carbon dioxide equivalent (MtCO2e) and over 80% of this number was credited to Carbon dioxide emissions (454 (MtCO2e)). 2012 saw an increase in the total greenhouse gas emissions by approximately 3.2% to 581.1 MtCO2e. Interestingly, the amount of carbon dioxide emissions in the UK increased by a greater percentage, 4.4%, to 474.1 MtCO2e. However, the 2013 report painted a much more promising picture with both total greenhouse gas emissions and carbon dioxide emissions decreasing, to 569.9 MtCO2e and 464.3 MtCO2e respectively. Provisional statistics for 2014 also suggest that the UK's emission of greenhouse gasses are falling, and that poses the question what the United Kingdom is doing to fight climate change.

It begun in 2008 with the Climate Change Act and the objective was clear: Reduce the UK's greenhouse gas emissions by a minimum of 80%, from the 1990 baseline, by 2050. This objective would be achieved through both domestic and international action and by switching to an energy efficient, low-carbon dependence economy. There are many different policies and strategies the UK government has adopted to accomplish their goal. For one, implementation of a carbon budget is designed to restrict the quantity of greenhouse gases that the UK is able to produce over a stated time. The carbon budget limits are split between four periods: 2008 to 2012, 2013 to 2017, 2018 to 2022 and 2023 to 2027. In the first period the limit was 3018 MtCO2e, followed by 2782 MtCO2e, 2544 MtCO2e and 1950 MtCO2e in the following periods. The UK government also provides data on greenhouse gas emissions and uses their research to help shape successful policies. It is also using the EU Emissions Trading Scheme (EU ETS) to help considerably reduce the level of carbon emissions between 2013 and 2020. The EU ETS covers thousands of power stations, industrial plants and other installations. The EU ETS works by imposing a cap on the volume of greenhouse gas emissions from these bodies and gradually the cap is lowered, and so, hopefully, the greenhouse gas emissions will fall too. The

establishments involved in the EU ETS may also trade their emission allowances with each other.

Whilst climate change and greenhouse gases may have only been grabbing attention in recent years, this was not the case in Sweden. In the 1960s, Sweden realised the importance of sustainable energy and has since then worked to tackle issues posed by the environment. Perhaps this is why Sweden is one of the lowest emitter of carbon emissions in the EU and OECD. In 2012, greenhouse gas emissions from Sweden were 58.3 MtCO2e and this shows a remarkable reduction since 1990 when emissions were 72.7 MtCO2e. Sweden's goal is to reduce greenhouse gas emissions by 40% in comparison to the 1990 levels by 2020, and to achieve zero net emissions of greenhouse gases by 2050. These aims have shaped various types actions and policies. The carbon dioxide (CO2) tax in Sweden is an example of how economic and environment policies are working together to achieve their targets. It was introduced in 1991 and the reasoning behind this was that it would not only reduce carbon dioxide emissions but also act as a catalyst stimulating the creation of innovative sources of renewable energy. An example of the carbon tax in action is seen through consumers paying an extra amount per litre of fuel for their vehicles. Interestingly, consumers and industries do not pay the same level of taxes, with industries paying less. As of 2014, the carbon tax in Sweden was $168 per tonne CO2 equivalent (tCO2e). Sweden's 'green' objectives are not purely concentrated on greenhouse gas emissions and includes aims such as clean air, flourishing lakes and streams, zero eutrophication as well as many more. In fact there are a total of 16 environmental objectives that help form the environmental policies of Sweden.

