Master Thesis

To graduate with the academic degree of

GRADUATE ENGINEER (Dipl. Ing.)

# Multilevel climate policy:

## National and local efforts in support of EU biofuels policies exemplified by Germany, the United Kingdom, Italy, and Finland


Submitted by

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The research is part of two European Projects which involve the Climate Change Unit of the JRC, the ADAM project and the PEER project.

ADAM is the Acronym for Adaptation and Mitigation Strategies: Supporting European Climate Policy, which has seen the participation of different research centres and European universities and among whose aims one is to understand how effective European climate policies are.

The PEER Project studies the policy integration, coherence and governance and its main target is to assess the degree of climate change policy in different policy sectors. The research team here is composed of research centres, NGOs and the Finnish environmental agency.

From the primary research done for these two Projects two articles will be published in scientific Journals, one about biofuels (submitted in August 2008) and one about the congestion charge as a new instrument to lower emissions from autos in the city centres.

We worked in a team doing primary research via telephone calls, emails, participation to workshops, meetings and internet research.

I was in charge of the primary research about Germany and Berlin. This is why the part about Germany and Berlin is more detailed in this master thesis compared to the other three parts. Furthermore I took care of part about the political theory.

Even though each of us had a different country to study the collaboration during the research was very high, so I decided to include a summarised version of the empirical case study on the countries which were not my topic. This also allows a clearer comparative analysis in the final part of the work.

# Abstract

Emissions from road transportation are a growing source of $CO_2$. *Biofuels* use represents one option to reduce $CO_2$ emissions. This thesis examines the implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels at the national level and voluntary measures on biofuels promotion at local level. The analysis is based on four countries, namely Germany, the UK, Italy, and Finland and the cities of Berlin, London, Milan, and Helsinki respectively.

At the national level, differences in the degrees and forms of implementation in the four countries are examined. The concept of "Europeanization" is used to classify the modes of domestic changes. An analysis of the "mix of policy instruments" sheds light on the more or less successful implementation of biofuels policies at national level.

The implementation of the Biofuels Directive does not directly bind the local level but communities are seen as an important arena in which the governance of climate change is taking place. This thesis looks for a sort of parallelism between the commitments at national level and the activities at local level. The driving forces leading to different local-level involvement in local projects for the support of biofuels are investigated using a conceptual framework where (i) national-level regulations and support, (ii) the system of local self-government, (iii) support from the local citizenry, (iv) support from the local businesses, (v) access and acquisition of EU funds and (vi) horizontal networking between cities are analysed.

Although this thesis does not provide a representative picture, it shows interesting patterns: At national level, there is a parallelism between the duration and extent of the use of economic instruments to support biofuels and the share of biofuels sold. At local level, a clear relation between city-level activities and the support from local businesses as well as access to and acquisition of EU funds can be found. Horizontal networking and the exchange of know-how leads cities to get more self-consciousness on the importance of their activities. These experiences could potentially shape future climate policies and technologies. That is why it is fundamental to recognise the increasing importance that local activities are gaining thanks to their voluntary commitment towards the implementation of climate policies.

# Kurzfassung

Emissionen aus dem Straßenverkehr sind eine wachsende Quelle von $CO_2$. Eine Option, $CO_2$-Emissionen zu verringern, sind Biokraftstoffe. Diese Arbeit setzt sich mit der Implementierung der EU-Biokraftstoffrichtlinie 2003/30/EC auf nationaler und lokaler Ebene auseinander. Die empirische Analyse basiert auf vier Staaten, Deutschland, Großbritannien, Italien und Finnland, und in jedem Staat eine Stadt näher analysiert wurde, konkret Berlin, London, Mailand und Helsinki.

Auf nationaler Ebene werden Unterschiede in Grad und Form der Implementierung in den vier Staaten anhand des theoretischen Konzepts der „Europäisierung" untersucht. Über den Mix der eingesetzten politischen Instrumente werden die länderspezifischen Implementationsmuster der vier Staaten erfasst.

Neben der Untersuchung der nationalen Ebene sucht diese Arbeit weites nach Parallellen zwischen dem Engagement auf nationaler und den (freiwilligen) Aktivitäten auf lokaler Ebene. Die zentralen

Faktoren, die das Engagement von Städten in der Klimapolitik zu erklären vermögen, werden in einem heuristischen Modell gefasst, das folgende Erklärungsfaktoren enthält: (i) Unterstützung der nationalen Ebene, (ii) Grad an lokaler Autonomie, (iii) Beteiligung der lokalen BürgerInnen, (iv) Unterstützung durch lokale Firmen, (v) Zugang zu und Zuerkennung von EU-Fördermitteln und (vi) horizontales Networking und Austausch von Know-how zwischen Städten.

Obwohl die kleine Fallzahl kein representatives Bild zu vermitteln vermag, zeigen sich doch interessante Muster. Auf nationaler Ebene ergeben sich ausgeprägte Parallellen zwischen Dauer und Ausmaß der Nutzung von ökonomischen Instrumenten und der Menge des verkauften Biokraftstoffs. Auf lokaler Ebene wird das Aktivitätsniveau der Städt u.a. ausgeprägt durch die Untersützung von einheimischen Firmen sowie den Zugang zu und die Zuerkennung von EU-Fördermitteln erklärt. Darüber hinaus verstärken das horizontale Networking und der Austausch von Know-how das Bewsstsein der jeweiligen Städte über die Wichtigkeit ihren Aktivitäten. Diese Einsichten sind für die praktische Klimapolitik wie für die Technologieentwicklung insofern von Bedeutung, als sie darauf hindeuten, dass auch in Zukunft großes Augenmerk auf klimapolitische Aktivitäten auf lokaler Ebene gelegt werden sollte.

# 1 Introduction

Climate change is already taking place and is one of the most challenging and dangerous threats the Earth has ever faced taking into account the environmental, social and economic consequences it could bring (IPCC, 2007). The European Union is committed to taking serious steps to address its own greenhouse gas (GHG) emissions since the early 1990s. Although the total GHG emissions decreased by 1.5% from 1990 to 2005 in EU-15, the decreasing trend could be observed in all emissions sectors except from transportation. Due to the high growth of passenger transport (+28%) and freight transport by trucks (+62%) the emissions grew by 26% in the same period for this sector (1990-2005). These data exclude international aviation and navigation, which are growing even faster (EEA, 2007).

The standard of living is increasing and this leads to an increase in the income, which swifts people reliance more and more on faster transportation modes, which are more energy intensive (Poudenx, 2008). In fact, according to the decomposition analysis, the main driving force for rising emissions is the number of kilometres driven by passenger cars and, to a lesser extent, the increased proportion of private cars on the roads. Efficiency improvements cannot counteract this. For freight transport, the number of kilometres driven by trucks acts also as the main driving force but the increased proportion of trucks in road freight transport plays a greater role than for passenger cars (EEA, 2007).

This makes the mitigation of transportation emissions challenging. Therefore, measures in addition to efforts to reduce the transport volume are needed, like the mitigation of end of pipe $CO_2$ emissions from transportation. Nowadays one of the possible solutions from a technologic and economic point of view are biofuels[1] - liquid transport fuels derived from biomass – which are the only direct substitute for gasoline and diesel in road transportation. The EU has set ambitious targets for increasing their share.

Furthermore the growing concern about an impellent need for both mitigation and adaptation measures to tackle climate change has stressed the need of action at all levels of society. The local level is increasingly seen as an important arena in which the governance of climate change is taking place and which does not have to be underestimated when compared to international arena of policy negotiations (Betsill & Bulkeley, 2007). In the early phase of political discussion about climate change the origin of GHGs was not considered relevant, as once cumulated in the atmosphere they lead to global warming, therefore the international arena of policy negotiation resulted more relevant. Anyway it is at the local level where the main effects of climate change are experienced and where the emissions come from and this new perspective is gaining importance in the last years (Gupta et al., 2007b).

The challenges and opportunities of local-level decision making in the context of climate change was examined by Massetti et al. (2007) regarding Italy, by Mathy (2007) regarding France, by Gupta et al. (2007a) regarding the Netherlands and by Teng & Gu (2007) regarding China. Based on these case-studies, Gupta et al. (2007b: 146) concluded that “climate change is caused locally, but cumulates into a global problem; a problem with global impacts that are experienced locally. It is hence a glocal problem calling for a multilevel governance solution.”

Aim of this study is to focus on the policy output obtained at national level by the implementation of the *EU Directive 2003/30/EC on the Promotion of the Use of Biofuels or other Renewable Fuels for Transport* in four European countries, namely Germany, the United Kingdom, Italy, and Finland. Furthermore one city per examined country has been chosen to observe the local-level voluntary action to increase the share of biofuels. The study focussed on existing interactions between the national and

[1] The term biofuels is used in this thesis to refer exclusively to liquid fuels derived from biomass that can be used for transport purposes. Some studies use the term more broadly to cover all types of fuels derived from biomass used in different sectors.

local level to investigate whether there is a relation between the extent of failure or success of the implementation at national level and the initiatives taken at local level on the same policy area, in this case the support to biofuels use.

Implementation studies started in the 1973 and since then a broad repertoire of justifications put forward for doing implementation research have been used. They can be categorised as (1) to understand the causes of success or failure of one or more policies combined together in reaching their objectives; (2) to predict the policy outcome; (3) to give recommendations to normative policy and policy design; (4) to provide a unifying approach to study multi-actor and inter-organizational activity within policy and administration (Schofield, 2001).

The implementation study in this work can be classified between the first and the second category. The study uses a top-down approach: it starts from the objectives set at supra-national level and it consequently reconstructs the measures implemented at national and local level to see in how far objectives have been reached.

As regards theory, this research builds upon the broad field of Europeanization studies. More specifically it uses a special branch of Europeanization theory which looks at the question of how Member States adapt their policies and policy processes to the requirements of the EU, always from a top-down perspective.

To guide empirical analysis a heuristic framework that singles out a set of explanatory factors has been developed both to explain the national-level activities and to support the explanation of the local level ones. It has been developed and used to justify the more or less ongoing activity level of the cities in supporting biofuels use.

Chapter 2 gives an overview of the different biofuels in use, it introduces transportation biofuels legislation at EU level, it discusses the related sustainability concerns, and it finally gives a classification of the support measures for biofuels usually put into practice at national level. The role of the four example countries and cities in promoting biofuels for transportation is examined in the framework of theories presented in chapter 3. In chapter 4 the methodology used for this research is explained. Chapter 5 contains a brief explanation of the national and local governance settings of the four case-study EU Member States and cities. Chapters 6 to 9 present the case studies of Berlin, London, Milan, and Helsinki. The case of Berlin is described much more in details as the author of this work was personally in charge of collecting all information about it, while the data in chapters 7, 8 and 9 were collected by her colleagues. In each case study, the implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels at the national level and the voluntary action taken by the respective city is presented. The countries and cities are compared and the differences discussed in Chapter 10. Finally, the conclusions are in Chapter 11.

In the comparative analysis and in the conclusions the differences in implementation among the four countries and the different levels of activity in the four cities are described, connecting the empirical findings with the theoretical propositions outlined in chapter 3. Finally, the explanatory factors included in the heuristic framework are synoptically tabularised in order to get a first qualitative assessment of relevant factors that influence national and local efforts in support of EU biofuels policies for transportation.

# 2 Biofuels for transportation: an overview

In the last few years, the production and demand of biofuels has increased both thanks to the support from governments in many countries and due to the increases in international oil price. Numerous and complex are the motivations for governments to support biofuels consumption, comprehending environmental, economic and political reasons.

The security of supply is considered the most important motivation given the fact that oil consumption and imports between 1992 and 2006 have expanded in concomitance with the economies expansion. The main reasons for that are the rising prices for crude oil together with the insecurity given from the dependence on foreign oil supplies of many countries, which is augmenting (OECD, 2008).

Beside this the implementation of biofuels policies takes place in response to growing environmental concerns associated with climate change issues and global warming. Other reasons are the creation of new market outlets or additional demand for agricultural products to support the farm sector and improve both commodity prices and farm incomes.

Beyond that an expanding biofuels sector should generally stimulate the economic activities and in particular the employment in rural regions, which often lag behind urban areas in terms of economic growth and performance. Thus regional development and broader economic growth are also mentioned as objectives in support of the development of renewable biofuels programmes.

This chapter aims to describe biofuels from a technical perspective as well as to give an overview of the legislative situation at EU level and of the measures used to support biofuels development. In details, section 2.1 gives a short overview of biofuels quantities worldwide while the different kinds of first generation biofuels, i.e biodiesel, bioethanol, and biogas, and its use in the EU is explained more in details in the sections 2.1.1 to 2.1.3 concluding with section 2.1.4 on second and third generation biofuels.

Section 2.2 is focused on the EU legislative framework about biofuels and section 2.3 on the concerns about biofuel sustainability which have been rising in the last few years. Section 2.4 provides an exemplary classification of the different kinds of biofuels support measures put into practice by different countries in the world to foster renewable fuel production. The support measures can be found in the empirical case studies at national level and the classification is a useful tool to better understand the different measures described.

## 2.1 Biofuels options

Global production of biofuels in 2007 amounted to 62 billion litres or 36 million tons of oil equivalent (Mt) – i.e. 1.8% of total fuel consumption for global transport in energy terms. Brazil and the United States provide for three-quarters of the global supply (OECD, 2008). Brazil used to be the world's largest producer of biofuels and has been overtaken by the US only recently. In Europe, production of biofuels is growing rapidly also, main causes are strong government incentives. EU production is concentrated on biodiesel (two-thirds of the world's biodiesel output) while Brazil and the US are concentrated on ethanol. In 2007, the biofuels share in total transport-fuels demand was about 20% in Brazil, 3% in the US and less than 2% in the whole EU region (though the single Member States' shares strongly differ from one another, with Germany and Sweden having the highest ones) (OECD, 2008).

There are many kinds of biofuels and many ways of producing them. Most biofuels produced are either ethanol or esters (better known as biodiesel), which are considered as the conventional biofuels (OECD, 2008). Currently marketable biofuels are biodiesel, bioethanol and biogas, while second and third generation biofuels are still in a research phase and are still not marketable. Each fuel has its own

unique characteristics, advantages and drawbacks which I will try to sum up in the following chapters (Bundesregierung, 2004; Edwards et al., 2008; OECD, 2008).

### *2.1.1 Biodiesel*

Biodiesel – commonly used in the form of Fatty Acid Methyl Ester (FAME) – is made from fat oily plants (rapeseed, sunflower). The mostly used and well-established technology for biodiesel production is the transesterification of vegetable oils and animal fats. The process begins with the filtration of the feedstock to remove water and contaminants, then the material is mixed with an alcohol (usually methanol) and a catalyst (sodium hydroxide or potassium hydroxide usually). At this point the oil molecules break apart and reform into esters (biodiesel) and glycerol, which are separated from each other and purified. The glycerine is the by-product, used in many types of cosmetics, medicines and food, whose market has fallen in the last years causing problems to find a substitutive market to this by-product (OECD, 2008).

In the EU the most common raw material to produce biodiesel is rapeseed. Rapeseed is separated into oil and cake. Cake is used as a by-product for animal feed. With transesterification the oil is reacted with methanol and produces Rapeseed Methyl Ester (RME, a kind of biodiesel) and glycerine as the by-product. If methanol is replaced with bioethanol it results in Rapeseed Ethyl Ether (REE) (Edwards et al., 2008).

Compared to ethanol the total world production of biodiesel remains small, with a total of 10.2 billion litres in 2007. With 60% of the total world production the EU is the main producer; within the EU, Germany and France are the lead producers. The US production increased a lot in the last years, becoming the second world largest producer behind Germany in 2007. Indonesia and Malaysia have started producing biodiesel to be exported to the European market, and production in Argentina started in 2007 (OECD, 2008).

Most biodiesel are blended with diesel for use in conventional vehicles. It is usually a 5% blend (named B5) but in some countries it is also marketed in blends up to 30% (named B30) or in pure form (named B100), which needs some modification to the diesel engine though (Edwards et al., 2008; OECD, 2008).

### *2.1.2 Bioethanol*

Bioethanol – commonly used in the form of Ethyl Tertiary Butyl Ether (ETBE) – is an oxygenate which can be directly produced through the fermentation of raw materials containing sugar (sugar beet, sugar cane) or indirectly through the conversion of the starch contained in cereals (feed wheat, barley, maize, potatoes, starch crops). As for the starchy crops, they first have to be converted to sugar in a high temperature enzymatic process. The sugar produced in this process or directly derived from sugar crops is then fermented into alcohol using yeasts and other microbes. The by-products, stillage or distiller's dried grains with solubles (DDGS), is used for animal feed reducing the overall costs of ethanol (OECD, 2008).

The ETBE is a chemical mix from ethanol and isobutylene. It is not used as a pure fuel but is used as an admixture of up to 15% (E15) with petrol. It can be used to substitute the fossil fuel Methyl Tertiary Buthyl Ether (MTBE), until recently the most commonly used oxygenate (OECD, 2008).

In Brazil, where there are the major ethanol producers, the raw material used is sugar cane, the ethanol production is very cheap and has a better Greenhouse Gas (GHG) balance (approx 9.5 Mt ethanol are produced annually). The US are the second world ethanol producers. In the US, ethanol is usually produced from maize and it has a worse GHG balance (approx 4.8 Mt ethanol are produced annually).

Within the EU, bioethanol for the fuel sector is mainly produced in Sweden, Spain and France (OECD, 2008).

To introduce ethanol into the market for transport fuels efforts have focused on low percentage blends, such as a 10% ethanol and 90% gasoline blend (E10) or in some European countries a 5% ethanol and 95% gasoline blend (E5). Such blends generally do not require recent car engines to be modified, which is the case when blends with more than 30% ethanol are used.

### *2.1.3 Biogas*

Biogas is produced from the anaerobic digestion by methane bacteria or the fermentation of biodegradable matters, like wet manure, biomass, sewage and organic waste. This chemical reaction produces methane. The percentage of methane in the composition of biogas varies depending on the raw material and the anaerobic digestion process. As it can be used for electricity and heating purposes, biogas production installations so far have concentrated on small-scale combined heat and power generation plants. Larger-scale plants are developing as if purified and compressed, biogas can replace compressed natural gas (CNG) as an automotive fuel for use in compatible vehicles (JRC, 2006; Edwards et al., 2008; OECD, 2008).

Planet-energies.com (2008) affirms on its website that biogas for heating is known since the Assyrians used it to heat water, while in modern times, China and India use a lot of biogas for households lighting. However the first place for biogas used as a fuel in public transport goes to New Zealand. Within the EU, the Netherlands is the first country in terms of quantity of biogas injected into the gas distribution network. The bigger biogas producers in 2006 were Germany with 1.92 Mega tons of oil equivalents (Mtoe, whose conversion factor is specified in Annex 1)[2], UK with 1.70 Mtoe and Italy with 0.35 Mtoe. Nevertheless the biogas contribution to world energy consumption remains overall very low. It is also the case in the 25-member EU, where only 5.3 million tons of oil equivalents (toe) were produced in 2006.

GHG emissions can be saved through the production of biogas because the methane releases from stored manure are avoided, and also because it produces less $CO_2$ than the amount produced through the combustion of diesel for example. A local use of biogas concentrated in the electricity and heat generation is anyway more cost-efficient. In doing that the cost of purification, distribution, compression, storage and vehicle modifications are saved (Edwards et al., 2008; JRC, 2006; OECD, 2008).

### *2.1.4 Second and third generation biofuels*

Second generation biofuels are taken into consideration for the future although the production processes are still in an early phase, are complex and very expensive. Its advantage is that they can be made from almost every form of biomass, either wood- and crop-residues or dedicated energy crops like switchgrass or poplar, which are cheaper feedstock. They also emit much less GHG than the first generation biofuels, as growing these feedstock has less impact. Moreover this would stop the concerns arising from the first generation biofuels as no food would be used for this kind of fuel production (Edwards et al., 2008; OECD, 2008).

Significant research is ongoing on second-generation biodiesel through gasification and Fischer-Tropsch synthesis, a technology used in several oil-embargoed countries in the 20th century to produce transport fuel from coal. This would aim at the production of ethanol from biomass (straw, stover, wood

[2] The Mtoe is an energy unit multiple of the toe. One toe corresponds to the amount of energy released by burning one tonne of crude oil.

chips and grasses) other than starch or sugar crops as well. This second generation biofuels uses the cellulosic, hemi-cellulosic and lignin parts representing the bulk of biomass, using larger proportions of biomass to produce biofuels than for example just the oily seeds, when speaking about biodiesel production.

Production plants of this kind have been developed in North America and Europe but are still in an early phase and the second generation bioethanol quantity produced is still very low (OECD, 2008).

Production costs are anyway still much higher than those of conventional biofuels and fossil fuels due to the fact that the current output of plants using these technologies remains very small compared to first generation biodiesel (OECD, 2008). Projections say that the high investment costs will not be offset through “learning” to reduce the capital costs by 2020, so second generation biofuels will still be more expensive than the first generation ones in 2020 (Edwards et al., 2008).

Third generation biofuels are made out of biomass sources not used for food production, such as algae, switchgrass, jatropha, babassu, and halophytes. Algae are simple, photosynthetic plants. They have a single-celled structure, extremely efficient in use of light and absorption of nutrients. Furthermore their production does not compete with agriculture. Algae production facilities are closed and do not require soil for growth, use 99% less water than conventional agriculture, and can be located on non-agricultural land far from water. They can be grown with polluted or salt water. Since the whole organism converts sunlight into oil, algae’s growth and productivity is 30 to 100 times higher than crops like soybeans. As for the other raw materials taken into consideration, jatropha reclaims wasteland, is a natural fence for crops and grows in poor soils; Halophytes grow on salt ground, where nothing else grows well; switchgrass, a hardy grass, needs little water and produces a high output of biomass; babassu is a native growing Brazilian tree with a high oil-yield nut. These types of biofuels are starting to look very promising as their production is much more efficient compared to the production of first-generation biofuels, but further research is required and volumes need to be expanded.