Part 2: Deployment of renewable energy sources

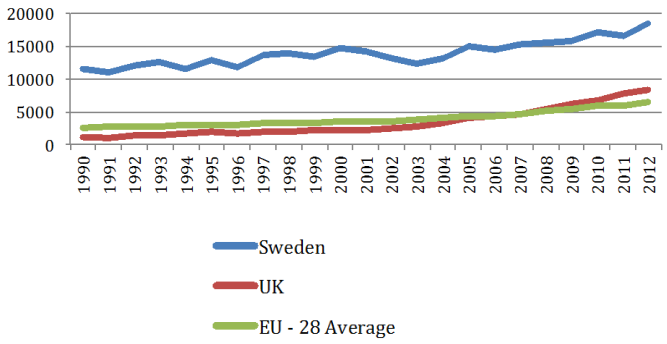
The second part of this article will focus on the development of renewable energy sources. According to the International Energy Agency, the most basic definition of renewable sources is "energy derived from natural processes (e.g. sunlight and wind) that are replenished at a faster rate than they are consumed." (International Energy Agency, 2014) Arguably, the most well-known ones include hydro, wind and solar power. This section will focus on how the use of renewable energy sources has differed between Sweden and the UK in total electricity production, and what the potential causes of these differences have been.

According to the Global Status Report for renewables published earlier this year, total renewable energy capacity grew from 85 to 560 Giga Watt globally between 2004 and 2013 (REN 21, 2014), equivalent to an increase of approximately 560 %. The same report states that, in 2012, renewable energy accounted for approximately 19 % of total energy consumption. In addition to this, it presents data showing that, in 2013, renewables excluding large hydro plants accounted for approximately 43 % of the new generating capacity installed in the world. In the same year, renewables share in total electricity production was at a level of 8.5 %.

In terms of primary production, Sweden has done much better than the UK in using renewable energy sources. This is illustrated in figure one, with the green line representing the primary production of an average EU country. Similarly, the share of renewables in total energy production in 2012 was 51 % in Sweden. The same figure for the UK was 4.2 %.

However, Sweden has an unfair starting point, as its natural resources allow for high usage of large hydropower plants. As can be seen in figure two, total share of hydropower in renewable energy production was at a level of 37 % in 2012. In comparison, the same figure for the UK was 6 %. Hence, only looking at primary production of renewable energy would lead to a biased analysis. Instead, one should consider the actual growth in renewable energy source usage over the past 20 years. Since 1990, the UK has seen an increase of approximately 12 800 tonnes, equivalent to an increase of 1245 %, whilst Sweden has raised its usage by only 7000 tonnes.

Figure 1 *– Primary production of renewable energy (1000 toe) (Source: Eurostat)*



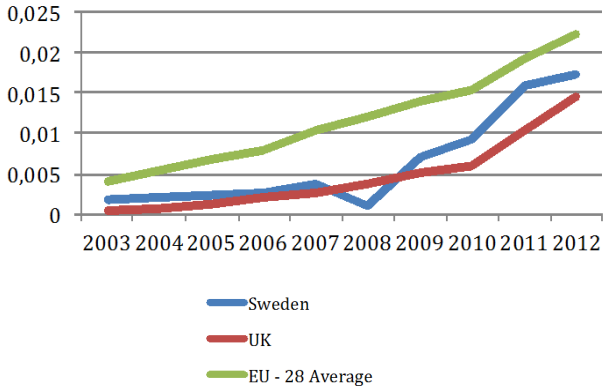


Figure 2 *– Percentage of total renewable energy production 2012 (Source: Eurostat)*

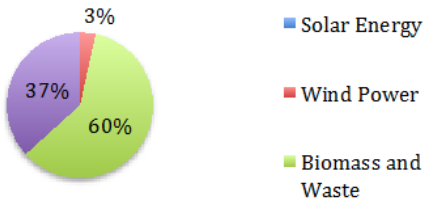
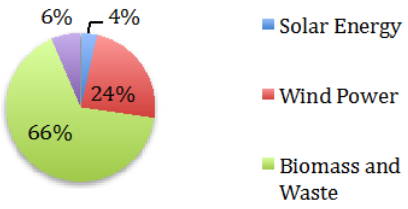


Figure 3 *– Percentage of total renewable energy production 2012 (Source: Eurostat)*



Growth in the energy produced by hydropower in Sweden over the same period has been fluctuating between 60-80 TWh (Swedish Energy Agency, 2012), meaning this energy source cannot have been the reason for the Swedish increase in renewable energy production seen in figure one. The same situation applies for the UK. Furthermore, the growth in biomass usage in energy production over the past years has been at somewhat equivalent levels in Sweden and the UK (Eurostat, 2014). It is also difficult to analyse this energy source due to the amount of different production methods it comprises. Hence, the analysis of the rest of the article will focus primarily on wind power.