## 2.2 Legislative framework in the EU

The European institutions have been encouraging the development of renewable energy and particularly of biofuels for quite a long time now. The first official paper which highlighted the need to substitute fossil fuels was the Commission Green Paper "Towards a European strategy for the security of energy supply" of November 2000 (EC, 2000). It introduced the objective of substituting 20% of traditional fuels by alternative fuels in the road transport sector by 2020. It stressed the key role of economic instruments in form of tax reductions to achieve the targets set in terms of volumes by reducing the price differential between biofuels and fossil fuels.

In addition, in the Communication entitled "A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development" presented to the Göteborg Summit in June 2001 the EU highlighted the important role of biofuels in tackling climate change and in the development of clean energies (EC, 2001a).

Furthermore in September 2001, following the Communication presented in Göteborg, the European Commission adopted the White Paper "European Transport Policy for 2010: Time to Decide". It established a target of 6% market share of biofuels to be reached by 2010 (EC, 2001b).

Moreover in November 2001, the European Commission launched an Action Plan and adopted two proposals for Directives to foster the use of alternative fuels for transport. It started with the regulatory and fiscal promotion of biofuels. The Action Plan for the promotion of alternative fuels and biofuels in

road transport concentrates policy efforts on the promotion of biofuels in the short, natural gas in the medium and hydrogen in the long term (EC, 2001c).

The first proposal for a Directive would allow Member States, but not oblige them, to reduce fuel duties on pure biofuels or biofuels blended into other fuels used for heating or transport purposes. The taxation of mineral oils in the EU is based on two Directives, 92/81/EEC (on the Harmonisation of the Structures of Excise Duties on Mineral Oils) and 92/82/EEC (on the Approximation of the Rates of Excise Duties on Mineral Oils). These set a minimum fuel duty level for each mineral oil according to its use (motor fuel, indusproject and commercial use, heating), some fuel duty reductions were already foreseen but on the majority of the cases they needed the Council's unanimous authorisation.

Given the fact that appropriate differentiation of fuel duty rates would contribute to the development of the biofuels industry by offsetting the high cost of manufacturing biofuels compared to fossil fuels, in October 2003 the EU Directive 2003/96/EC on the Taxation of Energy was passed. It allows Member States to reduce fuel duties in proportion to the percentage of biofuels incorporated in the fuel or end product, without the need for a specific authorisation of the EU's Council of Ministers.

As a direct regulatory support for biofuels, the *EU Directive 2003/30/EC on the Promotion of the Use of Biofuels or other Renewable Fuels for Transport* was passed in May 2003. The aims of this Directive correspond to those listed above in the Introduction to this chapter, among which the security of energy supply is considered the most important. The EU aims at tackling the oil dependence of the transport sector it is currently facing. A second aim is to mitigate GHG emissions of road transportation to meet the Kyoto targets and to follow the guidelines of the White paper "European transport policy for 2010: time to decide" published in September 2001.

The Biofuels Directive sets indicative targets for the Member States, they have to reach a minimum share of biofuels use in the total petrol and diesel use for transport of 2% in 2005, of 5.75% in 2010 and of 10% in 2020. The percentages have to be calculated on the basis of energy content, whose conversion factors are also specified in Annex 1[3]. The 2005 target was not met, and according to a study of the European Environmental Bureau it is unlikely that at EU level the target for 2010 will be met either (EBB, 2007). To allow the Member States to comply with the EU targets, the EU itself mandated them to build up the necessary legislation and it allowed for fuel duty concessions for the promotion of biofuels use. According to the EU law, European Union Directives have to be implemented only at national level, no binding target can be set for the local level by the EU legislation.

Beside the Biofuels Directive two further support measures are relevant at EU level for the development of biofuels production: a tariff on denaturated and non-denaturated ethanol imports of Euro 10.20/hl and 19.20/hl (respectively correspondent to the 33.2% and the 62.4% in ad valorem terms, using the 2007 average prices and exchange rates). Imports of biodiesel are taxed with a tariff of 6.5%. Moreover within the Common Agricultural Policy the EU provides a specific area payment for crops used for energy generation with the Energy Crop Aid. 45 Euro/ha are paid for feedstock used for biofuels production and for those used for the Combined Heat and Power generation (CHP) (OECD, 2008).

The European Commission issued a Communication on the use of energy from renewable sources in January 2008 (EC, 2008). A Draft Directive submitted to the European Council and European Parliament is included in the Communication. The proposal aims to establish by 2020 national renewable energy targets resulting in an overall binding target in the energy sectors of transport, electricity, heating and cooling of a 20% share of renewable energy sources. The mix of the sectors' shares in reaching the overall target is left to the Member States' discretion, however by 2020 each Member State has to achieve a binding 10% minimum target for biofuels in transport. The motivations

[3] The energy content per litre of volume expresses the value in MegaJoule (MJ) of one litre of fuel. It is the basic unit to calculate the share of biofuels in the total amount of transport fuels placed on the EU and national markets.

beside this are the same as in the Biofuels Directive: the transport sector presents the most rapid increase in GHG emissions of all sectors of the economy so GHG savings focused on this sector are fundamental. Through biofuels it is possible to tackle the oil dependence of the transport sector, decreasing the insecurity in energy supply. Without specific requirements biofuels would hardly be developed, as they are still more expensive to produce than other forms of renewable energy.

## 2.3 Sustainability concerns about biofuels production

A target of 10% for 2020 is ambitious and there is a high risk that it cannot be met through sustainable production. The quantity of fossil fuels and fertilizers used in the cultivation of raw materials and later in the process and supply of biofuels is a key element in the final calculation of the GHG balance of biofuels. In fact although the exhaust tailpipe emissions of biofuels should be smaller than those of conventional fuels, much depends on the sustainability of the production phase. They are defined as "indirect effects of biofuels consumption" and can counterbalance the smaller emissions released from their combustion (Edwards et al., 2008). Therefore, the drafted Directive also proposes sustainability standards for biofuels. Within biofuels production a minimum level of GHG savings and a number of requirements related to biodiversity have to be respected.

In principle, it would be possible for the EU to technically meet its biofuels needs exclusively through internal production. This would imply the modification of the food and feed supply, which would have to be compensated through importations (EEA, 2005). In the end it is more likely that a combination of EU production and imports from third countries both for food and biofuels production will take place.

With more farming for food and feed production displaced outside the EU, the EU will become an indirect importer of food. This happens with rapeseed oil originally grown for food production and today diverted to biodiesel production, which has caused an increase in palm oil imports in the EU, which is cheaper. The main consequence of this is deforestation, especially concentrated in developing countries with large tropical rainforests, as the agriculture and energy crops sectors grow. This causes a massive $CO_2$ emissions amount (about 20% of global emissions), since carbon stored in the soils is released (especially from peat lands), which is a further negative side-effect of biofuels production (Edwards et al., 2008).

As far as the security of supply is concerned, the advantage would only be partial: with a 10% share of biofuels the effect of an eventual fossil fuel restriction would be 90% so powerful compared to what would happen in case of 100% reliance on fossil fuels. Fossil fuels are still used to produce biofuels, which is a disadvantage as it diminishes the protection given by higher fossil fuels consumption. Moreover, as it has been illustrated above, a substantial share of biofuels will anyway have to be imported, creating a new security of supply issue, which will anyway be less threatening as it will not be so strongly bound to the risk of fossil fuel disruption (Edwards et al., 2008).

For these reasons the EEA Scientific Committee recently suggested suspending the target of 10%. Before setting a new and more moderate long term target they suggest carrying out a comprehensive scientific research on the environmental risks and benefits of biofuels (EEA, 2008). In 2008, the JRC in the study from Edwards et al. (2008) also stated that the biofuels programme in Europe is not the best cost opportunity strategy to achieve the $CO_2$ reduction targets, as the biofuels production costs in the EU outweigh the benefits in term of GHG savings, security of supply and employment creation (Edwards et al., 2008).

## 2.4 Support measures for biofuels

Given the high production costs of biofuels compared to fossil fuels and the need to modify the present infrastructure, transport and delivery system it is unlikely that renewable fuels prosper without public support from national governments.

A study from the OECD (2008) shows a classification of different examined and/or applied policy measures to foster the development and use of renewable biofuels industries in OECD member countries, being the four countries examined in the following case studies among them. These policy measures have an effect on various stages of the production and use chain of biofuels and are often combined together to obtain more effectiveness. This classification will help to classify and in comparing the different measures adopted to implement the EU Directive 2003/30/EC on the Promotion of Biofuels.

The study distinguishes among measures affecting the production of biomass, measures affecting the conversion of agricultural feedstock into biomass for renewable fuels, measures affecting the distribution of biofuels and support measures for renewable fuels consumption.

As far as the measures affecting the production of biomass are concerned, they can take the form of direct subsidies per output of biomass produced to a biomass producer (a farmer or a wood producer), like the Energy Crop Aid of the European Union. It was introduced in 2003 Common Agricultural Policy reform, put into practice in 2004 and foresaw the coming increase in the demand for biodiesel and bioethanol crops in the next future in response to the Biofuels Directive implementation. Another type are general input subsidies; these are not direct subsidies for biomass production but subsidies with an indirect effect on agricultural biomass production costs; they aim at reducing what the farmers pay for variable inputs.

The measures affecting the conversion of agricultural feedstock into biomass for biofuels point at a reduction of infrastructure costs. Governments financing part of the investment costs to a producer for a biofuels installation and giving capital grants are the most often used measure of this kind. However it can take also other forms, like a system for guaranteed loans underwritten by the state or capital grants exclusively allocated by the government to the firms owning a licence proving its efficiency on the basis of a variety of criteria. The direct reduction of production costs guarantee an amount of money to the upstream producer usually proportional to the amount of biomass produced. Another way is to guarantee a price that the biofuels distributor has to pay to a private, independent and eligible producer of biofuels, it can be fixed for a multi-annual period or periodically adjusted. This guaranteed minimum price is also known in some cases as “feed-in-tariff”. In addition, quantitative requirements, such as quota obligation schemes can be used to set the amount of fuel that must be produced from agricultural feedstocks or biomass.

To reduce the distribution costs there are measures affecting the distribution of biofuels, which can take the form of a fuel duty credit to biofuels blenders. The biofuels blenders pay a fuel duty on the fuel supplied, afterwards they can claim a tax credit for the part of the biofuels supplied. A direct subsidy in the form of a State Aid can also be guaranteed to the distribution costs of biofuels. In addition to the quota obligation schemes seen before which are focused on the production, government can require infrastructure quotas focused on the distribution, i.e. to oblige petrol stations to sell a certain amount of biofuels.

An example for the support measures for renewable fuels consumption can be a reduction of biofuels prices compared to the price of the fossil fuels. To obtain this a fuel duty exemption for biodiesel and bioethanol is mostly used. Exempted to the fuel duty can be a pre-determined quantity of renewable fuel or an unlimited quantity of biofuels (the second option may later lead to overcompensation risk, as it will be the case described in section 6.2 for Germany). Quantitative requirements can be set again here, a quota obligation scheme to set the minimum consumption of renewable fuels. It can be a minimum

share target or a blending percentage under which biofuels users may be required to consume a certain amount of renewable fuel with their total fuel purchases. In case of non compliance to the set targets a penalty can be set (OECD, 2008: 27).

# 3 Theoretical frameworks

The implementation of EU Directives and their effects at national level have been studied since the 1970s and the existence of differences in the implementation processes of the Member States is evident. In general environment policies are good examples for such an analysis as the environment is one of the EU's most well developed areas of competence. The first Environmental Action Programme was formally launched more than thirty years ago, at the 1972 Paris Summit, and it established the framework for environmental policy-making in the European Union. Five similar programmes followed, giving the possibility to assess the extent to which Europeanization is implicated in the national environmental policies of the Member States. To give an opposite example, Europeanization in sectors like foreign affairs or defence would be more difficult to study, because the EU does not have such a long story of involvement in these policy areas (Jordan & Liefferink, 2004: 3).

"The concept of Europeanization is characterised by theoretical and methodological pluralism, given the fact that it has been explained from different theoretical perspectives" (Jordan & Liefferink, 2004: 5). According to Jordan & Liefferink, (2004) there are five main strands of definitions of "Europeanization":

*The top-down impact of the EU on its member states.* Heritier et al. (2001: 3, cited in Jordan & Liefferink, 2004: 6) "define it as the process of influence deriving from European decisions and impacting on Member States' policies and political and administrative structures". In this way the EU acts in a top-down mode through legal acts and policies.

*The accumulation of policy competences at EU level.* Cowles et al. (2001: 2 cited in Jordan & Liefferink, 2004: 6) define Europeanization as "the emergence and development at the European level of distinct structures of governance". Following this theory Europeanization is synonymous with European Integration, which corresponds to the creation of the European Union itself.

*The growing relevance of the EU as a reference point for national and sub-national actors.* (Hanf & Soetendorp, 1998:1; Wessels et al., 2003: xiv, both cited in Jordan & Liefferink, 2004: 6) The EU policies are increasing in number and relevance therefore the EU is becoming a more and more important player which is difficult to ignore.

*The horizontal transfer of concepts and policies in the EU between member states.* Bomberg & Peterson (2000, cited in Jordan & Liefferink, 2004: 6) relate Europeanization with the term "policy transfer" whereas Burch and Gomez (2003: 2, cited in Jordan & Liefferink, 2004: 6) "encompass examples of "cross loading" through which the states share ideas amongst themselves." The EU can be seen as the facilitator of inter-state transfer.

*The two way interaction between states and EU.* This description comes from the empirical observation that states routinely pre-empt domestic adjustment by "shaping an emergent EU policy in their own image" (Bomberg & Peterson: 8, 2000 cited in Jordan & Liefferink, 2004: 6). "In this mode Europeanization is circular rather than unidirectional, cyclical rather than one off" (Goetz, 2002: 4, cited in Jordan & Liefferink, 2004: 6). Here, the EU "is both a cause and an effect of national change" (Jordan & Liefferink, 2004: 6).

The first definition is the one that best fits in this work as it starts with a top-down approach and aims to understand how EU Directives influence the national policy system. The fifth definition is more related to the part of this research focused on the local-level measures and can be linked to the multilevel governance theory.

In order to give a useful tool to examine the case studies described in chapters 6, 7, 8 and 9 at national level Europeanization as a top-down approach will be introduced in section 3.1 while in section 3.2 a heuristic framework for the analysis of local-level activities will be introduced.

## 3.1 Europeanization from a top-down perspective

As seen above theories of Europeanization can be applied to different categories of studies: to understand an historical process, as a matter of cultural diffusion to describe the export of cultural norms and patterns, as a process of institutional adaptation and as the adaptation of policy and policy processes (Featherstone, 2003: 5).

As already discussed in the previous section, Europeanization in this study is used as a tool to understand processes of institutional adaptation and adaptation of policy and policy processes to European decisions. The first type of Europeanization refers to how domestic actors and institutions have been affected from the EU and how public administrative institutions have adapted themselves to the obligation of EU membership. The second type is the largest category within the Europeanization theories and it studies the impacts of EU membership on national public policy (Featherstone, 2003: 7).

In order to treat Europeanization more in details section 3.1 is further subdivided and the next sections contain a more in depth explanation of different aspects of Europeanization. Section 3.1.1 gives an overview of the multilevel governance concept, which is connected to the Europeanization studies and tries to explain the more and more relevant role of local authorities in the EU arena. Section 3.1.2 focuses on the description of "misfit" and connected to it are the five degrees of domestic political change required for Europeanization to take place. Section 3.1.3 provides an overview on the political and societal actors which play a decisive role in overcoming the "misfit" and give shape to one of the five degrees of change described in the previous section

### *3.1.1 Multilevel governance*

The concept of multilevel governance, which forms integral parts of most Europeanization theories, is "used to describe the changing nature of territorial politics within the EU" (Goldsmith, 2003), i.e. the "shifts in authority in global politics" (Paterson, 2001). This phenomenon has been described as a "new geography of governance" which leads to a "hollowing out" of the nation state. Thanks to the EU some functions which were previously mainly national and centralised are relocated up to the supranational level or down to the local level.

Multilevel governance originates from the regional policies of the EU, which since the 1980s have been involving the sub-national level in the management of regional funding (Benz & Eberlein, 1999). "Regional policy has encouraged forms of cooperative subnational politics which have subtly changed both national intergovernmental relationships and those between the European Union and the Member States. Cross border cooperation through Programmes as INTERREG, cohesion policy requiring the adoption of the partnership principle, pilot poverty programmes like Poverty 1-3 and URBAN all provide examples where cities and regions have adapted as part of their attempts to win EU fundings" (Goldsmith, 2003: 113).

From a multilevel-governance perspective the levels of government are not seen as parts of a stable hierarchical arrangement. A fixed distinction between what happens at supra-national, national and local levels is unhelpful, as authoritative decision-making is dispersed across multiple territorial levels and authority is shared among a variety of public and private actors (Hooghe & Marks, 2001). This dispersion of power and of participation identifies actors engaged in policy networks and witnesses a transformation towards a network mode of governance as opposed to the ones of hierarchy or market. "The result is a system of decision making in which there are multiple access points, multiple opportunities to exercise influence and pressure, and multiple places at which decisions are made" (Goldsmith, 2003: 116). In addition, attention to non-state actors and to the way they interact across

state boundaries becomes important. It may also facilitate the action of nation-states and performing governance functions themselves

Principles of multilevel governance can be found within environmental policy-making as well, e.g. as nation states commit themselves in supra-national environmental agreements but implementation thereof requires the cooperation of actors at sub-national levels. This empowers the local reality strengthening the phenomenon described for the regional policy.

The multilevel character of environmental policy can, inter alia, be seen in the implementation of EU regulations at the sub-national level. Today, many regulations which are implemented locally were formulated at the EU level. Typically, EU influence is only indirect because it comes in the "disguise" of national legislation, in this sense, national governments act as a kind of filter between the EU and lower levels of governance (Schultze, 2003). EU Directives bind the Member States as to the results to be achieved; they have to be transposed into the national legal framework but leave Member States the choice on the method used in order to achieve these results (Schultze, 2003). In addition local-level authorities may take initiative to put into practice measures in line with those implemented at national level, facilitating the action of nation-states in performing governance functions themselves.

### *3.1.2 "Misfit" and degrees of domestic policy change*

Empirical evidence shows that the degree to which and the forms in which national and sub-national governments react to EU regulations vary remarkably. The scholarly literature on Europeanization has devised various typologies which help to characterise Member States' reactions to EU pressures. Scholars have also put forward various explanatory frameworks to better understand the underlying causes of these reactions. The so-called "misfit" framework is one of those. "Policy misfit" is not the only useful concept to explain Europeanization but it better than others fits to this work.

The concept of "misfit" postulates that one of the key factors that explain the extent of domestic change is the amount of divergence or "policy misfit" between EU rules, regulations and requirements on the one side and domestic policies on the other side (Jordan & Liefferink, 2004: 7). "Policy misfit" essentially indicates the incompatibility between national and European policies, in brief compliance problems. The less compatible the national policies are with the European standards, the bigger is the "policy misfit", and the bigger is the adaptation pressure at the domestic level (Auel, 2006: 304). There must be a certain level of "policy misfit" or incompatibility between European-level processes, policies and institutions on the one hand and domestic-level processes, policies and institutions on the other to develop adaptation pressures within one country which push in direction of a domestic change.

To quantify the extent of adaptation pressures leading to domestic change, i.e. to comply with the EU policies, five degrees of domestic policy change have been outlined (Jordan & Liefferink, 2004: 7). They cover both the magnitude and the direction of policy change (Radaelli, 2003: 37). These five degrees depend on the existing domestic "misfit" and as a consequence they depend also on the intervening factors which help to overcome the "misfit" and produce domestic change.

*Absorption:* Member States are characterised by a small "misfit" between EU requirements and prevailing domestic characteristics (Jordan & Liefferink, 2004). Domestic structures and policy legacy provide a mixture of resiliency and flexibility. It indicates change as adaptation because national characteristics do not have to be modified and the EU requirements are simply absorbed (Radaelli, 2003: 37). An example from environmental policies could be when the EU simply asks states to tighten a pre-existing limit for a certain substance as part of the reform of an existing EU Directive.

*Accommodation:* Member States are characterised by a medium "misfit" between EU requirements and prevailing domestic characteristics, so the amount of domestic adaptation is low (Jordan & Liefferink, 2004: 8). Member States accommodate Europeanization pressures by adapting existing policies without changing their essential features and the underlying collective understanding attached to them. One way is the patching up of new policies and institutions onto existing ones without changing the latter (Börzel & Risse, 2003: 70). A practical example from environmental policies could be when states have to implement a new policy tool without fundamentally changing the whole environmental protection system or overturning the underlying policy paradigm.

*Transformation:* Member States are characterised by a high "misfit", so the domestication fails. Member States can only implement EU requirements by altering their existing characteristics. This type of change happens when states have to alter their policy style to implement measures which had never been used before (Jordan & Liefferink, 2004: 8). It is also defined as paradigmatic change (Radaelli, 2003: 37). For example the EU has often pushed the UK to adopt clear limits for specific polluting emissions. These caused an alternation of the UK policy style, because the UK had only ever set a small number of such limits and only ever on a relatively informal basis.

The last two degrees refer to more specific circumstances.

*Inertia:* The "misfit" varies. The Member States deliberately block EU requirements either by not implementing policies or by engaging in partial compliance (Jordan & Liefferink, 2004: 9). The amount of domestic change will be limited until sufficient political pressure has built up to deliver the necessary national adaptations. In the long term it could become unsustainable, causing crisis and abrupt changes (Radaelli, 2003: 37).

*Rentrenchment:* The "misfit" varies. Member States block EU requirements at the implementation stage and develop new national policies diverging from the EU requirements. Countries actively resist adaptive pressure by stressing their unique features (Jordan & Liefferink, 2004). It is a very paradoxical effect and implies that national policy becomes less European than it was, meaning that national policies become even more national because of European Union policies (Radaelli, 2003: 38).

### *3.1.3 Actors' reactions to misfit*

As shown from the classification above, "misfit" provides societal and political actors with new opportunities and constraints to pursue their interests. European policies can challenge national policy goals, regulatory standards, the instruments or techniques to be used to achieve policy goals and/or the underlying problem-solving approach. In presence of "policy misfit" a condition towards Europeanization is that at national level various facilitating or hindering factors – actors, institutions –respond to pressures towards adapting to, inducting or slowing down the change (Börzel & Risse, 2003: 58).

The capacity of actors to exploit these opportunities and to avoid the constraints to lead to a domestic redistribution of power is decisive to pursue this mechanism. These intervening factors which play a relevant role in enhancing or overcoming the "misfit" are differently identified depending on the political theory chosen to explain these mechanisms. In the following, two relevant theoretic strands will be introduced, namely rational institutionalism and sociological institutionalism.

*Rational institutionalism* recognises *multiple veto points* and *formal institutions* as key explanatory factors. The veto points are actors in a country's institutional structure with different interests which can be empowered to avoid constraints emanating from the Europeanization pressures and inhibit domestic adaptation (Börzel & Risse, 2003: 58, 64). Veto points can be compared to points of negotiation; in fact those who want to bring domestic adaptation have to negotiate in the framework of veto points to achieve a change (Jordan & Liefferink, 2004: 9). In case the formal institutions or national pressure groups have a political interest in exploiting "policy misfits" and in implementing the changes demanded

by the EU they promote a maximal approach to implement European policies (Jordan & Liefferink, 2004: 10). They may provide actors with material and ideational resources to exploit new opportunities which lead to an increased likelihood of change (Börzel & Risse, 2003: 58).

*Sociological institutionalism* recognises two key explanatory factors: *change agents* and *political culture*. Change agents or norm entrepreneurs are figures able to mobilise the domestic context persuading others to redefine their interests and identities (Börzel & Risse, 2003: 59). Norm entrepreneurs usually use moral arguments and strategic constructions to persuade actors to redefine their interests and identities, engaging them in processes of social learning. Among all the types of norm- and idea-promoting agents, "epistemic communities" and "advocacy coalitions" are the most used in the literature about Europeanization. "Epistemic communities" are networks of actors with an authoritative claim to knowledge and a normative agenda. They legitimate new norms and ideas by providing scientific knowledge about cause-and-effect relationships. They are also defined as the "science" which provides "truth" to policy makers (Bulkeley & Betsill, 2003: 10). Usually the higher the consensus among the scientists involved, the more scientific advice is institutionalized in the policy making process. To the second type belong the "advocacy coalitions" or "issue networks", which are bound together by shared beliefs and values rather than by consensual knowledge. They appeal to collectively shared norms and identities in order to persuade other actors to reconsider their goals and preferences (Börzel & Risse, 2003: 67).

The second mediating factor according to sociological institutionalism is political culture. In the context of environmental politics, political culture mainly plays out as national societal support for environmental protection, or the national environmental sensitivity, also described in section 3.2.3. A positive environmental sensitivity of one country's population conduces to consensus building and cost-sharing, promoting adaptation to European targets (Börzel & Risse, 2003: 59). A political culture conducive to consensus building and cost-sharing also facilitates domestic change in response to Europeanization. A consensus-oriented or cooperative decision making culture helps to overcome multiple veto points by rendering their use inappropriate for actors. Furthermore it allows to sharing the costs of adaptation, facilitating in doing so the pressure for adaptation. Rather than shifting costs of adaptation upon a social or political minority the winners of domestic change compensate the losers (Börzel & Risse, 2003: 68).

## 3.2 Local-level activity and its causes

In recent years, the role of cities in climate governance has gained more importance. Cities have been described by Mac Leod & Jones (2003) as "newly configured territorial political spheres". On the one hand, many climate change-related problems stem from the activities of urban individuals, communities, governments and industries (Collier, 1997). On the other hand, cities are places in which efficient solutions can be found, and where win-win options between economic, environmental and social objectives may be possible (Bulkeley & Betsill, 2003).

Even though the implementation of EU Directives takes place at national level it is a matter of discussion whether or not the local level is contributing more and more to reach the targets contained in the EU Directives. The nation state is not the only actor anymore and a traditional distinction among domestic and supra-national politics is increasingly problematic (Bulkeley & Betsill, 2003, 10). Thus, national emission profiles are strongly influenced – in a positive as well as in a negative way – by decisions taken at the local government level (Collier, 1997). Both as perpetrators of environmental problems and as supplier of environmental solutions cities are not independent in their actions, they move from the issue of local and urban sustainability as a common basis and thanks to the exchanges which are taking place more and more often through networking cities become part of a polycentric

system of multilevel governance, in which cities interact with national and supra-national actors and cooperate with other cities.

This section is sub-divided into six sub-sections, 3.2.1 to 3.2.6, in which relevant factors for the explanation of local-level activities will be described in greater detail.

The form and degree of implementation of EU requirements at the local level depends on a number of factors. The key factors as summarised in the conceptual framework shown in Figure 1 are: (i) national-level regulations and support, (ii) the system of local self-government, (iii) support from the local citizenry, (iv) support from the local businesses, (v) access and acquisition of EU funds, and (vi) horizontal networking between cities.

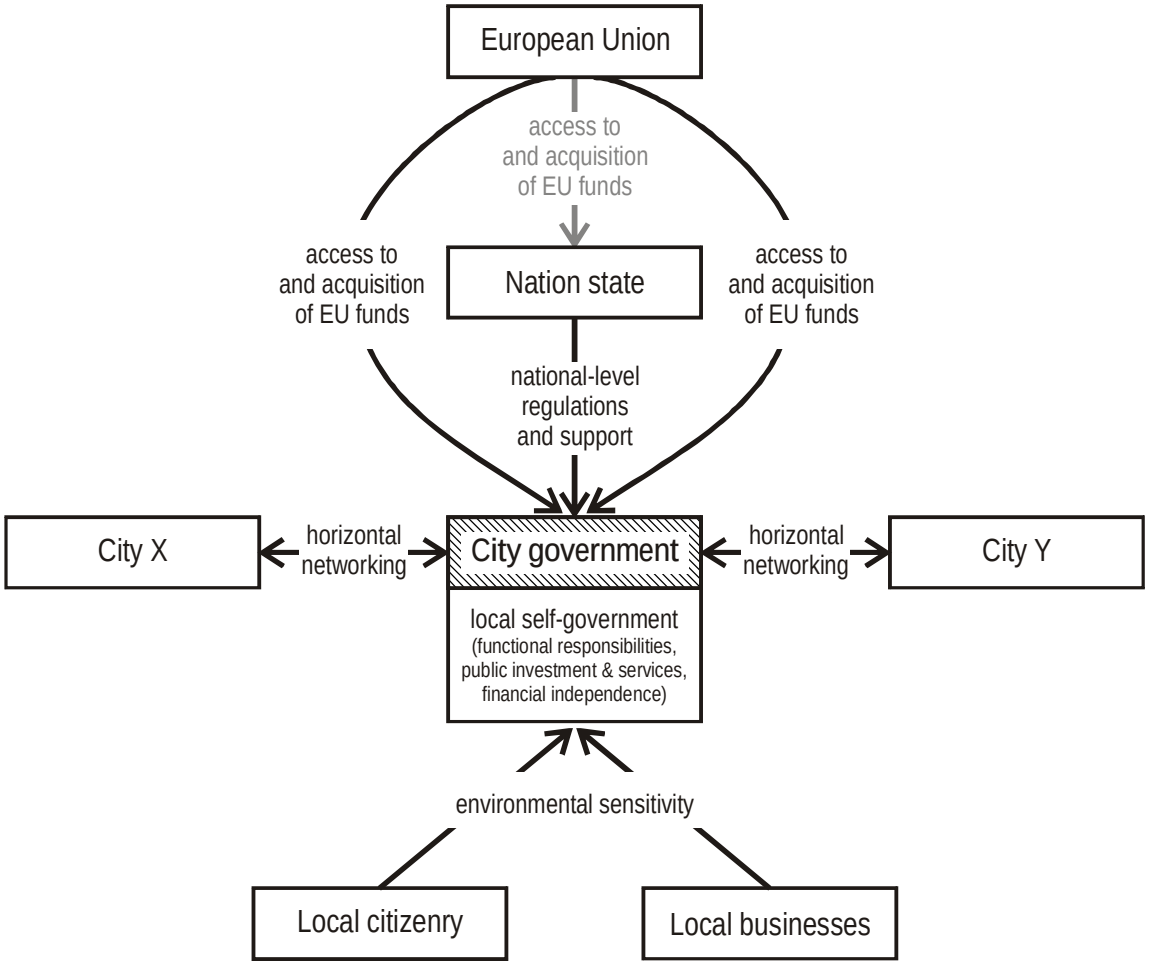


Figure 1: Conceptual framework

### *3.2.1 National-level regulations and support*

National governments have a large set of public policy instruments through which they can accomplish EU targets or gently entice regions and cities to start climate protection policies. These are a set of techniques by which governmental authorities wield their power in attempting to ensure support and effect social change. These policy instruments can not only be addressed by the national government to implement EU Directives or to shape national policies but they can also be used to implement measures at the local level. Governments can create unique mixes of several policy instruments to reach a target

and it is important to have a general overview of the different forms of these instruments, to understand how they are combined together and how they fulfil (or not) their function.

There are different typologies of policy instruments. One of the most known is the distinction among regulatory instruments, economic instruments and information instruments, also known as the stick, the carrot and the sermon. As Vedung (1998) in his study stated, "The government may either force us, either pay us or have us pay, or persuade us" (Vedung, 1998: 30).

*Regulatory instruments* ("the stick") prescribe certain modes of behaviour by means of formulated rules, directives and prohibitions which mandate receivers to act respecting what is ordered in these rules. The regulatory instruments can be divided into unconditional prohibitions, prohibitions with exemptions, prohibitions with permissions and obligations to notify. Relevant for this study are the prohibitions with permissions, also known as enabling legislation. Permissions are granted to the applicant as long as he proves that his activity is in line with specific requirements outlined by the regulatory instrument. Its aim is to control, to raise demands on the activity involved through, for example, permissions granted like quotas (Vedung, 1998). Their effectiveness decisively depends on the possibility of threatening and imposing sanctions (Mayntz, 1983).

*Economic instruments* ("the carrot") involve either the distributing (grants, subsidies) or the subtracting (taxes, user charges) of material resources. Economic instruments make use of the market mechanism and rely on the utility maximization of the addressees, they leave the subjects autonomy within which to choose whether to take an action or not. A first classification can be the "in-cash" / "in-kind" dichotomy. Governments can choose whether to transfer payments in money or in kind, with the in-kind instruments being more constraining than the in-cash ones. The in-kind incentive tool of interest for our study is the government provision of goods and services. The in-cash incentive tools of interest here are the subsidies, payments sustained by the government to individuals or businesses, no products or services are received in return. The aim is to make a particular service or product available at a price that the public can readily afford. When the tax expenditures are in form of tax exemption, some parts of an income/fortune/action are exempted from taxation. Tax exemptions reduce the costs of taking actions deemed valuable by the government. They neither prescribe nor prohibit the actions involved in the measure, they make these actions cheaper (Vedung, 1998).

*Information instruments* ("the sermon") cover government-directed attempts at influencing actors through transfer of knowledge, communication of reasoned arguments, and moral persuasion in order to achieve a policy result. It is nothing more than a transfer of knowledge or a persuasive reasoning which should make the citizens do what a government deems desirable. Mass-mediated versus interpersonal transmission of information is taken as basis for further classification. As the word self-explains, mass-mediated transmissions use the mass media to disseminate messages, while among the interpersonal channels of transmission the relevant one in this study is government demonstration, whose underlying idea is that if a particular material or technology can be seen in operation, the probability of its adoption and use will increase. Similar to the economic instruments, no obligation is involved, the addressees are not mandated to act as prescribed in the information, it is plain recommendation (Vedung & van der Doelen, 1998).

The constraint imposed on the addresses is the basis underlying this tripartition. Regulatory instruments are more constraining for addressees than economic means, and the economic means are more constraining than information instruments (Vedung, 1998).

### *3.2.2 System of local self-government*

The form and degree of city-level activities do not only depend on support from higher hierarchical levels but they are also very much influenced by the prevailing system of local self-government (Hesse &

Sharpe, 1991; Goldsmith, 1996). There are two factors which strongly determine a city's scope for action: first, the local authority's jurisdiction and functional responsibilities and, second, a city's financial independence which mainly depends on whether cities have a constitutional right to levy taxes or whether they are dependent on central state grants to fulfil their functions. The more competencies and resources are concentrated at the nation-state level the more national governments can (and have to) resort to regulatory and financial instruments in order to influence local action; the more competencies cities possess (esp. in the field of environmental policy) and the higher the level of public investment and services (e.g., water supply, waste management, public transportation, construction of schools, roads, and hospitals etc.) the more important an autonomous local action becomes.

In 2007 the State of European Cities Report created an index to measure city power in different fields, taking into account (1) size, (2) governance structure and political status, (3) size of budget and resources controlled by city authorities, and (4) the proportion of income obtained from local taxes and charges. Cities were categorised among "most powerful", "more powerful", "less powerful" and "least powerful".

Berlin, one of three city-states in Germany, is not only indexed as one of the "most powerful" cities in Germany but also within the EU. Causes for its power are its status as a federal state, the high levels of expenditure per resident and the importance of local tax revenues and the size.

In Scandinavia and in Italy, cities are categorised as "most powerful" as they have the highest shares of local government expenditures and local taxes, but the power of cities is more homogeneously distributed and no local authority stands out for its higher power here. In the UK, due to the existing diverse systems of local government, the status of the cities is not homogeneous. London is a particular case, data on Boroughs and Greater London Authority spending and income suggests levels of spending per capita very high, similar to cities ranked as "most powerful". However London and other UK cities dispose of less control on local taxes, which causes them to be classified as "more powerful", officially estimating London as the least powerful city amongst the cities in our study (State of European Cities Report, 2007).

In all four countries addressed in this study, local authorities have the lead responsibility for developing local transport strategies. The local authorities also have a role in planning and financing new local transport infrastructure: In Germany and the UK, the local authorities have the lead responsibility, whereas in Finland and Italy the local authorities have partial or shared responsibility on the issue. With regard to operating and procuring public transportation, the local authorities in Italy have the sole responsibility, in Germany lead responsibility and in the UK and Finland partial or shared responsibility (State of European Cities Report, 2007).

In case of municipally-owned energy companies (like in Germany, Austria, Italy or Sweden) the potential influence as far as energy is concerned is greatest as they can directly influence investments and costs and impact on emissions. Local authorities play a relevant role in all countries as energy consumers, as for street lighting or for public buildings. Investments in efficient technologies, insulation and various energy management activities can reduce emissions, furthermore local authorities can commit themselves in providing advice and information to the citizens about environmental issues. Energy efficiency investments in public buildings can be seen as good example (Collier, 1997).

### *3.2.3 Support from local citizens*

The national or local involvement in climate change activities can have motivations which stem from the culture of a Member State. The history of national engagement with environmental issues and the degree of public environmental sensitivity are considered as important explanatory factors to explain the high or low activity at national and local level in relation to environmental policy.

If there is support from the public it is more likely that national and local authorities get involved. Public sensibility both to environmental issues and to climate change issues has a propulsive effect towards more activities on environmental policy. It is important to notice that environmental sensitivity varies from nation to nation and within one nation it also varies locally.

The classification of the different countries is also different from study to study according to the factors taken into account to support the theories. According to the study by Collier (1997) the so called "leader" countries, such as Sweden and Germany, historically and traditionally are more active in the environmental field, while the "laggards", like Italy, Spain or the UK, are less likely to be proactive. This connotation of "leaders" and "laggards" is directly linked to the expertise and capability developed within the authorities at different governance level; usually authorities in the leader countries have long established environmental departments also at local level, which are usually lacking in the "laggard" countries (Collier, 1997: 45).

How the local environmental sensitivity is perceived in the four countries of this study will be briefly described in sections 5.1 to 5.4, where the description of the national and local political context is also provided.

### *3.2.4 Support from local businesses*

In this study, the presence of environmental culture at national level and the involvement of businesses in supporting projects at local level have been considered as related to each other. This is based on the consideration that if the environmental culture in one country is strongly present, then businesses in that country will be interested in getting involved in "environmental friendly" projects. This can take place not exclusively because managers are moved by environmental awareness but also because they aim at improving the green image of their company, expecting positive feedbacks in the sales to environmental sensitive consumers.

Although connected, the two explanatory factors of "support from local citizens" and "support from local businesses" will be measured on different bases in this study. Support from local citizenry will not be measured directly but the degree of national environmental conscience as described in the literature will be taken as a proxy variable. Support from local businesses will be quantitatively measured in this study through the concrete participation of private companies in local projects.

### *3.2.5 Access to and acquisition of EU funds*

Cities are not only financially supported by the national government but also from the EU, typically in the form of co-financing of specific projects. In the context of climate policy, the most relevant funding schemes are the European Regional Development Fund (ERDF), the Intelligent Energy Europe (IEE), now part of the Competitiveness and Innovation Framework Programme (CIP) and the EU main instruments for funding research in Europe, namely the Framework Programmes for Research and Technological Development (FP). The development and increase of local cooperation among regions, towns and project partners characterises each Programme here listed.

As for the ERDF, it focuses on the correction of imbalances between regions, it aims at strengthening the economic and social cohesion in the EU. It has 3 main objectives of regional policy and in this framework it finances, among others, infrastructures linked to environment, energy and transport research and development.

IEE aims at supporting local, regional and national initiatives within the fields of energy efficiency, renewable energies, energy-related aspects of traffic as well as financial international cooperation. A budget of 250 million Euros was available for the period 2003-2006 and financial assistance of up to 50

per cent of the total costs of projects could be carried out. Starting from 2007, the IEE Programme was included in the Competitiveness and Innovation Framework Programme (CIP), valid from 2007 to 2013. The total amount for the CIP will be 4.213 billion Euros, of which 780 millions Euros are allocated for IEE. Financial assistance of up to 50 per cent continues to be guaranteed. The competition of small and middle enterprises, the promotion of the information society, innovations - in particular eco-innovations - as well as energy efficiency and the use of renewable energies are financially supported by this Framework Programme.

Since 1984, the European Union supports research and technological development with the Research Framework Programmes. The Fifth Research Framework Programme lasted from 1998 to 2002 and disposed of an overall budget of 13,7 billion Euros. In the Sixth Research Framework Programme (FP6), valid from 2002 to 2006, 17.5 billion Euros were available. 2.12 billion Euros were allocated for "sustainable development, global changes and ecological systems, including the research within energy and traffic". Excellency networks were financed up to 25% and integrated projects up to 50%. For the Seventh Framework Programme (FP7) (2007-2013) 50 billion Euros are allocated. It is made up of 4 main activity areas, among which cooperation provides support to international research projects across the EU in different thematic areas, like environment (including climate change) and transport.

### *3.2.6 Horizontal networking between cities*

Policy networks started appearing due to the increasing complexity of policy processes and decision-making processes in particular. Many are the factors contributing to the creation of a new role of policy networks: the diffusion of numerous organization forms (concentrated interests as well as dispersed collectivities); the increasing complexity and the more and more numerous facets of policy making; new areas regulated by public policies; new policy actors playing a relevant role in new decision making processes, etc. (Capano & Giuliani, 1996).

Policy networks represent new forms of political government which reflect the changed relations between state and society (Kenis & Schneider, 1991: 41, cited through Capano & Giuliani, 1996: 277). The networks, intended as structures with a weak link, characterised through horizontal interdependencies, faith, reciprocity and dispersion of control would allocate themselves between or beyond the concepts of market and hierarchy.

Thanks to empirical research different kinds of network can be distinguished, the horizontal networking among cities can be interesting for this study. *Horizontal networking* is a phenomenon which started at the end of the 20th century and the literature on policy transfer and policy diffusion (e.g. Dolowitz & Marsh, 2000) has defined it as a source of policy learning. A number of European municipalities have organised in transnational city networks in order to have a forum for the exchange of information, experiences and ideas, gaining potential benefits from it (Collier, 1997; Betsill & Bulkeley, 2007). In fact they can strengthen their institutional capacity through the exchange of knowledge, know-how and innovation. Horizontal networking stimulates policy transfer and disseminates best practices. It helps cities to download Europeanization, meaning that it helps cities to keep up with a European or international state of the art in urban policy making. On the other side it can also help to upload Europeanization, representing cities interests to the EU institutions (an aspect which is not relevant in this study).

Horizontal and vertical networks “allow member cities to develop and hone a profile on the basis of expertise on, and engagement with, specific topics. On the one hand there is the possibility to influence processes at the EU level, on the other hand, these activities simultaneously provide opportunities that increase a city’s resonance at the European level” (Kübler & Piliutyte, 2007, 370). Such functional networks are not necessarily related to the EU but can contribute to the preparation of and the subsequent participation in EU programmes as maintaining contacts between their members reduces

the transaction costs of building partnership among cities when applying for or managing EU programmes (Kübler & Piliutyte, 2007: 367). “The result is a system of decision making in which there are multiple access points, multiple opportunities to exercise influence and pressure, and multiple places at which decisions are made” (Goldsmith, 2003: 116).

In the last six sub-sections a system of explanatory factors has been introduced. National-level regulations and support, system of local self-government, support from local citizens, support from local businesses, access to and acquisition of EU funds and horizontal networking between cities are convened to explain the lower or higher activity level of local authorities. National-level regulation and support, support from local citizens and support from local businesses are useful also to explain activities at national level, they help to understand how national governments get involved and overcome the “misfit” existing between EU regulations and existing internal policies.

# 4 Methods

This work investigates the implementation of the *Directive 2003/30/EC on the Promotion of the Use of Biofuels or other Renewable Fuels for Transport*, part of the EU Climate Change Package Measures (CCPM), in four EU Member States: Germany, the United Kingdom, Italy and Finland. Furthermore the voluntary mitigation measures taken at city level in one city for each of these countries, namely Berlin, London, Milan and Helsinki, are analysed. In this study the term “voluntary measures” is used to describe the measures implemented at local level that neither are required by the examined directive neither by other EU legislative acts nor are required by national laws.

The research is carried out in two steps: first the implementation process of the Biofuels Directive and its achievements in the four countries is examined and second the local measures and how they contribute to the compliance of national and EU climate targets are considered.