Figure 4 *– Ratio total wind power production to total primary energy production (Source: Eurostat)*

Since the UK has a population six times as large as that of Sweden, it will naturally produce more wind power energy. As a result, the data presented in figure four has been adjusted to total electricity production in order to control for country sizes. The similarity in wind power growth is striking, with the UK and Sweden showing almost the same figures. The EU-28 Average is drawn up by Spain's and Germany's high wind power electricity productions (Eurostat, 2014). In general, both Sweden and the UK are doing much better in terms of wind power production than the majority of EU countries and should thus be considered as successful in this instance.

Policies

In the mid-1970s the Swedish government began its introduction of economic policies aimed at increasing the production of wind-power turbines. The reason was to make the Swedish economy less oil dependent. (Åstrand K. et al. 2004). The first ten years mainly consisted of a wind research programme to support the development of efficient wind energy technology. This was complemented by a subsidy to wind power in 1991.

The first subsidy introduced covered 25 % of the investment costs of wind turbines with capacity over 60 kW. (NUTEK (Swedish National Board for Industrial and Technical Development),1992a) A total of 350 wind turbines were supported by this subsidy. (Åstrand K. et al. 2004) In 1998, the subsidy was changed to a level of 15 % of the investment cost, covering wind turbines with capacity over 200 kW. Eventually, this was transformed into an "Environmental Bonus" that

would correspond to the electricity tax for households. Technically, energy suppliers were given the opportunity to deduct tax for each kWh produced by a wind power plant. (Åstrand K. et al. 2004) A more recent environmental policy is the green car rebate, involving a rebate of 10000 SEK to individuals that buy a new green car. (The Government of Sweden).

The deployment of renewable energy sources and, in particular, wind power in the UK started in the late 1970s. The erstwhile Central Electricity Generation Board was involved in the development of demonstration sites to promote the use of wind energy (IRENA-GWEC). At around the same time, the newly elected Conservative government led by Margaret Thatcher carried out a larger privatisation reform of the energy sector. One example was the Oil and Gas Act in 1982, which led to the privatisations of British Gas and British petroleum (IRENA-GWEC). Arguably, this was one main step leading up to the Electricity Act of 1990.

With the Electricity Act of 1990 came the introduction of the Non-Fossil Fuel Obligation (NFFO) with the aim of providing support for nuclear power and deployment of renewable energy sources. The money for the NFFO was raised from the introduction of a fossil fuel levy. Briefly speaking, the NFFO covered the difference in the premium price and average monthly purchasing price electricity companies had to pay for nuclear and renewable energy generators, encouraging the deployment of renewable power plants such as wind power. It remained in place until 1998.

The first target from the UK government arrived in year 2000, stating that renewable plants should produce 10 % of the country's electricity by 2010 (IRENA-GWEC). This was later revised to 15 % for 2020. At the same time, the government introduced the Utilities Act, replacing the NFFO system by the Renewables Obligation. The RO effectively forced electricity suppliers to supply their customers in the UK with specific amounts of electricity from renewable sources. It involved the use of Renewable Obligation Certificates, similar to pollution permits in function that could be traded between electricity suppliers, allowing deployment of renewable sources at the lowest cost possible. There effect on wind power plant deployment was obvious: by 2003 more offshore wind power plants had been built than during the decade 1990-2000 (IRENA-GWEC). Four years later, in 2007, wind power overtook hydropower as the largest renewable resource in the UK, producing 2,2 % of the UK's total energy output. As shown in figure 2 above, that figure has increased to 24 % in 2012.

Conclusion

In this article, we have discussed the results obtained by the countries in creating a green economy. When comparing the difference in greenhouse gas emissions, Sweden is performing better, especially when it comes to reducing carbon dioxide emissions. However, in terms of the deployment of renewable resources, our findings suggest that the two countries are on par with each other. Although, Sweden has a higher total level of renewable energy production, most of this comes from its large hydropower production.
This analysis is somewhat limited due to the limited space available, however we hope it provides a brief picture of the current situation in creating a green economy.

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