As far as the primary research to complete the empirical case studies is concerned, the key institutions at national and at local level have been fit to the explanation recognised and a range of written documents have been collected and reviewed, among them legal documents, policy documents with guidelines for future actions, position papers, and research reports. Furthermore key actors for the development of projects at local level like local government civil servants, environmental and energy agency functionaries, trade associations and private companies representatives have been contacted and interviewed either via telephone or directly. No pre-defined interview pattern has been followed and interviews have not been registered. In general when information found in documents or in websites were not clear enough or missing (it was often the case during the local-level primary research phase) the researchers used to call the responsible or expert of the project to clarify key points.

As for the city of Berlin the author of this work personally held phone interviews with Mr. H. Blümel from the Senate Administration for City Development, Mrs. Kerstin Kallman and Mr. Patrik Lamers from the Berlin Energy Agency and at latest with Mr. Markus Podbregar from the TSB Innovationsagentur Berlin GmbH. In London she personally held one interview with Mr. A. Gardner, from the Government Car and Despatch Agency. Her colleagues held the other interviews, in London with Mr. R. Cuthbert from the London Borough of Richmond upon Thames, and with Mr. T. Stuart from Transport for London. In Milan there was one person interviewed, Mr. P. Rasini from the Milan Enterprise for Transport (Azienda Trasporti Milano – ATM) as well as in Helsinki, Mr. R. Mäkinen from the Public Transport Services Unit of Helsinki Metropolitan Area Council.

Furthermore the participation to workshops in Brussels, Helsinki and Milan has been relevant. The colleagues of the author participated to the following workshops focused on the local-level activities: "Adapting to climate change - options for EU action" held in Helsinki the 27 and 28 September 2007, “European week of regions and cities” held in Brussels from the 9th to the 11th October 2007 and ”Traffico in città, un dialogo tra Milano e la Gran Bretagna” (Traffic in cities, a dialogue between Milan and Great Britain) held in Milan the 21 February 2008.

# 5 Local governance context in the four case studies

The roles and responsibilities of national and local authorities vary from country to country. On a formal level, the implementation of EU Directives involves only the national governments. However, local authorities can independently facilitate the efforts of national governments to reach EU targets, but rather than being a formal implementation matter it is part of the activities of each single local authority.

So that the case-studies on the national and local activities in the four countries and the four cities that will be described in greater detail in the chapters 6 to 9 can be put into a larger perspective, the following sections will describe the local governance context in the four case studies. The chapter is divided into four sections, section 5.1 treating Germany and Berlin, 5.2 treating UK and London, 5.3 treating Italy and Milan and 5.4 treating Finland and Helsinki.

## 5.1 Political context of Germany and Berlin

The Federal Republic of Germany is composed of 16 Federal States. The form of government is a parliamentary republic, with the Chancellor as head of the government and representative of the executive power composed by 14 Ministries, where the Federal Ministry for Environment, Nature Conservation and Nuclear Safety deals with environmental protection. At national level the legislative power resides in the German Parliament, divided between the Lower house of the Parliament, elected through direct elections (Bundestag) and the Higher house of the Parliament, representing the governments of the 16 Federal States (Bundesrat) (Kilper & Lhotta, 1996).

Being a federal state, the legislative competence in Germany is divided between the national and the federal level. The national government passes the majority of laws but their application is often competence of the federal states. Depending on the policy area of the laws passed, different kinds of legislative competences are determined together with different processes, exclusive, concurrent, framework competences have to be respected. They are clearly distinguished in the Articles 70-75 of the German Basic Law. As far as environmental protection is concerned, it can be divided into different categories (waste management, land use management, hunting…) and most of the laws concerning them have to follow the concurrent legislation process. According to it, federal states have right to legislate as long as the national government did not pass laws on the policy area listed under the concurrent legislation process. Once the national government passed laws the federal states can in some cases (mostly on environmental protection policy areas) amend these laws with further regulation valid only at federal level.

As far as the environmental sensitivity is concerned, according to the examined literature, in Germany "the German public has always been one of the most environmentally aware amongst EU Member States" (Wurzel, 2004: 101) and this is demonstrated by the "Green Party being well represented on most local councils. The local authorities boast long established environment departments" (Collier, 1997: 46).

Berlin is the capital city of Germany and a city-state. It is the largest conurbation in Germany. Approximately 3.4 million inhabitants live in an area of 889 km² (Senatsverwaltung für Stadtentwicklung, 2008). Being Berlin a federal state, it has executive and legislative power. It is one of the three German city-states (together with Bremen and Hamburg), this means that the power of the Federal State of Berlin is limited within the borders of the city, all around Berlin there is the Federal State of Brandenburg. The executive power is composed of eight Senate Administrations (Senatsverwaltung), which have the functions of ministries. Each federal state has one representative for the executive

power, in Berlin the Governing Mayor (Regierender Bürgermeister). The Parliament, in Berlin the House of Deputies (Abgeordnetenhaus), has legislative power (Berlin Constitution, Art. 38, 55-58).

The city of Berlin is divided into 12 Boroughs with a Mayor and a Borough Administration each. They do not play a relevant role in this case study as all the projects described involve the entire city and none of them directly involve only one or some of the boroughs.

## 5.2 Political context of the UK and London

The United Kingdom of Great Britain and Northern Ireland is divided into four countries: England, Scotland, Wales and Northern Ireland. The form of government is a constitutional monarchy. The executive power is represented by the Prime Minister and is divided among the eleven Governmental Departments of which the Department for Environment, Food and Rural Affairs (Defra) deals, among other things, with environmental protection. The legislative power resides in the two Chambers of Parliament, the House of Commons and the House of Lords.

In the UK there is one of the most diverse systems of local government existing in the European Union. While the other countries of the UK have an independent government different from the central one, England is the only country directly governed by the national government and its institutions, which as a result have more power on England than on the other three countries of the UK.

England is subdivided into nine regions with a limited power compared to the regions in the other UK countries. Every region has a Government Office and some associated institutions, among which a Regional Development Agency (RDA) and an Assembly. A Government Office Network (consisting of nine Regional Government Offices and their corporate centre, the Regional Co-ordination Unit) form the Government Office Network, which coordinates the policies of the different National Governmental Departments in order to implement, integrate and deliver the programmes in the nine English regions.

As for the environmental sensitivity, the UK is considered as a “laggard” country for its environmental culture and it is not particularly known for its leadership in environmental policy. However local authorities have become increasingly active in drawing up their own environmental strategies, especially within the framework of implementing Local Agenda 21 (Collier, 1997).

London is the capital city of the UK and also an English region, named Greater London. It has an extension of 1577 $km^2$ and more than 7 million inhabitants. Only in the Region of London the Mayor and the Assembly are directly elected and they form the citywide government for London denominated Greater London Authority (GLA). The GLA, created in 2000, is responsible for transport, police, fire service and economic development functions, and assumes purely strategic or promotional roles in other areas such as planning, environment and health.

The GLA does not provide any services itself; instead its work is carried out by four functional bodies, which work under the policy direction of the Mayor and the Assembly: The Transport for London (TfL), which is responsible for managing of traffic, public transport, main roads, and administering the London Congestion Charge, the Metropolitan Police Authority (MPA), the London Fire and Emergency Planning Authority (LFEPA) and the London Development Agency (LDA).

Greater London is the administrative top level subdivision, covering thirty-two boroughs. Twelve boroughs and the City of London Corporation (which is not a London Borough) constitute Inner London, twenty others constitute Outer London. The boroughs are administered by London Borough Councils elected every four years and are responsible for administration of local services in their areas (schools, social services, waste collection, roads and parking). The Borough Councils can be grouped together for

planning purposes (e.g. waste management) creating five sub-regions (Central London, East London, North London, South London, and West London).

## 5.3 Political context of Italy and Milan

The Italian Republic is subdivided into 20 regions. In Italy the form of government is a parliamentary republic, the Chief of Government is the representative of the executive power, divided among 22 ministries, with the Ministry of the Environment, Land and Sea Protection responsible for environmental protection. The legislative power at national level resides in the Parliament which is divided between the Chamber and the Senate.

The legislative power is divided between the national and the regional level. The national and regional governments have exclusive legislative power in some fields while for others there are shared competences. The national government has exclusive legislative powers in the environmental ecosystems protection field. There is concurrent legislation[4] in management of the territory; production, transport and distribution of energy; great transport infrastructures; and valorisation of the environmental heritage[5]. Even though Legislative Decree 122/1998 transfers more powers from central government to decentralized authorities (the regions), the main decisional powers in the field of environment are still in the hands of the national government (Massetti et al., 2007).

Each region has a Regional Council with executive power, which is represented and coordinated by one regional president, while the legislative organ is the Regional Assembly.

Italian regions are further divided into provinces. According to the subsidiary principle, jurisdiction and functions of provinces and municipalities are conferred with regional and state laws[6]. The competences of the provinces in the environmental field include soil conservation, protection and valorisation of the environment, prevention of extreme events, protection and valorisation of water and energetic resources; mobility and transports; and management of waste disposal. In relation to the activities of the municipalities, the province has mainly a coordination role. Moreover, the provinces participate in the elaboration of the Regional Development Program.

Italy is considered a “laggard” country in environmental protection and the delay Italy reaches in implementing EU environmental Directives does not help the country to develop an environmental conscience. In the last years environmental issues have become increasingly important at local level, especially in the North. Perception of the importance of environmental protection between Italian population living in the North and in the South is reflected by the big difference in the quantity and quality of environmental protection measures applied at local level in the North and in the South of the country (Collier, 1997).

Milan is the capital city of the Lombardy Region, of the Province of Milan and the Municipality of Milan has an extension of 182 km$^2$ and 1.3 million inhabitants. Among the functions and competences of the municipalities, they supply services to the community and the citizens, wield administrative functions for the economic development and manage the land use planning (when not expressly attributed to other administrative levels)[7].

[4] The concurrent legislation is described in art. 117 of the Italian Constitution. It lists the field where the Italian regions have the legislative power, which is though limited by the National Government that determines the fundamental rights as far as the fields listed are concerned.

[5] Art 117 and 121 of the Italian Constitution.

[6] According to Art. 114 of the Italian Constitution, Decree 112 of 31 March 1998 and Legislative Decree 267/2000.

[7] Art.13 of the Legislative Decree 267/2000.

## 5.4 Political context of Finland and Helsinki

The Republic of Finland is divided into six provinces and 20 regions. The form of government is a semi-parliamentary republic; the Prime Minister is the Head of the Government (the Council of the State) divided among 12 ministries which have the executive power. Environmental protection resides within the Ministry of the Environment. The Parliament is unicameral and is the only body in Finland with legislative power.

However, several other governance levels take decisions that have an effect on transportation (from the highest to the lowest level with regard to land area and population): The province, the region, Helsinki Metropolitan Area Council and the City of Helsinki.

The 6 Finnish provinces have a State Provincial office each. The State Provincial Office of Southern Finland promotes the welfare of the province and supports the local authorities in the provision and development of basic services. It distributes state subsidies and gives licences for public transport, and is involved in the development of public transportation towards an efficient operation (State Provincial Office of Southern Finland, 2007).

Finland is described as a forerunner in the EU as in many areas its environmental standards are much higher than the EU minimum standards, allowing Finland to be classified among the "leaders". This connotation looks homogeneous among the Scandinavian countries. The principle of "realistic pragmatism" successfully represents the Finnish environmental culture. This means that the implemented policies are neither moralistic nor idealistic but rather result-oriented (Sairinen & Lindholm, 2004).

Helsinki is located in the Province of Southern Finland within the Uusimaa Region, one of the 20 Finnish regions. The Uusimaa Regional Council is a statutory, joint municipal authority that operates according to the principles of local self-government as regional development and planning authority. Based on the Finnish law, in particular Land Use and Building Act (No 132/1999) and Land Use and Building Decree (No 895/1999), the Uusimaa Region is responsible for the regional land use plan and the associated traffic plan (Uusimaa Regional Council, 2007).

Helsinki Metropolitan Area Council (YTV) is the statutory cooperative body of the cities in the capital area (Helsinki, Espoo, Vantaa and Kauniainen). The Act on the Helsinki Metropolitan Area Council (No 1269/1996) defines its tasks, among which arranging regional public transportation including procurement of services and fare and ticket system, compiling transport system plans in the area and promoting their implementation.

Municipalities are the most important administrative units in Finland. The City of Helsinki, with an extension of 186 $km^2$ and 570.000 inhabitants, is responsible for local land-use planning (according to Act No 132/1999 and Decree No 895/1999), public transportation and for the parking policy, which all have an effect on the choice of transportation mode. With regard to the climate related EU Directives, the provinces and regions do not usually have a role. Instead, they are implemented from the national to the city level (Helsinki or Helsinki Metropolitan Area) (Monni & Raes, 2008).

# 6 The case of Germany and Berlin

This chapter deals with the empirical case study about Germany and Berlin. The study begins with a section concentrated on the different opinions expressed by different relevant biofuels actors in Germany. Some positive and some negative opinions (esp. about its sustainability) are described, together with opinions which legitimate or de-legitimate support to biofuels development in Germany. The following section describes the implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels in Germany, followed by an overview of the biofuels quantities reached thanks to the measures applied.

The third section of this chapter focuses on the city of Berlin. The section is further divided into sub-sections, starting with an introduction focused on how biofuels are considered by the Berlin Government in its Programmes. It is followed by the financial framework of the city concerning the development of biofuels use. Finally, the projects (finished, ongoing and formulated but not put into practice) are examined one by one.

This chapter is more detailed than the chapters 7, 8 and 9 which contain the empirical part about the case studies of UK/London, Italy/Milan, and Finland/Helsinki, respectively. As explained in the Acknowledgements, during this project the author of this thesis worked in a team. During the primary research she was mainly in charge of collecting data about Germany and Berlin, while data about the other three case studies were mainly collected by the other colleagues of hers. After the primary research phase, each researcher drafted a description of the respective case study. As a result, given the fact that Germany and Berlin were the principal research areas of the author, much more material was available and a more detailed description of the case study on Germany and Berlin is provided. The chapters on the other three case studies are based on the drafted descriptions received from the colleagues, where many data found during the primary research were left out and by now impossible to recover.

## 6.1 Positions on biofules of political actors in Germany

Germany is leader in the production and consumption of biodiesel in the EU. On the one hand, since 1990 the German Federal Government has been promoting bioenergy and biofuels and is one of the main institutions involved in the support of the biofuels industry. Support to the development of biofuels comes from the main political parties also.

On the other hand, environmental groups like Friends of the Earth are critical towards biodiesel and bioethanol development in Germany. Also the German Environmental Protection Authority (Umweltbundesamt, UBA) has raised concerns about biofuels, arguing that they are not a cost-effective option for climate mitigation. Energy crops for biofuels decrease the land availability to produce biomass for Combined Heat and Power Generation (CHP), a technology considered to be more cost-effective for climate mitigation, given the higher emissions reductions achieved at equal levels of raw material used (Bomb et al., 2007).

With an argument similar to the one of UBA, the association representative of the oil companies interests - the German Petroleum Industry (Mineralölwirtschaftsverband, MWV) - opposes any fuel duty exemption or reduction in favour of first generation biofuels. The association agrees on the fact that, for climate mitigation purposes, biomass used for CHP is a more cost-effective option than biomass used for biofuels for transport. Furthermore both biodiesel and bioethanol are considered to bring a negligible contribution to energy security (Bomb et al., 2007).

In Germany, several trade associations enhance the strong cooperation between the biofuels industry, oil companies and automobile manufacturers. They work as a network lobbying policymakers, coordinating research, promoting products and exchanging information. The Union for the Promotion of Oil and Protein Crops (Union zur Förderung von Öl- und Proteinpflanzen, UFOP) is the leading association for biofuels. It has also given important input in the EU arena for the formulation of the EU Directive 2003/30/EC on the Promotion of Biofuels (Bomb et al., 2007).

## 6.2 Implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels

Before the EU Directive 2003/30/EC on the Promotion of Biofuels was passed, the German Federal Government was already taking measures to develop the use of biofuels. The first fiscal measure appeared in 1999, namely in the form of an exemption from the so-called “ecotax”. The ecotax was added on top of the Mineral Oil Tax for fossil diesel in 1992. In 1999, pure biodiesel received were completely exempted from the fuel duty (Van Thuijl & Deurwaarder, 2006).

In 2002, the German Federal Government published a report to highlight the adjustments required to draw up the model of sustainable development and fixed targets to reach it. The title of this document is “Perspectives for Germany, our strategy for a sustainable Development” (Perspektiven für Deutschland, unsere Strategie für eine Nachhaltige Entwicklung). The report still did not explicitly mention biofuels usage but it listed climate protection targets to be reached at national level, like the reduction of fuel consumption and a greater use of environmental friendly alternative fuels (Bundesregierung, 2002).

The Biofuels Directive was adopted in May 2003. In order to implement it the German Federal Government amended the Mineral Oil Tax Act (Mineralölsteuergesetz) through the Tax Modification Act 2003 (Steueränderungsgesetz), which entered into force on 1 January 2004. It provided an exemption from the fuel duty not only for biofuels, but also for Natural Gas (NG), Liquid Gas (LG) and for mineral oil for experimental purposes (Bundesregierung, 2004). Until 31 December 2009, all biogenic fuels in pure form and the fractions of biofuels and bioheating fuels in blends for transportation and heating are exempt from fuel duty (Bundesregierung, 2004; BMELV, 2004).

That biofuels gained importance within a couple of years is noticeable through the “Progress Report: Perspectives for Germany, our strategy for a sustainable Development” (Fortschrittbericht: Perspektiven für Deutschland, unsere Strategie für eine Nachhaltige Entwicklung) published in 2004. This document was the continuation of the report published two years before. One year after the Biofuels Directive was passed, a whole chapter of the report published by the German Federal Government was focused on biofuels, examining the national situation of its development from a political, indusproject, and research-related point of view (Bundesregierung, 2004). The report was published in collaboration with oil companies and automobile manufacturers, as well as research institutes. It states that biodiesel and bioethanol are important for blends but potentials are limited by land availability.

In 2006, the proportion of biofuels in Germany already accounted for around 6.3% of total fuel consumption. That means that Germany achieved well in advance the target fixed by the Biofuels Directive which calls for a minimum of 5.75% biofuels of total national fuel consumption by 2010.

Given the lack in economic viability of biofuels support measures bridging the financial gap with fossil fuels allowed to create favourable market conditions for biofuels. However, as already mentioned above, one of the possible risks is to create overcompensation, which is the case when the fuel duty exemption causes biofuels to become much cheaper than fossil fuels. This has state budget implications especially if no limit to the biofuels volume exempted from fuel duty is foreseen.

This drawback was already identified in 2004, when the amendment to the Mineral Oil Tax Act was passed to support biofuels. After this amendment the German Federal Government was required to indicate, in the annual report to be sent to the Lower House of the Parliament, whether overcompensation was occurring or not (BMELV, 2005).

Due to the occurrence of overcompensation in 2005, the Lower House of the Parliament passed two Acts which are having a central role in the reassignment of the biofuels market, the Energy Tax Act (Energiesteuergesetz), and the Biofuel Quota Act (Biokraftstoffquotengesetz). The Energy Tax Act entered into force on 1 August 2006, immediately introducing an increase of the fuel duty burden for biodiesels, which should take place gradually. Through this Act the fuel duty exemption, planned to be in force until December 2009, ceased (BMELV, 2006). In the beginning, the duty burden for biodiesel should be 9 eurocent per litre. From 2008 onward, it should annually rise by 6 eurocent per year reaching 33 cent/l in 2011. It will finally reach a total amount of 45 cent/l in 2012. With pure vegetable oil the taxation starts in the year 2008 and will also reach 45 cent/l in 2012. Ethanol in the form of E85 remains exempted from fuel duty until 2015. Biodiesel added to conventional Diesel is taxed with 15 cent/l. The fiscal privilege for the blend was replaced on 1 January 2007 by a blend obligation in accordance with the Biofuel Quota Act, described underneath. The blend will then be taxed 47 cent/l with Diesel and 65 cent/l with gasoline (UFOP, 2007).

In Table 1 the distinction among the different kinds of taxation for the different types of biofuels and the comparison to the taxation of the fossil fuels is given.

| | Up to July 2006[1] | Aug.-Dec. 2006[2] | 2007[3] | 2008 | 2009 | 2010 | 2011 | From 2012 |
|---|---|---|---|---|---|---|---|---|
| Pure biodiesel[4] | 0 | 9.0 | 9.0 | 15.1 | 21.1 | 27.1 | 33.0 | 45.0 |
| Vegetable oil[4] | 0 | 0 | 2.0 | 10.0 | 18.0 | 26.0 | 33.0 | 45.0 |
| Added biodiesel | 0 | 5.0 | 47.4 | 47.4 | 47.4 | 47.4 | 47.4 | 47.4 |
| Petrol[5] | 72.0 | 72.0 | 72.0 | 72.0 | 72.0 | 72.0 | 72.0 | 72.0 |
| Unleaded petrol[5] | 67.0 | 67.0 | 67.0 | 67.0 | 67.0 | 67.0 | 67.0 | 67.0 |
| Gas oil[5] | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 |

Table 1: The rounded fuel duty rates for biodiesel and vegetable oil in eurocents per litre
Source: (BMELV, 2006; UFOP, 2007)

1) Tax Modification Act 2003 (Steueränderungsgesetz 2003)
2) Energy Tax Act (Energiesteuergesetz)
3) Biofuel Quota Act (Biokraftstoffquotengesetz)
4) From 1.1.2007 only biodiesel outside the quota
5) Following the recommendations of the Energy Directive, status of July 2007

On 1 January 2007, the Biofuel Quota Act entered into force and support for biofuels was coupled with compliance with fuel standards. With a regulatory provision it replaced the fuel duty relief for biofuels amending the Energy Tax Act and the Federal Immission Control Act, (Bundesimmissionsschutzgesetz), valid since 1974. It establishes that fuel suppliers are obliged to market a legally-prescribed minimum percentage of biofuels (named quota) related to their entire annual sales of petrol and diesel. The minimum percentage has to be expressed in energy content. In the Biofuels Quota Act the quota to be reached are defined as net climate protection contributions (Dekarbonisierung) of 5% for 2015 and 10% for 2020. The key points are as follows:

- From 2007, minimum quota are fixed in relation to energy content at 4.4% for the diesel quota and 1.2% for the petrol quota. The quota for petrol will be raised to 2.0% in 2008, 2.8% in 2009 and 3.6% in 2010.
- From 2009, a combined total quota of 6.25% in energy content will be introduced for both fuels. This will gradually be raised to 8% in 2015. Minimum quota for petrol and diesel will continue to be applied separately and they can be considered as the under-quota of the combined total quota, which has to be reached combining the efforts from both fuels sectors.
- While with the Energy Tax Act fuel duty relief on pure fuels was limited to the end of 2009, now a regressive fuel duty incentive will be retained for pure vegetable oil and pure biodiesel outside the quota for a transitional period until the end of 2011.
- Until 2015, a regressive fuel duty incentive is granted to second-generation biofuels, biogas and pure bioethanol (E85), having regard to the overcompensation arrangement. No duty is currently levied on such fuels.
- From 2012, biofuels wholly or partially produced from animal oil or fat will no longer be taken into account to meet the quota requirement (BMELV, 2007; BMU, 2007).

In Table 2 an overview of the different percentages of the above described quota for the different fuel sectors is schematised.

| Year | Total quota (%) | Diesel quota (%) | Petrol quota (%) |
|---|---|---|---|
| 2007 | - | 4.40 | 1.20 |
| 2008 | - | Minimum | 2.00 |
| 2009 | 6.25 | Quota | 2.80 |
| 2010 | 6.75 | applies | 3.60 |
| 2011 | 7.00 | also | Minimum |
| 2012 | 7.25 | to | Quota applies |
| 2013 | 7.50 | subsequent | also to |
| 2014 | 7.75 | years | subsequent |
| 2015 | 8.00 | | years |

Table 2: The different quota applied for petrol, diesel and the total amount to be reached for each year from 2007 to 2015. The percentage is expressed in energy content.
Source: (UFOP, 2007)

In 2009, a new Ordinance, the Biomass Sustainability Ordinance, (Biomasse-Nachhaltigkeitsverordnung), will be passed. As a reaction to the growing concerns about the sustainability of biofuels and in order to create a durable and sustainable perspective for biofuels production after 2015 it establishes that only biofuels produced in a sustainable way will be included in the biofuels quota or will be fuel duty exempted. It is determined that biofuels are evaluated considering their GHG reduction, as a consequence, biofuels with a good GHG balance are favoured compared to other biofuels (UFOP, 2007).

As far as the concrete quantities of biodiesel in Germany are concerned, its development became a central topic of the German economy and policy. In 1998, its production was 65,000 t/a and arrived at 1.2 million t/a in 2004. The amount of biodiesel plants in 2005 was around 25 and in 2006 the enlargement and new construction of ten biodiesel plants was announced. Most of the biodiesel

producers sell B100 (biodiesel in pure form) to the market, but some also sell it to oil companies for blending (Bomb et al., 2007; UFOP, 2007).

As for bioethanol, no bioethanol for transport was produced before 2005. Since 2006, three bioethanol plants were started and the construction of another six has been announced (Bomb et al., 2007).

In Table 3 the exact quantities of biofuels expressed in tons and in percentage of energy content and the single quantities by fuel type are shown. The biofuels added to petrol or diesel have been subtracted from the fossil fuels amounts and are shown separately in the total biofuels amount. The good results demonstrated by the high level of biofuels consumption in Germany are undoubtedly attributable to the promotion through fiscal privileges over many years, which allowed the development of a market for pure biodiesel (UFOP, 2007).

| | Quantity (1,000 t) | Energy content (%) |
|---|---|---|
| Fuel consumption | 51,385 | |
| Petrol | 22,191 | 41.72 |
| Diesel fuel | 29,194 | 51.96 |
| Biofuels | 4,029 | 6.32 |
| *These include:* | | |
| Biodiesel | 2,481 | 4.6 |
| Vegetable oil | 711 | 1.16 |
| Bioethanol | 478 | 0.55 |

Table 3: Fuel use in the transport sector in Germany in 2006
Source: (Petroleum tax statistics January – July 2006; BMELV, 2006)

In the years before the Biofuels Directive was passed, the German Federal Government was already financing research on biodiesel since the end of the 1990s and about bioethanol since 2002. The government finances Programmes which see the cooperation of federal authorities, private industries and universities in a growing number of research projects. By 2004 the German Federal Government had provided fundings for four research projects on the development of biodiesel and for two research projects on bioethanol. In 2005 the Federal Agricultural Research Authority (Bundesforschungsanstalt für Landwirtschaft) started a new project about biodiesel involving one university and also other research and development projects on bioethanol involving universities started. Furthermore, in the years 2006 and 2007 the German Government underwent an ongoing endeavouring to set up a Biodiesel Association for Research and more and more universities and associations have been involved into biofuels research projects (BMELV, 2004; 2005; 2006; 2007).

## 6.3 Voluntary actions in Berlin

This section is exclusively focused on the city-state of Berlin. The first sub-section describes the importance that the Senate of Berlin has given to climate protection in general and to sustainable transport in particular. It also gives documentation about the focus of the city on NG and biogas, avoiding investments on biodiesel and bioethanol. The following sub-section will be on the EU Financial Programmes used by Berlin to co-finance the projects run at city level, and the last sub-section focuses on the description of the projects found.

### *6.3.1 Biofuels in the City Programmes*

One of the focal points of the Berlin Senate is climate protection. In 1990, the Berlin Energy Saving Act (Berliner Energiespargesetz) was passed and was the first legislative act to encourage environmental and socially viable energy supply. It was modified in 1995. In Art. 15 it states that every four years the Berlin Senate has to prepare a State Energy Programme. The first one was published in 1994 and was named Berlin Energy Concept (Energiekonzept Berlin); the following ones, named State Energy Programmes (Landesenergieprogramme), have been published since 1997 in a four year sequence. It observes the impact on the environment of the city of Berlin and contains targets and measures to save energy, to develop the energy consumption in a sustainable way and to develop energy sources.

The Town Development Plan – Traffic (Stadtentwicklungsplan – StEP Verkehr), published in July 2003, is another relevant document for climate protection and emissions reduction in general and for the ecological traffic policy in particular. This document was published by the Berlin Senate as well. A target list is the basis for the concept of this document. One of the target aims at stopping the further increase of the traffic-caused energy consumption in the city-state of Berlin within 2015 (compared to 1998). One of the main focuses of the Town Development Plan – Traffic is the environmental strategy, which wants to achieve a shift towards a less polluting Modal Split[8] for a better air quality. The city-state of Berlin has a strongly limited possibility of action regarding a further decrease of the $CO_2$ emissions by traffic. In its analysis contained in StEP Verkehr the Senate mentions the use of NG, biogas and hydrogen and a limited support to biodiesel and bioethanol as one of the main measures to lower traffic-caused pollution. Important to notice is that the Senate of Berlin (Dept. for Health, Environment and Consumer Protection - SenGUV) remains sceptic towards the usage of biodiesel and bioethanol within the city of Berlin. Main causes for it are the uncertainties around the social and environmental balance of biofuels which, according to them, do not legitimate an administrative support (Der Senat von Berlin, 2006).

Another important document is the Berlin Air Pollution Control and Action Plan 2005-2010 (Luftreinhalte- und Aktionsplan Berlin 2005-2010) where the condition of air pollution on Berlin is examined, an analysis of the causes of air pollution is given, together with statistics about the different air pollutants and their high levels in different parts of the city. The most important part is the one dedicated to the measures taken at city level, where two out of the four measures listed in section 6.3.3 are described, namely the initiatives TUT and TELLUS.

The last State Energy Programme, which runs from 2006 to 2010, contains a programme about climate protection and energy production, fixing the targets and instruments for climate protection until 2010. It is based on the interpretation of the results of the two previous Programmes and of the Sustainability Report published in 2004. It is important to notice that it is based on the fundamental idea that federal states and municipalities of the Federal Republic of Germany have an important obligation to cooperate at the realization of the national climate protection programme and at the compliance to the targets fixed within European and international agreements. Also this document comprehends the Senate's opinion about biofuels; i.e. the Senate affirms here also that NG and in particular biogas are worth to gain policy support rather than biodiesel and bioethanol, because of the still existing uncertainties about the sustainability of the latter ones.

According to the State Energy Programme 2006-2010, because of its strained financial situation Berlin can accomplish energy-saving measures only if it can get financial co-aid from the German Federal Government or from the European Union. The Lower House of Berlin decided in January 2006 that a

[8] The Modal Split, or Modal Share, is used to describe the percentage of travelers using a type of transport. In this case the city of Berlin aims at pushing the Berlin inhabitants to use more frequently public means of transport and less frequently private vehicles. In doing so the modal split share of buses, trains and underground would increase and GHG emissions from the private transport sector would decrease.

financial focal point "environmental protection/ecological sustainability" had to be formed and could be financed with a support from Berlin funds up to 20% of the total costs of the measures. Emphasis is to be set on the promotion of renewable energies and energy efficiency of buildings.

What is worth mentioning is that strong support is given from EU Funding Programmes to develop projects at city level in Berlin. Berlin has been funded through the IEE Programme within the initiative MaDeGasCar, which received in total 1,411,558 Euros to spend in 30 months and to be allocated in equal proportion among the ten partners of the initiative[9].

Through the FP6 and FP7 almost 33 million Euros flew into the TELLUS Project of the initiative CIVITAS. Of them 3.8 millions went in favour of the City of Berlin. The overall TELLUS Project did not handle only with biofuels and NG, but the part for the NG promotion received 360,000 Euros from the EU[10].

### *6.3.2 Measures on biofuels*

In the documentation which can be found in the official website of the city of Berlin[11], it is demonstrated that the city of Berlin has been committed for 20 years in lowering the emissions from the transport sector. Nevertheless, some air pollutants are still not decreasing, especially Particulate Matter smaller than 10 μm (PM10) and Nitrogen Dioxide ($NO_2$). That is why Berlin is committed to pursue a combination of different measures at city level, important to lower the still remaining high levels of some air pollutants.

Since the end of the 1990s, the Senate of Berlin was involved in projects and activities to support the use of NG, only in recent years more attention has been focused on biogas and to some extent also hydrogen. With that, the city of Berlin maintains a different direction compared to the German Federal Government, which fosters biodiesel and bioethanol protection, as explained above (Senat von Berlin, 2006).

Even though NG is not considered as a biofuel, projects on its development are considered as a symbol for the pro-activity of Berlin, noticeable by the early development of projects and also by the focus of Berlin, first on NG and later on biogas.

The main actors involved in biofuels projects are the Berlin Senate, the Brandenburg Government, private companies (GASAG, the Berlin-based energy supplier, the Berlin Energy Agency, and smaller companies) and research institutes.

The first project to involve NG promotion in Berlin started in September 2001 with the name "Tausend Umwelttaxis" (Thousands Environment Taxis, TUT Project[12]). It was largely funded by GASAG and by the German Federal Government, and it promoted the use of NG-powered taxis and school buses. From its early beginnings in September 2001, the TUT vehicle fleet has grown to take in over 700 taxis and more than 80 school buses. The NG is available at thirteen filling stations around the German capital, making up adequate infrastructure for all travel within city limits.

Second, the project TELLUS[13] which lasted from February 2002 to January 2006 aimed at new forms of vehicle use, integrated traffic management systems and clean vehicle fleets. It was developed in the context of the CIVITAS I initiative of the EU, financed by the FP5, whose goal was the environmental

[9] From personal communication with Mr. Patrik Lamers, Berlin Energy Agency, October 2008.

[10] From a personal communication with Mr. Markus Podbregar, TSB Innovationsagentur Berlin GmbH, October 2008.

[11] www.berlin.de

[12] http://www.tut-berlin.de/

[13] http://www.fav.de/Pro_TELLUS.html

friendly and sustainable organization of city traffic. The initiative involved five European cities: Rotterdam, Bucharest, Gdynia, Göteborg and Berlin, allowing important networking among the cities to take place. Together with the company HARU REISEN (a Berliner company in the traffic business) the Project TELLUS financed nine NG-driven buses. The Berlin Senate promotes the use of 100 NG-driven trucks in the commercial economy. It exerts itself to make possible that the network of NG stations is extended as well as the fleet modernization is accelerated by the use of cars.

Third, in September 2007, the Berliner Energy Agency, in cooperation with GASAG began a project called MArket DEvelopment for GAS-driven CARs (MADEGASCAR)[14] under the IEE Programme. The MADEGASCAR project aims at stimulating the local market for NG vehicles (NGV) by actions along the value chain (production, up-grading, injection, supply and usage of biogas). This project will be connected to other current activities in Berlin regarding gas and hydrogen promotion to develop the supply infrastructure system in particular. This should help to guarantee a better integration of the alternative fuels. One of the aims is to create a European network to support the project and to promote NGV in the future.

Fourth, in November 2007, the beginning of the construction of a biogas installation in the Federal State of Brandenburg close to Berlin was celebrated. The project is named “Bioerdgas aus Brandenburg” (biogas from Brandenburg). This installation is the first of this kind in Brandenburg. It will inject biogas from a $CO_2$-neutral production from renewable energies for the use of the capital city in the public NG network. The future production amount will correspond to the energy requirement for thermal heat and hot water of almost 2,000 houses. The biogas will be mostly used as fuel in NGV as well as for CHP production. The investment for the plant amounts to about 9 million Euros, funded by the EU, the Federal State Brandenburg and the Federal State Berlin, with the collaboration of GASAG and other local private companies.

In 2008, two research projects have failed to obtain financial funds by FP7. Their aim was to evaluate the impact of biofuels production in Germany, among them also biodiesel and bioethanol. The research project Demo-Bios envisaged to create cooperation between the Federal State Brandenburg and the city-state Berlin. They aimed at examining and optimising the overall biofuels process chain (farming – transport – production – transport – utilisation) for different European regions, among which Berlin and Brandenburg. It wanted to understand the environmental impacts of the biofuels use in the regions of production as well as the regions of application, the effective sustainable regional production capacities and the economic impacts of the production.

In mid May 2008, another project named HiFiBioReg – High efficiency Biofuels Strategies for Regions – should have begun in collaboration with the Brandenburg State, the Technical University of Berlin and a research institute. In the project, a tool for decision makers and stakeholders to support the understanding of the interactions within the biofuels process chain would have been developed. Thus integrated environmental friendly biofuels strategies for mobility in metropolitan areas could be developed and assessed in their impacts on sustainability within the metropolitan area and its hinterland[15].

Table 4 helps to get an overview of what is described in sections 6.2 and 6.3.2. The column Germany contains what has been implemented at national level by the German Federal Government, while the column Berlin contains the measures put into practice at local level by the Berlin Government. The acts and measures are ordered following the year they were passed, so an overview of what has happened at national and local level in the same year is provided.

[14] http://www.madegascar.eu/

[15] From personal communications with Mr. Herrmann Bluemel, Berlin Senate Administration for City Development, August 2008.

| Year | EU (Directive requirements) | Germany | Berlin |
|---|---|---|---|
| 1999 | | - A=Ecotax: pure biodiesel exempted from fuel duty | |
| 2001 | | - A | TUT |
| 2002 | | - A | TUT, TELLUS |
| 2003 | Directive 2003/30/EC | - A | TUT, TELLUS |
| 2004 | | - B=Total exemption from fuel duty for any biofuel | TUT, TELLUS |
| 2005 | Indicative target 2% biofuels | - B<br>- | TUT, TELLUS |
| 2006 | | - B Until July.<br>- Since August C=Gradual increase in biodiesel fuel duty until 2012.<br>- Share of biofuels reached 6.3% | TUT, TELLUS |
| 2007 | | - C+D=Minimum Quota for biodiesel and bioethanol, increasing until 2015) | MaDeGasCar |
| 2008 | | - C+D | MaDeGasCar, Berlin&Brandenburg |
| 2009 | | (C=Gradual increase in biodiesel&bioethanol tax)+D+(E=Only biofuels from sustainable production included in biofuels Quota or exempted from fuel duty) | |
| 2010 | Indicative target 5.75% biofuels | C+D+E | |

Table 4: Requirements of the Biofuels Directive and relevant action in Germany and Berlin

# 7 The case of UK and London

In chapter 7 the empirical case study about London is presented, with the description of the implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels at national level in section 7.1 and the measures taken at local level in London about biofuels in section 7.2.

## 7.1 Implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels

As one of Europe's largest consumers of fuel, the UK intends to work towards a situation which will extend reserves of fossil fuel from the North Sea. Since 2002, the UK Government is promoting biodiesel through a 20 pence/l fuel duty incentive (HM Treasury, 2001; UK Government, 2005) and since January 2005 it is promoting bioethanol with a similar duty incentive. In a first moment it had to last until 2007 but according to the last National Report on the implementation of the Biofuels Directive it will last until 2010, offering more certainty to the industries (UK Government, 2007)

In November 2004, the UK Government passed the UK Energy Act, which provided for the enactment of a Renewable Transport Fuels Obligation (RTFO)[16] to facilitate the reaching of the renewable energy target of the UK, set at 10% by the EU. No specific target was set for biofuels quantities to be reached by 2010, referring to the forthcoming RTFO (UK Government, 2005).

RTFO entered into force in April 2008, it was implemented by Order 2007/3072 and fixed minimum percentage targets in the total transport fuel sales to come from renewable sources. It set the obligation at 2.5% of the total transport fuel sales expressed in volume (sold in the forecourts) for 2008-2009, rising to 3.75% in 2009-2010 and reaching 5% in the years 2010-2011. These targets are expressed on a volume basis and correspond to 2% of the total fuels sales in energy content for 2008-2009, 2.8% for 2009-2010 and 3.5% for 2010-2011. The UK Government is aware that the national level target for 2010-2011 falls below the target fixed by the EU. The Biofuels Directive allows Member States to set different targets from the EU ones provided that any differentiation is "motivated". The UK Government's motivation for the difference between the national indicative target for 2010 fixed at 3.5% in energy content and the EU one of 5.75% by energy content is primarily that:

- the UK Government is not yet confident that higher levels of biofuels can be delivered in a sustainable way;
- the 5% by volume level is consistent with current EU fuel quality standards which impose a 5% volume-based limit for biofuels blends (UK Government, 2008).

Biofuels suppliers will provide information about the full Life-Cycle Analysis of the products to the new Renewable Fuels Agency, which will calculate and publish data about the impacts of the biofuels supplied to the UK market.

In the meantime RTFO necessitates that each year suppliers of fossil fuels in the UK gain a certain number of Renewable Transport Fuel certificates distributed by the Renewable Fuels Agency. The biofuels eligible for Renewable Transport Fuel certificates (biodesel, bioethanol, biogas) are also set by the Order 2007/3072. Fossil fuels suppliers can accomplish this obligation either supplying biofuels and obtaining certificates, or purchasing certificates obtained by other biofuels suppliers or buying a buy-out price.

[16] Modeled on the Renewable Obligation (RO) scheme for the UK electricity industry.

It also sets out the powers and duties of the RFA as administrator of the scheme, and the civil penalities that may be imposed by the RFA for non compliance with the requirements. Each supplier of road transport fossil fuel has to produce certificates showing the supply of an amount of renewable fuels equal to the percentage specified. RTFO certificates can be traded between suppliers, the buy-out price has been set at a level designed to ensure that it will generally be more economic to supply biofuels, in order to maximise the uptake. For the first two years of the RTFO the buy-out price will be 15 pence per litre, for a total amount of 35 pence per litre for the first and second year of the obligation and it will then rise to 30 pence per litre in 2010, when the fuel duty incentive is phased out (UK Government, 2008).

In addition to the fuel duty subsidy for the end product, in 2004 the UK Government proposed a 100% Enhanced Capital Allowance (ECA) scheme to allow the cost of capital assets to be written off against chargeable profits. For example, one hundred percent first-year ECA would allow a business to write off the whole cost of qualifying capital assets against the taxable profits of the period during which the expenditure is incurred. The accelerated tax relief can provide a cash flow benefit for businesses in profit and a net present value benefit of about five percent. Debates about the integration of the ECAs also for technologies related to biofuels are still going on (Defra, 2007; HM Treasury, 2004, 2005; UK Government, 2007). This would represent a further stimulating instrument for the biofuels sector and a remarkable step ahead in conjunction with the implementation of the RTFO. The only direct supports allowable under the EU single market's rules are the Regional Selective Assistance grants (RSA), for example in Scotland the Scottish Government financed a biodiesel plant which will deliver around 5% of Scotland diesel needs.

However in January 2008, the UK Environmental Audit Committee made a press release revealing its concerns about biofuels sustainability (House of Commons, 2008). In the document the need of robust sustainability standards in order to avoid environmental damage and the destruction of environmentally critical rainforests is emphasised. Already in December 2006 the UK Government commissioned two projects to develop a robust, practical and cost-effective methodology for the consistent quantification of GHG savings for biofuels: the Carbon Certification Project and the Sustainability Reporting Project (Alastair, 2007).

Talking about the results of the UK policies and measures on biofuels, before the 20 pence/l fuel duty incentive, biofuels sales were negligible but afterwards the sales increased rapidly. On the one hand, a report made by the UK National Farmers Union (NFU) (2006) estimates that UK farming could supply for the 5% RTFO target by 2010. As we can see from Table 5 if the 100% of the RTFO obligation were to be produced within the UK it would require 1.2 million ha of 5.9 million ha (UK arable land in 2004) which corresponds to 20% of the UK arable land. Anyway there is also confidence in the advancement of technology: in fact the demand could be met by second generation biofuels and importations (DfT, 2007).

| | Petrol | Diesel |
|---|---|---|
| Estimated 2010 Demand | 19 million tons | 22.5 million tons |
| 5% by volume (RTFO) | 1.2 billion litres of bioethanol | 1.35 billion litres of biodiesel |
| Feedstock Required | 3 million tons of wheat | 2.7 million tons of OSR |
| Land Involved | 375,000 ha (8t/ha) | 840,000 ha (3.2t/ha) |

Table 5: Summary of the land involved in supplying RTFO for 2010
Source: (NFU, 2006)

On the other hand, the biodiesel industry in UK is still in its early years. According to a study published by the UK Parliament the Biofuels Directive's national target of 5.75% for 2010 is not likely to be achieved as in 2005 biofuels made up only 0.24% of total UK fuels and around 50% of it was imported, mainly from Brazil (POST, 2007).

At present, biodiesel is produced in UK by about 30 companies while the first UK bioethanol production plant was built in Norfolk by British Sugar in 2007. British Petroleum and Associated British Foods jointly plan to build a bioethanol plant near Hull, to start production in 2009 (POST, 2007).

As far as the research on biofuels in the UK is concerned, the UK Government financed five projects in 2004 and 2005 thanks to the Government New and Renewable Energy Research and Development Programme. The projects are run by universities and private technology centres on the development of advanced production methods for biomass transport. Further two projects were run under the Industry sponsored Low Carbon Vehicle Partnership. In 2006 the UK Government financed the National Non Food Crop Centre which researches on BTL processes for biofuels. In 2007 the UK Government allocated 5 millions Pounds for Carbon Trust, to develop research projects for advanced Biofuels. Not directly financed by the UK Government are the Technology Strategy Board and the Biotechnology and Biological Sciences Research Council. The first one has provided 10 millions Pounds for research on low carbon technologies and advanced biofuels, while the second one launched a specific action with the aim of growing the capacity of bioenergy research in the UK (UK Government, 2005; 2006; 2007; 2008).

## 7.2 Voluntary measures on biofuels in London

London is responsible for 8% of national $CO_2$ emissions in the UK, producing 44 million tons of $CO_2$ each year. As London's population of 7.5 million is expected to grow to 8.1 million by 2016, it is estimated that its emissions will increase by 15% to 51 million tons by 2025 (GLA, 2007).

In 2004, the Mayor of London set out an Energy Strategy "Green light to clean power: The Mayor's Energy Strategy" in which he defined an energy hierarchy in order to ensure that London's energy needs are met in the most efficient way: using less energy (Be Lean), using renewable energy (Be Green) and supplying energy efficiently (Be Clean).

The city of London is planning to reduce the emissions of $CO_2$ by 20% relative to the 1990 level, by 2010, and it aspires to a 60% reduction from the 2000 level by 2050. To achieve this, the Mayor had facilitated the establishment of the London Energy Partnership[17].

In the case of London, five voluntary actions are identifiable. Those actions are in line with the EU biofuels targets. They all utilise a Green Procurement Policy.

First, since 2005, seven Boroughs of South-East London (Bromley, Southwark, Bexley, Greenwich, Lambeth, Lewisham, and Croydon) in partnership with Transport for London (TfL), the Mayor of London and Thames Water (a company responsible for water supply and waste water treatment in parts of Greater London) are carrying out a Biodiesel Initiative for Sustainable Transport from Recycled Oil (BISTRO). The aim of the project is to reduce GHG emissions by re-using Used Cooking Oil (UCO), cleaning and processing the UCO into biodiesel, to use it (pure or blended) in the fleets of the Boroughs and at the same time to facilitate the water treatment by avoiding pouring of used oil down the drains (South-East London Transport Strategy, 2008).

Second, the London Borough of Richmond upon Thames (in South West London, part of Outer London) is making noticeable efforts towards a sustainable management of the resources with the

[17] http://www.lep.org.uk/

implementation and improvement of a wide-ranging climate change strategy to deliver GHG emission reductions across the Borough. In 2006, Richmond Council completed a project running part of its fleet of 300 vehicles on recycled cooking oil, considered as a biofuel. The aim will be to supply biodiesel for the entire fleet in 2008 (estimated consumption of 750,000 litres of biodiesel annually).The Council asked to the National Chancellor of the Exchequer for an additional reduction in the tax on this form of biodiesel as, due to the collection costs, the biodiesel derived from used cooking oil is significantly more expensive than conventional diesel. The Chancellor of the Exchequer turned down the request[18].

Third, the Government Car and Despatch Agency (GCDA), which supplies Ministerial and delivery vehicle services to the UK Government uses a 5% biodiesel blend in its London-based vehicles. The initiative, called “Green Cars”, offers environmentally friendly taxi service for government employees. Ministers can choose between the Toyota Prius, a petrol-electric hybrid car, and a Jaguar powered by biodiesel blend (GCDA, 2008). In August 2008 the fleet comprised of 46 cars and 26 light commercial vans capable of running on biodiesel blend. GCDA has its own refuelling station in London and its drivers are required to refuel there whenever possible[19] (House of Commons, 2006).

Fourth, Transport for London (TfL) is projectling the use of different blends of biodiesel on buses. However, until projects are completed and the environmental impact of biofuels is better understood, there will be no policy towards specific London wide incentives and initiatives[20]. There is a need to develop mechanisms to ensure that GHGs savings from biofuels are accurately measured, in order to encourage efficient production methods (GLA, 2007).

Fifth, there are voluntary initiatives taken by single companies. Some made it for a matter of public image, some for real environmental awareness and some for political (and strategic) needs. A noteworthy initiative is the one taken in August 2007 by the Radio Taxis Group Ltd, the greatest London taxi company, which manages 3000 "black cabs". They announced that the entire fleet will run with a diesel consisting of 30% of biodiesel. Such an effort is estimated to yield an emissions saving of about 5.2 tons of $CO_2$/year (equalling to taking 300 cabs out of the road) (Radio Taxis Group Ltd, 2007). This is part of the project where the company has been engaged: in the previous years it set an aim to become "carbon neutral" voluntarily acquiring emission rights (Green Energy UK, 2005).

In addition, there are two initiatives funded by the Intelligent Energy for Europe Programme. The BioDieNet project[21] aims at developing a network of actors to stimulate the market for locally produced biodiesel from used cooking oils. The London partners are Energy Solutions (North West London) and the North East London Energy Efficiency Advice Centre (NELEEAC). Bio-Nett[22], where NELEEAC is also involved, is an R&D project whose aim is to develop local supply networks, linking biofuels producers with public sector users.

Table 6 helps to get an overview of what is described in sections 7.1 and 7.2. The column UK contains what has been implemented at national level by the UK Government, while the column London contains the measures put into practice at local level by the different local authorities and businesses in London. The acts and measures are ordered following the year they were passed, so an overview of what has happened at national and local level in the same year is provided.

[18] From personal communication with Mr. Cuthbert, London Borough of Richmond upon Thames, January 2008.

[19] From personal communication with Mr. A. Gardner, GDCA, August 2008.

[20] From personal communication with Mr. Towne Stuart, TfL, February 2007.

[21] http://www.biodienet.eu/

[22] http://www.bio-nett.org

| Year | EU (Directive requirements) | UK | London |
|---|---|---|---|
| 2002 | | -A= 20 pence/l fuel duty incentive for biodiesel | |
| 2003 | Directive 2003/30/EC | -A | |
| 2004 | | -A | |
| 2005 | Indicative target 2% biofuels | -(A= 20 pence/l fuel duty incentive for biodiesel & bioethanol)<br>-Share of biofuels reached 0.24% | BISTRO |
| 2006 | | -A<br>-Green Cars | BISTRO, Richmond Upon Thames (RUT), Green Cars (GC) |
| 2007 | | -A<br>-Green Cars | BISTRO, RUT, GC, Radio Taxis Group (RTG), TfL |
| 2008 | | -A<br>-Green Cars<br>-In April, RTFO | BISTRO, RUT, GC, RTG, TfL |
| 2010 | Indicative target 5.75% biofuels | -A<br>-Green Cars<br>-Minimum national target 5% biofuels | |

Table 6: Requirements of the Biofuels Directive and relevant action in the UK and London

# 8 The case of Italy and Milan

Similar to the case of London, the case of Milan is divided into section 8.1, where the implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels is explained, and section 8.2, where the projects about biofuels in the city of Milan are explained.

## 8.1 Implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels

The Italian Government began with incentives to foster biofuels use and to enhance its technological development through the Fiscal Act 2001, which guaranteed a fuel duty exemption for three years (from 1 July 2001 until 1 July 2004) to an annual contingent of 300,000 tons of biodiesel (pure or blended with diesel oil in whichever percentage). The Italian Government determined how to divide the 300,000 tons of biodiesel among the distributors: it determined which amount of fuel duty exempted biofuels had to be delivered to the final distributors (Ministero delle Finanze, 2005).

To implement the Biofuels Directive the Fiscal Act 2005 had fixed 12.9 million Euros in tax reduction for bioethanol production. This allocation would have concurred to produce 3 million hectolitres of ethanol to be transformed into ETBE in 3 years (2005, 2006, 2007). Furthermore another exemption from fuel duty lasting three years would have been introduced after the first one had lost its validity, allowing continuation with the previous measure (Ministero delle Finanze, 2005). The tax reduction though has still not been authorized from the DG Competition of the European Commission.

The Biofuels Directive has been further implemented in the Italian legislative system with the Legislative Decree n.128/2005, published the 30 May 2005, which set national targets for biofuels introduction of 1% by December 2005 and 2.5% by December 2010 in energy content on the national annual fuel consumption. These goals were not in line with the targets set by the Biofuels Directive (2% by 2005 and 5.75% by 2010) and the motivation provided by the Italian Government to justify these considerably lower targets were not judged as sufficient[23] (Ministero delle Finanze, 2005; 2006). As a consequence, in 2005 the European Commission opened an Infringement Procedure against the Italian Government, sending a Letter of Formal Notice, followed by a Reasoned Opinion in 2006[24]. This happened because the Italian Government failed to provide adequate reasons for setting biofuels targets considerably lower than the ones set by the Biofuels Directive (EC, 2005; 2006). After that, the Legislative Decree 128/2005 has been modified through the Fiscal Act 2007 and new biofuels targets in energy content are set by the Italian Government starting from January 2007 at 2.5% within 2008 and at 5.75% within December 2010 (Ministero delle Finanze, 2007).

[23] The Italian Government affirmed that the maximum internal production of biofuels could reach 300,000 tons annually, the same amount exempted from fuel duty in the period 2001-2004.

[24] Article 226 of the Treaty establishing the European Community regulates the Infringement Procedure. It is composed by an informal and a formal stage. During the informal stage the Commission and the Member State concerned seek solutions to bring the infringement to an end. The informal stage is not compulsory, the Commission decides whether to begin with it or not. During the formal stage the Commission submits a letter of formal notice to the Member State concerned, in which the alleged non-compliance is determined and concerns are stated. The Member State has to respond within a pre-determined period (usually two months). If an agreement between the Member State and the Commission has not been reached and the Commission believes the Member State has been infringing EC legislation, the Commission addresses a reasoned opinion to the Member State, in which the infringement and the deadline for its elimination are stated. If the Member State does not comply with the reasoned opinion and fails to eliminate the infringement within the set period, the Commission may bring the case in front of the European Court of Justice.

In order to further promote biofuels, a new system was developed that combines an obligation of integration and fuel duty incentives, in brief an exemption from fuel duty and an obligation of 1% increase of biofuels per year (Massetti et al., 2007). First, from July 2006 onwards, diesel and gasoline producers have to add biofuels in a minimum quantity of 1% referring to the production of the previous year. The percentage, expressed in energy content, will be increased by 1% every year until 2010 in order to reach 5% (Law 11 March 2006, n.81). Second, in the Fiscal Act 2007 was determined that to an annual contingent of 250,000 tons of biodiesel will be applied a fuel duty incentive which amounts to 20% of the fuel duty applied to diesel. The reduced duty will be applied for a three years period (from 1 July 2007 until 31 January 2010). Like in 2001 the Italian Government determined how to divide the 250,000 tons of biodiesel among the distributors (Ministero delle Finanze, 2007; 2008).

According to an estimate of the Italian Biodiesel Producers Association, the Italian production of biodiesel is in constant increase having exceeded 400,000 tons annually in 2007 (Assobiodiesel, 2008).

Despite the expected growth, it has been pointed out that even considering high productivity scenarios of crops yield, abandoned and set aside land available would not be sufficient for reaching the target with domestic production, unless alimentary production would be replaced by biodiesel production (Russi, 2008).

With the contribution of the FP7, the European Commission introduced the Biofuels Technology Platform in 2006. The Italian Biofuels Platform began to function in the end of January 2008, as an instrument for the creation of national alliances between private and public sector to accelerate the market of biofuels.

## 8.2 Voluntary measures on biofuels in Milan

In 2006, a study of the National Commission against Atmospheric Pollution Emergencies (Commissione Nazionale contro l'emergenza da Inquinamento Atmosferico, CNEIA) urgently pointed to the bad state of air quality in the City of Milan and more in general in the Lombardy Region. In its study, CNEIA shows in graphs the emission levels in the 20 Italian regions with the Lombardy Region having the highest level of emissions among all regions, and this concerning all kinds of GHGs. This is due to the intensive indusprojectization, in particular around the Milan area, and the intensive use of private vehicles to commute (CNEIA, 2006). Therefore, the need to improve air quality is an important issue for the local authorities of Milan. Measures like congestion charges and traffic bans have been undertaken in order to improve the situation. Promotion of biofuels has not been a priority in Milan, but remarkable exceptions are represented by two municipal companies, the Milan Enterprise for Transport (Azienda Trasporti Milanesi, ATM) and the Milan Enterprise for Environmental Services (Azienda Milanese Servizi Ambientali, AMSA). Those two companies are promoting biofuels by using them in their fleets.

ATM is the municipal company that deals with public transport service of the City of Milan and of 85 municipalities in the Province of Milan through underground railway lines, automobiles, trams and trolley buses (ATM, 2005). From 2006 onwards, the ATM diesel oil suppliers are required to supply a biodiesel blend containing 4% biodiesel[25].

AMSA operates in the management, disposal and transformation of urban waste into energy. Since 2008, 982 vehicles (almost 80% of the fleet – except electric and methane driven vehicles) of AMSA have been fed with a biodiesel blend composed of 25% biodiesel. The biodiesel utilised is derived from rapeseed oil and is supplied from the Italian company "Maxcom" (AMSA, 2006).

[25] From personal communication with Mr. P. Rasini, ATM, March 2008.

Table 7 helps to get an overview of what is described in sections 8.1 and 8.2. The column Italy contains what has been implemented at national level by the Italian Government, while the column Milan contains the measures put into practice at local level by the municipal companies together with the Municipality of Milan. The acts and measures are ordered following the year they were passed, so an overview of what has happened at national and local level in the same year is provided.

| Year | EU (Directive requirements) | Italy | Milan |
|---|---|---|---|
| 2002 | | -A= Since July 300,000 tons of biodiesel exempted from fuel duty | |
| 2003 | | -A | |
| 2004 | Directive 2003/30/EC | -A | |
| 2005 | Indicative target 2% biofuels | -Until July A<br>-219 million Euros in tax reduction for bioethanol production, DG Competition still have to allow it<br>-1st national biofuels targets: 1% by 2005 and 2.5% by 2010 | |
| 2006 | | -Too low national targets cause Infringement Process<br>-Distributors of transport fuels obliged to supply minimum volume of 1% biofuels | ATM |
| 2007 | | -B= Since July Tax incentive to 250,000 tons biodiesel: 20% diesel fuel duty<br>-Minimum volume to supply 2% biofuels<br>-2nd national biofuels targets: 2.5% by 2008; 5.75 by 2010 | ATM |
| 2008 | | -B<br>-Minimum volume to supply 3%<br>-2nd biofuels target 2.5% | ATM, AMSA |
| 2009 | | -B<br>-Minimum volume 4% | |
| 2010 | Indicative target 5.75% biofuels | -Until July B<br>- Minimum volume 5%<br>-1st biofuels target 2.5% (caused Infringement Pr.)<br>-2nd biofuels target 5.75%; | |

Table 7: Requirements of the Biofuels Directive and relevant action in Italy and Milan

# 9 The case of Finland and Helsinki

Similarly to the previous two, the chapter about Finland and Helsinki is divided into section 9.1, where the implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels at national level in Finland is described, and section 9.2, where the measures about biofuels put into practice at local level in Helsinki are described.

## 9.1 Implementation of the EU Directive 2003/30/EC on the Promotion of Biofuels

In 2002, before the Biofuels Directive passed but under the Directive on the Harmonisation of the Structures of Excise Duties on Mineral Oils (92/81/EEC), Finland granted fuel duty reduction of 30 cent/l on bioethanol in a fuel blend of petrol and bioethanol intended for research and experimental use. Two projects run until 31 December 2004 and were not extended. So far no fuel duty reductions have been granted pursuant to the EU Directive 2003/96/EC on the Taxation of Energy, which came into force on 1 January 2004 (Finnish Ministry of Trade and Industry, 2004).

On 31 December 2004 the period set for the projects ended and these were not extended. No further tax reductions have been foreseen to reach the Biofuels Directive targets. On the contrary in order to implement the EU Directive 2003/96/EC on the Taxation of Energy biogas to be used as a motor fuel is exempted from the fuel duty. The fuel duty reduction was an effective instrument, but only in the short term. The share of biofuels used for transportation expressed in energy content rose from 0.02% in 2002 to 0.1 in 2003 and 2004 but as soon as the projects ended, in 2005 the share decreased to 0%. It went up to 0.02% in 2006 as Neste Oil, Finland's largest seller of transport fuels, began selling biofuels without any State support (Finnish Ministry of Trade and Industry, 2005; 2006; 2007).

As Finland did not reach the 2005 target of 2%, a biofuels obligation was introduced in 2008 to reach the 2010 EU target of 5.75%. From 2008 onwards the Act on the Promotion of the Use of Biofuels in Transport (No 446/2007) requires the distributors of transport fuels to have a certain share of biofuels of all transport fuels sold expressed in energy content. A distributor is the person who, in accordance with the Finnish Law, is liable to pay a tax on the supplied or received for consumption petrol or diesel. The obligation system is intended to be flexible for distributors, it is solely related to the total quantity of biofuels, allowing the distributors to meet their quota obligation by introducing biofuels in blends of their choosing, within the limits of quality standards. Furthermore the Law does not regulate the origin of the biofuels. The biofuels obligation will increase gradually from 2% in 2008 to at least 4% in 2009 to reach 5.75% in 2010 (Finnish Ministry of Trade and Industry, 2007).

As for the research on biofuels Finland, has clearly set its own targets, aiming at the development of more efficient second generation biofuels since 2003. Finland Technology Development Centre (Tekes) has had four Technology Programmes since 1999 financing bioenergy and renewable energy research. In 2004 a new Programme has been launched, while in 2007 Tekes introduced an important programme with a total budget of 137 million Euros to spend over 6 years. The total amount of funds Tekes allocated in Finland for Research and development of bioenergy and second generation biofuels amounted at 176.5 million Euros by 2007. In 2006 Finnish Parliament has allocated 9 million Euros for second generation biofuels to spend during 3 years (Finnish Ministry of Trade and Industry, 2004; 2005; 2006; 2007).

## 9.2 Voluntary measures on biofuels in Helsinki

Transportation causes more than one fifth of GHG emissions in the Helsinki Metropolitan Area (YTV, 2007). The major share of emissions is caused by road transportation (90%), but emissions from navigation had the largest relative increase: almost 60% since 1990. Road transportation can be divided into many sub-causes; passenger transport is the most polluting; it produces the majority of emissions, namely 65% (YTV, 2007). Reducing transportation and switching to less polluting fuels has notable co-benefits such as enhanced air quality, reduced noise and increased road safety (YTV, 2004; 2007).

As a voluntary initiative, the provider of public transportation services in Helsinki, HKL, in cooperation with Helsinki Metropolitan Area Council began to use a second generation biofuel (NexBTL) in the busses in 2007. The aim of the project is that half of the busses of HKL will use the 2nd generation biofuel in 2010. The biofuel is provided by the main Finnish fuel producer, Neste Oil, and the fuel will be tax exempted until the end of 2010, when the project period finishes. NexBTL can be produced from vegetable oils, animal fats or a mixture of them. The production capacity of the first NexBTL plant is 170,000 tons per year, and it has been operating since summer 2007. A second plant of a similar size is scheduled to begin production in 2009 (Neste Oil, 2008). The most important driving force which pushed the city to put this project into practice was the potential for reduction of emissions of $NO_X$ (15%) and particular matter (30%). Furthermore, the project gives an opportunity to reduce the emissions of the entire existing fleet while still using the existing fuelling infrastructure[26].

With regard to GHG reduction potentials, it is estimated that the production of the raw material, its transportation, production of the biodiesel and its use over the entire life cycle reduces emissions of 50% compared to a fossil fuel alternative (Economic and Planning Centre of the city of Helsinki, 2008). The lower emissions, the better quality and usability of the new fuel type are of particular interest for the fuel producer, which benefits from the experience on the production, distribution and long-term use of the new product (Finnish Ministry of Finance, 2007).

Table 8 helps to get an overview of what is described in sections 9.1 and 9.2. The column Finland contains what has been implemented at national level by the Finnish Government, while the column Helsinki contains the measures put into practice at local level by the local authority together with Neste Oil. The acts and measures are ordered following the year they were passed, so an overview of what has happened at national and local level in the same year is provided.

[26] From personal Communication with Mr. R. Mäkinen, Public Transport Services Unit of Helsinki Metropolitan Area Council, December 2007.

| Year | EU (Directive requirements) | Finland | Helsinki |
|---|---|---|---|
| 2003 | Directive 2003/30/EC | | |
| 2004 | | -Fuel duty reduction for biofuels for experimental use 30 cent/l<br>- Biogas exempted from fuel duty (Dir. 2003/96/EC)<br>-Share biofuels reached 0.1% | |
| 2005 | Indicative target 2% biofuels | -Share biofuels reached 0.02% | |
| 2007 | | -Distributors of transport fuels obliged to supply a biofuels minimum volume of 2% in 2008, 4% in 2009, 5.75% in 2010<br>-A= NExBTL for Helsinki Tax exempted | Autumn, NExBTL |
| 2008 | | -Minimum volume to be supplied 2% biofuels<br>-A | NExBTL |
| 2009 | | -Minimum volume 4% biofuels<br>-A | NExBTL |
| 2010 | Indicative target 5.75% biofuels | -Minimum volume 5.75% biofuels<br>-A | NExBTL |

Table 8: Requirements of the Biofuels Directive and relevant action in Finland and Helsinki

Source: (Finnish Ministry of Trade and Industry, 2007)

# 10 Comparative analysis and discussion

In this chapter a comparative analysis of the measures put into practice at national level and at city level is provided. In section 10.1, the national level is examined in details, providing a comparative analysis of the degree of success (or lack thereof) in implementing the Biofuels Directive. The results achieved through the implementation of the Biofuels Directive in the four countries and the "mix of policy instruments" put into practice is illustrated and compared.

As far as the city-level is concerned, in section 10.2 the activity levels that have been found in the four case-study cities are explained with the help of the set of explanatory factors outlined in chapter 3.2 (and summarily depicted in Figure 1 on page 16). The presence or absence of the individual explanatory factors – described in sections 3.2.1 to 3.2.6 – in the four cities should help to better understand and explain the higher or lower level of activity pursued within the cities investigated.

## 10.1 Comparison of national-level policies

As far as Europeanization is concerned, its definition which best can provide a suitable framework for this work is "*Europeanization as top-down impact of the EU on its Member States",* as already illustrated in section 3 (and esp. 3.1). According to this definition the EU acts in a top-down approach through legal acts and policies. As the main aim of this work is to understand how the different Member States have implemented the Biofuels Directive, it can be considered how in the four Member States Europeanization has taken place when considering the Biofuels Directive.

In the following three sections, different aspects of the implementation of the Biofuels Directive will be compared. In section 10.1.1, the degree of success in the introduction of biofuels in the national markets is measured referring to the percentages of biofuels in the total fuels sold in the years after the Biofuels Directive was passed. On this basis, the four countries are classified into three implementation categories. In section 10.1.2, the kinds of instruments put into practice in the four countries – already described in details in sections 6.2 for Germany, 7.1 for the UK, 8.1 for Italy and 9.1 for Finland – are summarised and compared. In section 10.1.3, the four countries are classified along the degree of success in the introduction of biofuels and in overcoming the "misfit" between the domestic situation and the biofuels targets contained in the Biofuels Directive. Building on "Europeanization" literature, the degree and mode of domestic policy change is described and explained. Furthermore the reasons of the implementation problems and the arguments provided by the national governments to justify the slow and not successful implementation are provided.

### *10.1.1 Degree of success in the introduction of biofuels*

The four countries investigated show different degrees of success in the introduction of biofuels. Table 9 lists the percentage in energy content of biofuels in the whole transportation fuel sold per country and per year.

| Country | Percentage (%) in energy content of biofuels for transportation sold per year | | | | | |
|---|---|---|---|---|---|---|
| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| Germany | - - | - - | 1.18 | 3.75 | 6.30 | - - |
| UK | - - | - - | 0.02 | 0.18 | 0.45 | 0.85 |
| Italy | - - | - - | 0.69 | 0.50 | 0.46 | 0.46 |
| Finland | 0.02 | 0.10 | 0.10 | 0 | 0.02 | - - |

Table 9: Percentage in energy content of biofuels sold in the whole transportation fuel sold per country and per year

- - = no data available

It can be observed that the only country which has positive results and concretely moves towards and then reaches the EU targets is Germany. In the UK the share of biofuels used slowly increases thanks to the acts implemented after the Biofuels Directive was passed, while in Italy the share slightly diminishes, witnessing the uncertain policies implemented after 2003. Finland is far away from reaching the targets, after a little increase in 2003 and 2004 the share of biofuels has to start again from the beginning.

Based on classifications by Di Lucia & Nilsson (2007) and van Thuijl & Deurwaarder (2006) three implementation categories can be made out: (1) effective implementation, (2) weak implementation but concrete measures for biofuels introduction in the coming years, and (3) weak implementation and uncertainty in the measures adopted for the coming years. Based on a qualitative judgement, the four countries can be assigned to the three implementation levels as follows:

(1) Effective implementation: Germany;

(2) Weak implementation but concrete measures for biofuels introduction in the coming years: UK, Finland;

(3) Weak implementation and uncertainty in the measures adopted for the coming years: Italy.

In the next section, the comparison of the mix of policy instruments adopted helps the reader to understand the classification provided here.

### *10.1.2 Mix of policy instruments used*

In a comparison of national-level measures the classifications from the OECD study (OECD 2008; described in section 2.4) and the typology of policy instruments from the political science literature (described in section 3.2.1) can provide a good basis for the comparative analysis of the measures used by the four Member States to reach the targets of the Biofuels Directive.

Let us first look at the type of policy instruments applied. Here, it has to be pointed out that to reach the targets of the Biofuels Directive the four Member States used and still use mainly regulatory instruments, i.e. the stick, in the form of support measures affecting the distribution of biofuels; or economic instruments, i.e. the carrot, in the form of support measures to promote the consumption of renewable fuels. Regulatory instruments, for example, require distributors to supply minimum percentages of biofuels to the consumers. This type of measure can be classified as a prohibition with permissions. Its aim is to control and to raise demands of biofuels through quotas.

One type of economic instrument reduces biofuels prices compared to the price of fossil fuels through a fuel duty exemption or reduction. It is an economic instrument classified under the “in-cash” form, with a part or the total of the fuel duty being tax- exempted. In this way the cost of taking actions deemed valuable by the government is reduced, favouring these actions, but neither prescribing nor prohibiting them.

For the years 2002 to 2007, Table 10 reports on the form and the level of fuel duty exemptions in the four countries (left column for each year) and the percentage in energy content of biofuel for transportation sold each year (right column for each year; percentages already shown in Table 9 above). At a first glance it is clearly recognizable that the larger and the more continuous the fuel duty exemption is, the higher the biofuels share in the total biofuels sold per year. This is clearly deductable from Germany. On the contrary, a non-positive trend can be outlined in the countries where a non-continuous fuel tax exemption has been in force. If the system of fuel duty incentives does not guarantee a long-term perspective to the companies aiming at producing biofuels, it is harder for them to make investments to start biofuels production. An analogue observation can be made for the UK. Here the fuel duty exemption system has been extended year per year for four years, allowing a sort of continuity, but which has been granted only year per year. This has also contributed to create uncertainties. The number of investments has probably been smaller than it would have been if the fuel duty exemption was fixed in advance for a stable number of years, without extending its validity in the Fiscal Act each year.

| Country | Fuel duty exemption and percentage (%) in energy content of biofuels for transportation sold per year | | | | | |
|---|---|---|---|---|---|---|
| | 2002 | | 2003 | | 2004 | |
| | Fuel duty exemption | % | Fuel duty exemption | % | Fuel duty exemption | % |
| G | Total exemption biodiesel | - - | Total exemption biodiesel | - - | Total exemption any biofuel | 1.18 |
| UK | 20 p/l biodiesel | - - | 20 p/l biodiesel | - - | 20 p/l biodiesel | 0.02 |
| IT | 300,000 t biodiesel fuel duty exempted | - - | 300,000 t biodiesel fuel duty exempted | - - | 300,000 t biodiesel fuel duty exempted | 0.69 |
| FIN | Fuel duty reduction 30 c/l on biofuels experimental use | 0.02 | Fuel duty reduction 30 c/l on biofuels experimental use | 0.10 | Fuel duty reduction 30 c/l on biofuels experimental use | 0.10 |

| | 2005 | | 2006 | | 2007 | |
|---|---|---|---|---|---|---|
| G | Total exemption any biofuel | 3.75 | Total exemption any biofuel/Gradual increase | 6.30 | Gradual increase | - - |
| UK | 20 p/l biodiesel + bioethanol | 0.18 | 20 p/l biodiesel + bioethanol | 0.45 | 20 p/l biodiesel + bioethanol | 0.85 |
| IT | - - | 0.50 | - - | 0.46 | 250,000 t biodiesel 20% fuel tax | 0.46 |
| FIN | - - | 0 | - - | 0.02 | | - - |

Table 10: Fuel duty exemption and percentage (%) in energy content of biofuels sold in the whole transportation fuel sold per country and per year

Payments sustained by the government to individuals or businesses favouring the production of biomass or the conversion of agricultural feedstock into biomass for biofuels production are economic instruments “in cash” in the form of subsidies. This type of subsidies has been proposed only in the UK but not yet implemented. Until now, the producers are not directly subsidised through measures adopted to implement the EU Directive 2003/30/EC on the Promotion of Biofuels but are financed by a EU subsidy system introduced by the 2003 Common Agricultural Policy (CAP) reform, the Energy Crop Aid. Thanks to the scheme, farmers growing energy crops and owning a contract with the processing industry for their energy crops for the biofuels production receive 45 Euros per hectare. At national level, only the British ECA system would be classifiable among the instruments having effect on the producers, but it is still under discussion as setting such a system could potentially go against the concurrence policy of the EU. Up to now the only allowed subsidy systems in addition to financial incentives from the CAP are the regional funding systems, which are granted to farmers who decide to grow biofuels feedstock in UK and in Germany.

It is noticeable that at first the measures implemented by the four Member States were concentrated on the consumers, and later on were coupled with measures having direct effect on the distributors. The

measures taken at national level have been summarised in Table 11, which clearly categorises the different kinds of instruments and helps for an overview.

| | Policy instruments at national level | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fuel duty incentives (consumer) | | | | Biofuels obligation (distributor) | | | | Production subsidies (productor) | | | | Biofuels quality standards | | | | Research and development | | | |
| | *G* | *UK* | *FIN* | *I* | *G* | *UK* | *FIN* | *I* | *G* | *UK* | *FIN* | *I* | *G* | *UK* | *FIN* | *I* | *G* | *UK* | *FIN* | *I* |
| 1999 | $A^{G}$ | | | | | | | | | | | | | | | | $F^{G}$ | | $C^{FIN}$ | -- |
| 2000 | $A^{G}$ | | | | | | | | | | | | | | | | $F^{G}$ | | $C^{FIN}$ | -- |
| 2001 | $A^{G}$ | | | $A^{I}$ | | | | | | | | | | | | | $F^{G}$ | | $C^{FIN}$ | -- |
| 2002 | $A^{G}$ | $A^{UK}$ | $A^{FIN}$ | $A^{I}$ | | | | | | | | | | | | | $F^{G*}$ | | $C^{FIN}$ | -- |
| 2003 | $A^{G}$ | $A^{UK}$ | $A^{FIN}$ | $A^{I}$ | | | | | | | | | | | | | $F^{G*}$ | | $C^{FIN}$ | -- |
| 2004 | $B^{G}$ | $A^{UK}$ | $A^{FIN}$ | $A^{I}$ | | | | | | ECA | | | | | | | $F^{G*}$ | $C^{UK}$, $D^{UK}$ | $C^{FIN}$ | -- |
| 2005 | $B^{G}$ | $A^{UK*}$ | | | | | | $B^{I}$ | | | | | | | | | $F^{G*}$ | $C^{UK}$, $D^{UK}$ | $C^{FIN}$ | -- |
| 2006 | $B^{G}$; $C^{G}$ | $A^{UK*}$ | | | | | | $B^{I*}$ | | | | | | | | | $F^{G*}$ | $C^{UK}$ | $C^{FIN}$, $D^{FIN}$ | -- |
| 2007 | $C^{G}$ | $A^{UK*}$ | | $C^{I}$ | $D^{G}$ | | | $D^{I}$ | | | | | | | | | $F^{G*}$ | $C^{UK}$, $E^{UK}$ | $C^{FIN}$, $D^{FIN}$ | -- |
| 2008 | $C^{G}$ | $A^{UK*}$ | | $C^{I}$ | $D^{G}$ | $B^{UK}$ | $B^{FIN}$ | $D^{I}$ | | | | | | | | | | $C^{UK}$, $E^{UK}$ | $C^{FIN}$, $D^{FIN}$ | -- |
| 2009 | $C^{G}$ | $A^{UK*}$ | | $C^{I}$ | $D^{G}$ | $B^{UK}$ | $B^{FIN}$ | $D^{I}$ | | | | | $E^{G}$ | | | | | | $C^{FIN}$ | -- |
| 2010 | $C^{G}$ | $A^{UK*}$ | | $C^{I}$ | $D^{G}$ | $B^{UK}$ | $B^{FIN}$ | $D^{I}$ | | | | | $E^{G}$ | | | | | | $C^{FIN}$ | -- |

Table 11: Policy instruments adopted in the EU member States

Source: modified, based on Di Lucia & Nilsson (2007); (BMELV, 2004; 2005; 2006; 2007); (Finnish Ministry of Trade and Industry, 2004; 2005; 2006; 2007); Ministero delle Finanze, 2005; 2006; 2007; 2008); (UK Government, 2005; 2006; 2007; 2008).

See Legend on next page.

Legend:

Germany:
$A^G$= Ecotax: pure biodiesel fuel duty exempted
$B^G$= Total fuel duty exemption for any biofuel
$C^G$= Fuel duty on biodiesel gradually increases until 2012.
$D^G$= Biofuels Quota Act until 2015
$E^G$= Only biofuels from sustainable production included in biofuels Quota or tax exempted
F = German Government research on biodiesel, various projects in cooperation with Universities and private Institutes
F*= German Government research on biodiesel and bioethanol, various projects in cooperation with Universities and private Institutes

UK:
$A^{UK}$= 20 p/l fuel duty incentive biodiesel
$A^{UK}$*= 20 p/l fuel duty incentive biodiesel & bioethanol
$B^{UK}$= RTFO
ECA proposed in 2004, still under discussion
$C^{UK}$= UK Government allocates funds on various Research Programmes New and Renewable energy and development Programme
$D^{UK}$= UK Government and Industry Sponsored Low Carbon Vehicle Partnership
$E^{UK}$= Biotechnology and biological Sciences Research Council
$F^{UK}$= Technology Strategy Board

Finland:
$A^{FIN}$= Duty reduction for biofuels for experimental use 30 cent/l
$B^{FIN}$= Act on the Promotion of the Use of Biofuels in Transport (No 446/2007)
$C^{FIN}$ =Technology Development Centre (Tekes) Financial Programmes (176 Mill €)
$D^{FIN}$ = Finnish Parliament (9 Mill €)

Italy:
$A^I$= Since July 300,000 t biodiesel fuel duty exempted
$B^I$= Legislative Decree n.128/2005, too low national targets set
$B^I$*= Causes Infringement Process
$C^I$= Fuel duty incentive to 250,000 tons biodiesel: 20% diesel fuel duty
$D^I$= Fiscal Act 2007: New minimum quantities fixed
--= No data available on research

This is the point where we can recognise a sort of parallel implementation of the Biofuels Directive in the four countries. With the support of Table 11 the parallelisms can be clearly followed. All Member States began with a fuel duty incentive to favour the purchases of biofuels to the final consumer. This market-based support system, allowed by Art. 16 of the EU Directive 2003/96/EC on the Taxation of Energy, has been the most employed policy support instrument for biofuels among all the EU Member States. As already described in section 2.2 the high level of fuel duty on diesel and gasoline in the EU facilitates the use of duty reduction to support alternative fuels and technologies (Di Lucia & Nilsson, 2007). Germany and Italy begun with a total exemption from fuel duty for a determined product or a pre-determined quantity, while the UK and Finland provided a duty reduction for a determined product.

Interestingly, some years after the fuel duty reductions have been introduced, three out of four Member States considered in this study (Finland excluded) are combining these cited measures affecting the consumer behaviour with measures affecting the distributor behaviour, namely quota obligations. In the case of Finland the quota obligation system is implemented but no fuel duty reduction is put into practice anymore after 2004.

In practice, to the economic instrument, i.e. the fuel duty exemption, a regulatory instrument is added: the biofuels obligation. In doing so governments require infrastructure quotas focused on the distribution, i.e. they oblige petrol stations to sell a minimum percentage of biofuels out of the overall amount of fuel sold, taking advantage of a regulatory instrument to reach the EU targets. The reasons why the countries do so are diverse though. Finland, the UK and Italy have begun a quota obligation system to ensure that the EU biofuels target would be reached in 2010. It was probably hoped that the regulatory obligation would have a more direct effect than the market instrument. In fact, the level of duty reduction together with the uncertainty the measure has offered in each of the three countries has proved to be insufficient to reach the level of capacity and infrastructure requirements to meet the Biofuels Directive's targets. Higher level of fuel duty incentives would be too expensive, potentially causing unsustainable costs for public finances. Moreover the European Commission had also indicated that higher levels of fiscal incentives could give rise to overcompensation risks like it was the case in Germany, where overcompensation was effectively occurring. This because of the full fuel duty exemption which should be expunged through the quota obligation introduced in 2007.

Another kind of regulation affecting the biofuels distributors is foreseen for 2009 in Germany. It is not a quantity but a quality obligation, it will specify sustainability standards concerning the biofuels the distributor will sell.

As far as the German Energy Tax Act is concerned, this Law can be defined as a "double" measure on the consumers. After overcompensation occurred the fuel duty exemption on biofuels was substituted by a fuel duty reduction, but it can be considered as double as it favours pure biofuels or blends with higher percentage of biodiesel or bioethanol, as noticeable from Table 1 in section 6.2. In this case biofuels users are not only led to prefer biofuels, but also to prefer higher percentage blends, leading to a final increase in the total biofuels purchases.

As far as the financing of research in the four countries is concerned, this has not been the main focus of this work and data has not been collected on a systematic basis. The data reported in Table 11 has been based on what the Member States have reported to the European Commission in their National Reports on the Implementation of the Biofuels Directive. No data regarding Italy has been found. This lack of information however reflects again that the National Reports submitted to the European Commission are drafted in a rather heterogeneous way, not always allowing a clear comparison of the countries' domestic situation. The German Federal Government has been financing research on biodiesel since the end of the 1990s and many initiatives and programmes have been launched to finance projects each year. Since 2002, also programmes focused on bioethanol are funded. The UK Report to the European Commission explains quite in details the number and characteristics of the

various strategies and initiatives financed by the UK Government and by private industries. In many UK projects one sees cooperation between private institutes and universities. In the UK, similar to Germany, every year new initiatives, public or private, have been launched. In Finland, research on second generation biofuels started in 2003. While in Finland it was first researched on bioenergy in general, it does not seem that research on first generation biofuels has ever gained importance. A large amount of money has been allocated by the Technology Development Centre (Tekes), which is the most important centre financing research in Finland and the only one mentioned in the reports examined. In 2007, it allocated 137 million Euros to be spent in six years for research on second generation Biofuels. The Finnish Government also allocates funds, but to a lesser extent compared to what Tekes does.

### *10.1.3 Explaining the degree of success in the introduction of biofuels*

In order to get a more complete image of the way in which the four countries have implemented the Biofuels Directive, the classification into three implementation categories, as described above, could be combined with the five degrees of domestic policy change from Jordan & Liefferink (2004), introduced in section 3.1.2. The extent of adaptation pressures to overcome the "misfit" between the domestic situation and the EU requirements leads to domestic change, i.e. in the end to comply with the EU policies. Jordan & Liefferink (2004) distinguish five specific patterns: *Absorption*, *Accommodation, Transformation, Inertia* and *Rentrenchment*.

In the following, the most successful country among the four countries studies, namely Germany, will be described first. Then the three less successful countries will be portrayed. The description of the UK, Finland and Italy will be preceded by a small paragraph illustrating the general motivations and arguments provided by the three countries' governments to justify the existing "misfit" between the national situation and European requirements.

*Success story: Germany*

In Germany pure biofuels enjoyed a full fuel duty exemption from the very beginning, which was fundamental for the development of the biodiesel sector. There was interest in biofuels for transport already before the Biofuels Directive entered into force. Interest in agricultural and rural development has given support to produce biofuels, while concerns about climate protection and energy security have motivated the biofuels consumption (Di Lucia & Nilsson, 2007). A receptive agricultural sector and car manufacturers who started adapting their cars for the use of pure biodiesel both played an important role. This is why in the case of Germany the domestic change that occurred can be classified as *Absorption*.

In case of *Absorption* Member States are characterised by a small "misfit" between EU requirements and prevailing domestic characteristics (Jordan & Liefferink, 2004). Domestic structures and policy legacy provide a mixture of resiliency and flexibility. It indicates change as adaptation because national characteristics do not have to be modified and the EU requirements are simply absorbed (Radaelli, 2003: 37). The "misfit" between German regulations and EU requirements has been rather small, especially given the fact that the ecotax had entered into force four years before the Biofuels Directive passed and was simply extended to bioethanol once the Biofuels Directive had to be implemented. This means that national characteristics did not have to be modified and that the EU requirements were simply absorbed at national level. The policy style had to be modified from 2006 on, paradoxically not as a cause of "domestication failure" but due to the occurrence of overcompensation. The Biofuels targets had been reached more easily than expected, the low "misfit" and the high commitment of institutions, associations and businesses in the accomplishment and the total fuel duty exemption played all together a decisive role. The EU targets had been reached but new instruments were introduced and this marked a turning point in the German policy style in use until 2006. An economic instrument

establishing an increase in the fuel taxation on biofuels, and the regulative one, establishing a system of quotas to reach the future targets contained in the Biofuels Directive were passed by the German Federal Government.

*Implementation problems: United Kingdom, Finland, and Italy*

All EU countries are obliged to hand in National Reports on the Implementation of the Biofuels Directive to the European Commission once a year. In those reports countries gave various motivations for their weak implementation. Based on a study by Di Lucia & Nilsson (2007) Table 12 summarises the motivations provided by UK, Italy and Finland, i.e. the "weak implementation" countries comprised in this study. The motivations provided by the three countries can be considered as arguments to justify the existing "misfit" between the national situation and European requirements.

As far as agriculture is concerned, from a physical perspective some countries have justified their low biofuels production with the argument of a *lack of agricultural potentials,* i.e. limited natural possibilities in its internal agricultural production. From the political perspective the analysis of Di Lucia & Nilsson (2007) shows that biofuels appear to be less attractive in those countries whose development does not contribute to employment and development in rural areas.

The arguments of the high *reduction cost of GHG emissions, investments in advanced biofuels, alternative use of biomass,* and *negative impacts on the environment* highlight a country's fundamental disagreement with the Biofuels Directive, that sees first-generation biofuels as a viable means for climate and environment protection. Countries that follow those lines of argumentation tend to opt for a partial implementation of the Biofuels Directive, like lower targets set (e.g. UK), or for the accomplishment of the targets in a longer term, for example by means of the development of second generation biofuels (like in Finland).

The argument of long *decision making and investment lead-times* illustrates practical problems related to the implementation of biofuels policies. A time consuming policy process due to a lack of experience with biofuels and the non-existence of sufficient biofuels production capacities or the uncertainty given to short-term financial systems are comprehended here (Di Lucia & Nilsson, 2007).

| Arguments | Countries | | |
|---|---|---|---|
| | UK | IT | FIN |
| Lack of agricultural potentials | | X | X |
| Reduction costs of GHG emissions | X | | X |
| Decision making and investment lead times | X | | |
| Investment in advanced biofuels | | | X |
| Alternative use of biomass | | | X |
| Negative impact on environment | X | | |

Table 12: Arguments presented in the years 2004, 2005, 2006, and 2007 by national governments for foreseen or effective non accomplishment to the EU target values

Source: (Di Lucia & Nilsson, 2007)

The UK has been characterised above as a country with "weak implementation but concrete measures for biofuels introduction in the coming years" as its approach has been really cautious. Instead of a fuel duty total exemption it first cut the fuel duty on biodiesel, and later on it applied the reduction also for bioethanol. This measure has brought some uncertainty as it has not been clear in the beginning when it

was supposed to expire. In 2005, it had to expire by 2008, in 2006, the end was fixed for 2009 and in 2007, it was finally agreed that it will finish during spring 2010. First of all, this offered uncertainty to the industries. The level of duty differential and the length of certainty the measure can offer has prolonged the *decision making and investment lead times*. In doing this it did not sufficiently stimulate the investments in production capacity and infrastructure requirements to meet the EU targets. Furthermore, a higher level of fuel duty incentive has not been provided because the European Commission has warned the Member States against overcompensation risks occurring due to high levels of fiscal incentives. Higher levels of fuel duty incentives would also be very expensive for the public finance, potentially leading to unsustainable pressure on it. So the UK did not want to face higher costs or a risk of overcompensation, two possible results of fuel duty total exemptions to biofuels. Further justifications for the UK's cautious approach were built on the argument of high r*eduction costs of GHG potentials.* It was calculated that the cost of one tonne of GHG saved on the basis of the RTFO measure would be 384 Pounds (104 Pounds per tonne of $CO_2$) while measures in other sectors tended to be cheaper. Sustainability concerns, esp. the possible *negative impacts on the environment* brought by the uncontrolled expansion and use of biofuels, were additional motivations for the cautious approach. The UK currently mentions sustainability concerns as the main reason for a lower target value contained in RTFO for 2010. The UK expects to accomplish the EU targets by 2013-2014 (UK Department for Transport, 2007). As regards the mode of policy change, the British approach can be classified as *Accomodation*.

In case of *Accomodation* Member States are characterised by a medium "misfit" between EU requirements and prevailing domestic characteristics, so the amount of domestic adaptation is low (Jordan & Liefferink, 2004: 8). Member States accommodate Europeanization pressures by adapting existing policies without changing their essential features and the underlying collective understanding attached to them (Börzel & Risse, 2003: 70). The degree of "misfit" between UK regulations and EU requirements can be classified as medium. The fuel duty was already cut in 2002, but only for biodiesel, and it was extended to bioethanol in 2005. These measures did not bring the hoped results in particular because the fuel duty exemption validity was extended year by year, not facilitating a decisive involvement of the industries. This did not allow the biofuels consumption to increase to an adequate extent in order to reach the EU targets. The UK, in the last years, brought forward all the motivations above listed to justify its failed accomplishment. Moreover since 2004, the UK Government talked about the formulation of the ECA and about the RTFO. The ECA is still under discussion and most probably won't be implemented as it would be against the competition policy of the European Union. Anyway, the RTFO entered into force in April 2008 bringing a new system of quota obligation among British policies which will contribute to let the UK reach the 5.75% of biofuels consumption for 2010.

Similar to the UK, Finland can also be classified as a country with "weak implementation but concrete measures for biofuels introduction in the coming years". A cautious approach can also be noticed here, in line with the principle of "realistic pragmatism" mentioned in section 5.4. In Finland, the main reasoning has been the high cost of biofuels production and the already high share of bioenergy in the country used for Combined Heat and Power Generation (CHP). The use of biofuels is not widespread and it has mainly been based on fixed-term pilot projects. One of the main causes that concur to hamper the production of biofuels in Finland is the lack of *agricultural potential*: the costs of arable crops production are among the highest in Europe. Ethanol produced from Finnish raw material cannot be competitive with the volume of production of ethanol sold on the world market. The domestic production of oily seeds only supplies part of the food industry's needs, the rest is imported. In this term, the widespread use of oily seeds for biodiesel production might endanger the internal food industry's supply. This means that the estimated potential for production of first generation ethanol and biodiesel derived from domestic crops is almost negligible. Also the *alternative use of biomass* is relevant as the cost-efficiency of the use of biomass used to produce transport fuel is smaller compared to the one derived by the use of biomass for other energy production, processing for transport use requires energy. It was

estimated that the costs for reducing one tonne of $CO_2$ by using biofuels for transportation is tenfold when compared with the corresponding reduction by using biomass in the CHP production. This is why since 2006 the Finnish Government finances research to develop second generation production technologies for biofuels and to bring second generation biofuels to the market by 2015. This intention has been marked in Table 12 above as *investments in advanced biofuels*. It is hoped that investment in second generation biofuels would halve the additional costs of first generation biofuels production incurred by the national economy and achieve a share of up to 8% of transport fuels in the energy mix by 2020. Second-generation biofuels may also contribute to greater environmental benefits compared with traditional fuels (Finnish Ministry of Trade and Industry, 2004). As regards the mode of policy change, the Finnish case can best be described with the category of soft *Rentrenchment* towards the targets prescribed in the Biofuels Directive.

In case of *Rentrenchment* Member States block EU requirements at the implementation stage and develop new national policies diverging from the EU requirements. Countries actively resist adaptive pressure by stressing their unique features (Jordan & Liefferink, 2004). A fuel duty reduction only for biofuels for experimental use was in force since 2002, but this "experimental" orientation left many possibilities of strong biofuels development out. Later Finland justified its non-accomplishment with the arguments of non sufficient agricultural potential available and the more efficient alternative use of biomass available to produce energy. Finland is much more research-oriented than the other three countries, as it looks for more efficient solutions to develop internal biofuels consumption. This confirms the "realistic pragmatism" which characterises the Finnish approach to policy solutions. With this attitude Finland continued with a second phase, which also started in 2006, where a change in the policy style took place. Finland started implementing measures to reach the EU targets on biofuels, but putting into evidence the unique features of Finland the Finnish Government allowed itself to accomplish the targets in a longer term than the one fixed by the Biofuels Directive. The longer term is motivated by the time necessary to research to develop and market second-generation Biofuels, the only type of biofuels which would legitimate the Finnish commitment towards a compliance with biofuels targets.

As regards the level of implementation, the situation in Italy can be described as "weak implementation and uncertainty in the measures adopted for the coming years". Although Italy is at the ninth place in the world for investments in the biofuels sector, the situation is still marked by a high degree of uncertainty. This uncertainty is a direct heritage of the measures applied in the past years, which do not concur to the takeoff of energetic crops. On the one hand, the Italian Government only justified itself in the 2006 National Report on the Implementation of the Biofuels Directive with a non-well defined deficiency in *agricultural potential* which would hamper Italy to accomplish with the EU biofuels targets (this motivation has then lead Italy to the Infringement Procedure in 2006). Moreover, in the later reports the Italian Government does not provide further justification for the missing accomplishment. On the other hand, a study from Ernst & Young (2007) points to a more verisimilar cause, namely the insufficient fiscal incentive system and an uncertainty spread within the sector caused by the absence of a continuous normative basis. In Table 12 above, this is classifiable as *decision making and investment lead times*, which concur to make investment decisions difficult (Ernst & Young, 2007). One reason is the absence of long term incentive programmes for the cultivation and consumption of biofuels. The first incentive programme lasted for three years, and the second one entered into force three years after the first one expired, and will also last only three years. It would be possible to obtain an impulse to biofuels local production thanks to an increase of the contingent exempted from fuel duty, which should not be limited to 250,000 tons per year anymore. The normative uncertainty was especially provoked by Legislative Decree n.128/2005, which set lower national targets compared to those set by the European Union. This made the European Commission open an Infringement Procedure against Italy. After the Infringement Procedure was started, Italy readjusted its targets to be in line with those fixed in Brussels. What aggravates normative uncertainties is the fact that, as described in section 5.3, legislative competences for environmental protection are split between regions and the nation state. This split does

not clearly determine the powers of the local authorities in the different environmental policies, concurring to an administrative uncertainty, which make the situation even more complicated. As regards the mode of policy change, Italy is classifiable in the category of *Inertia*.

In case of *Inertia* Member States deliberately block EU requirements either by not implementing policies or by engaging in partial compliance (Jordan & Liefferink, 2004: 9). The amount of domestic change will be limited until sufficient political pressure has built up to deliver the necessary national adaptations. In the long term it can become impossible to sustain, causing crisis and abrupt changes (Radaelli, 2003: 37). The existing misfit between Italian biofuels regulations and EU requirements can be classified as medium. A total fuel duty exemption was in force since 2002 but for a pre-determined contingent and for three years. This measure did not make the consumption of biofuels increase considerably. Only few industries started producing more biofuels as the tax-exemption lasted only three years, not enough to support a long term enterprise development strategy. A further step towards poor compliance was the fixation of a biofuels target to 1% by 2005 instead of committing towards the 2.5% EU target. This was justified with the argument of deficiencies in agricultural potential. This argument, however, was not considered valid by the Commission, which led to an Infringement Proceeding. This sort of escalation provoked a kind of transformation of the Italian policy. The Infringement Proceeding of the European Commission built up sufficient political pressure so that the Italian Government took the necessary national measures; it adopted new national targets in line with the EU ones, it set up a system of quota obligations to be reached annually, and it set up a new fuel duty exempted contingent of biofuels, which together form the new Italian policy strategy related to biofuels.

## 10.2 Comparison of local-level policies

As discussed in section 2.2 local authorities are not directly involved in the implementation of EU Directives. However, like many other cities also Berlin, London, Milan, and Helsinki have recently started voluntary measures to promote biofuels in their own fleet, mainly co-promoted by local-level authorities and the private sector.

As already described in section 3.2.2, the State of European Cities Report (2007) classified **Berlin** as the most powerful city in this study. The Berlin Government financially supports and takes part in the coordination of all the projects we have examined, whereas the German Federal Government only supported the first project on Natural Gas (NG), TUT. Even though NG is not a biofuel, projects for its promotion are examined in the case of Berlin, because they have been crucial for the subsequent development: promoting gas-driven vehicles allows Berlin to gradually switch from NG to biogas without the need to promote liquid biofuels to reach the biofuels targets. After the TUT Project a clear contradiction can be noticed between the German Federal Government that strongly supports biodiesel and the Berlin Government that sets biogas as a priority. In Berlin, a highly autonomous local authority together with significant local environmental sensitivity has favoured the development of local activities. The activities are also supported by research institutes and private companies such as GASAG (the Berlin energy supplier), the Berlin Energy Agency and other local businesses, involved in the projects examined. Berlin also draws on EU funding: two projects out of four (TELLUS and MADEGASCAR) are co-financed by the EU. These projects require networking among the project partners, which favours the sharing of expertise and fosters learning processes among cities.

Although the UK was classified among the “laggards” in local environmental sensitivity by Collier (1997) many biofuels projects are run in **London**, also in cooperation with private companies. Although the local authority is classified as the least powerful among the four cities, the London Boroughs cooperate in and finance a large number of projects. TfL is also strongly committed to save energy. Similarly to the Berlin case, measures are in place for the creation of networks using EU funds to help the development of the biofuels market and to enhance preparation for and participation in further EU programmes. The

UK Government is the official promoter of the initiative "Green Cars". 5% biodiesel blend driven vehicles are provided to the UK Government in its London-based ministerial and delivery vehicles. According to the distinction of the national-level measures described in section 3.2.1 this measure can be classified as a combination of an "economic instrument" in kind, in this specific case the provision of goods (cars and vans), and an "information instrument", in this case a government demonstration, whose motivating idea is that if a particular technology can be seen in operation, the probability of its adoption and use will increase. The UK Government has not helped the local authorities though, explicitly turning down a tax subvention request to favour a project.

Even though in section 3.2.2 Milan has been classified among the most powerful cities in Europe, the number of projects remains low up to now. One possible explanation is the size of the city, Milan being much smaller compared to Berlin and London. The Italian Government does not support the activities and it could also be considered that the non-linear implementation of the Biofuels Directive demonstrated by the Italian Government, up to now, has also had an effect on the local level. It could have slowed down the perception of how relevant it can be to voluntarily co-operate with the Italian Government to reach the targets contained in the Biofuels Directive. None of the projects is co-financed by the EU and no networking is present, as yet, in relation to projects for the development of biofuels consumption. This relative inactivity could also be rooted in the low degree of local environmental sensitivity, as explained in the theory part. Italy, in general, classifies as a "laggard" in environmental concern. A positive effect is brought by the transport and the waste management companies, which are municipally-owned. In this case the presence of municipal companies has been comprised under "degree of local self-government"[27]. A municipal company combines the local authority's interests with the power of a company, supporting the development of the two projects on biofuels in Milan.

Also in Helsinki the size of the city can probably partly explain why so far only one project is running. In the set of cases investigated, Helsinki it is the only city where the local authority has been strongly supported by the Finnish Government in the development of voluntary measures: an economical instrument in the form of a tax exemption was guaranteed for second generation biofuels used in the project. Support was also granted in the research phase of the project. This is in line with the principle set and stated in the National Reports on the Implementation of the Biofuels Directive sent to the European Commission. According to it, and in line with the principle of "realistic pragmatism" which characterises the approach of Finland towards environmental policy, second generation biofuels are the priority of the Finnish Government to reach the biofuels targets as their production is much more efficient compared to the first generation ones. Helsinki is influenced by the national-level perspective and is the only city in this study already promoting second generation biodiesel. The project in Helsinki is strongly supported by the Finnish fuel producer Neste Oil, which can economically afford to experiment with this new fuel at local level. No EU financing has so far been used to finance local projects, and no partnerships and networks can be related to biofuels use. This may partly be explained by the small size of the city.

Table 13 gives a more concrete overview of what is going on in the four cities and links local-level activities with the explanatory factors as described in sections 3.2.1 to 3.2.6 (and summarily depicted in Figure 1), i.e. (i) national-level regulations and support, (ii) system of local self-government and support, (iii) support from the local citizenry (iv) support from the local businesses, (v) access and acquisition of EU funds, and (vi) horizontal networking between cities. This tabulation is a useful tool to quantitatively assess the (strong or weak) presence of the explanatory factors in each city.

[27] The reason for this is that in Milan they can not be classified as independent businesses, given the fact that a strong participation of the Municipality of Milan is present in the total share number of the two municipal companies. If the share numbers would have been lower, as it is the case in other municipal companies, they could have been classified under "support from local business" but in this case the power the municipality owns thanks to the share number is too high to allow a classification as an independent business.

For the city of *Berlin* most of the six explanatory are seen to be present in almost all projects: Support from local authorities, from local businesses and citizens could be found in all projects studied. In some projects also support from the EU and the existence of horizontal networks could be found. The city of *London* offers a less homogeneous picture: Local authorities and local businesses have partially granted support; EU-level support could be found infrequently; the same is true for horizontal networking. In *Milan* the only positive factor involved is the local authority, taking action also thanks to the municipal companies. In *Helsinki* national-level support and support from businesses, the national oil producer Neste Oil in this case, cooperate to follow the research targets fixed at national level and concentrate their effort on a pilot project in Helsinki.

| | National-level support | Local authority support | Local citizen support* | Local business support | EU funds | horizontal networks |
|---|---|---|---|---|---|---|
| BERLIN projects: | | | | | | |
| TUT | Yes | Yes | Yes | Yes | No | No |
| TELLUS | No | Yes | Yes | Yes | Yes | Yes |
| Madegascar | No | Yes | Yes | Yes | Yes | Yes |
| Brandenburg for Berlin | No | Yes | Yes | Yes | No | No |
| LONDON projects | | | | | | |
| BISTRO | No | Yes | No | Yes | No | No |
| R.u. Thames | Denied | Yes | No | No | No | No |
| Green cars | Yes | No | No | No | No | No |
| TfL | No | Yes | No | No | No | No |
| Radio Taxis Group | No | No | No | Yes | No | No |
| Bio-Die-Net | No | Indirect | No | Yes | Yes | Yes |
| Bio-Nett | No | Indirect | No | No | Yes | Yes |
| MILAN projects | | | | | | |
| ATM | No | Yes | No | No | No | No |
| AMSA | No | Yes | No | No | No | No |
| HELSINKI projects | | | | | | |
| NexBTL | Yes | No | Yes | Yes | No | No |

Table 13: Local-level activities summary table

* based on literature review

Table 14 summarises the key findings of our comparative analysis. In the first row of the Table, the activity levels in the four cities, i.e. the *dependent* variable in this research, are classified using a simple tripartite division into “high”, “moderate” or “low” levels of implementation. Activity levels were operationalised by the number of biofuels-related projects currently carried out at the local level. Both the size of the city and the quantities of biofuels supported by each project could have been a second criterion of evaluation; however to simplify interpretation the activity level is assessed based on the absolute number of projects.

| | Berlin | London | Milan | Helsinki |
|---|---|---|---|---|
| Activity level in the cities | Moderate | High | Low | Low |
| Explanatory factors: | | | | |
| National-level support | +/- | +/- | - | + |
| Degree of local self-government | + | +/- | + | +/- |
| Support from local citizens | + | - | - | + |
| Support from local businesses | + | +/- | - | - |
| Access to and acquisition of EU funds | + | +/- | - | - |
| Horizontal networking between cities | + | +/- | - | - |

Table 14: Summary evaluation of key factors explaining city-level activities

Legend:
"+" = strong presence, more than half of the projects
"+/-" = weak presence, less than half of the projects
"-" = absence, not found

In the lower part of the Table the level of local activities is connected with the six theory-based explanatory factors. The presence (or absence) of explanatory factors has been quantitatively assessed in Table 13; Table 14 provides a summary thereof. A "+" is attributed in case the presence of the explanatory factor is found in more than half of the projects, "+/-" is attributed in case the explanatory factor is present in less than half of the projects, "-" is attributed in case the explanatory factor is not found in a single project. There is only one exception to this assessment rule, namely "support from local citizens". This factor has not been directly investigated in the case studies; therefore, assessments have to be based on literature review. "+" or "-" are attributed on the basis of the arguments found in political science articles and books and delineated in sections 3.2.3, as well as 5.1 to 5.4. The main conclusions that can be drawn from this analysis are presented in the final conclusions chapter.

# 11 Conclusions

Which are the implication of this study for those who whish to understand more about how implementation of EU Directives in the EU Member States takes place, which implications does it have at national level, and can a sort of correlation be seen between what happens at national level and at local level?

Because only a small sample of cases has been studied, which were also not chosen on the basis of statistical sampling, it is not possible to offer definitive, representative judgements on the entire range of practical questions which could arise after reading through this study. The author noticed that, of course, a more extensive study of intervening actors and their positions at national as well as at local level is still missing. In this respect, a research perspective considering the true intentions of various actor groups and the amount of interventions on the national policy arenas would have allowed a more complete analysis of implementation.

Nonetheless, certain patterns emerge quite strongly and some insightful conclusions can still be drawn based upon this study. In the following, some key conclusions are presented which might, in the end, lead to a better understanding of processes of Europeanization and some of the aspects influencing national and the local-level policies in the EU Member States.

In this study, four different countries and four cities have been compared to better understand the process of the implementation of one EU Directive – in this case the EU Directive 2003/30/EC on the Promotion of Biofuels – in the EU Member States. Moreover, this study has looked into the question of what kind of promoting (and hindering) forces the Biofuels Directive has exercised at national and at local levels. In this context, it has been tried to find out if a sort of relation in the commitment at national and local level can be delineated. This thesis clearly departed from the idea of being able to find strict correlations between the level of commitment in the implementation at national level and at local level. The thesis rather developed a heuristic framework, built on a set of explanatory factors which try to shed light on some of the possible causes, which move local authorities to engage in projects to promote biofuels. Even though the implementation of the Biofuels Directive does not directly bind the local level, this study showed that communities have to be seen as an important arena in which the governance of climate change is taking place.

With regard to the regulatory, economic and informational instruments introduced in the four countries, all four countries started implementing the Biofuels Directive using a distributive economic instrument, namely a fuel duty exemption. In Germany a similar instrument was already in place since 1999, and its validity was extended from biodiesel to all biofuels, after the Biofuels Directive was passed. Since 2002, also the UK, Finland, and Italy introduced a fuel duty exemption to reach the biofuels targets.

One of the main findings of this work is that there is a correlation between the extent and continuity of the use of economic instruments and the percentage of the biofuels sold, as clearly shown in Table 10 of section 10.1.2. From that Table it becomes clear that in case of a total fuel duty exemption, fixed for a more extended period of time, industries are more motivated to invest in biofuels and it brings positive results, like it is the case in Germany. On the contrary, if the fuel duty exemption is only partial and it does not last for at least some years (like in Italy or Finland) or its validity is extended each year in the Fiscal Act (like in the UK), the industries are not prepared to invest in biofuels, simply because of a lack of certainty of investment conditions.

The long-term existence of fuel duty exemptions and the existence of accompanying regulatory instruments (or rather the lack thereof) are not the only factor which helps to explain the more or less successful performance on Biofuels in Germany, the UK, Finland and Italy. In the heuristic framework

introduced in section 3.2.3, a population's *environmental sensitivity* was also singled out as an important factor to explain pro-active environmental behaviour. In the four case studies, a certain parallelism between a country's environmental sensitivity (as derived from the relevant literature) and national as well as local-level action regarding biofuels could clearly be seen. Germany has been classified among the "leaders" in *environmental sensitivity* and it has been strong in promoting biofuels. Support systems were in place before the introduction of the EU Directive 2003/30/EC on the Promotion of Biofuels because an interest in finding alternative solutions to the use of fossil fuels was already alive in Germany before the Biofuels Directive was passed. Furthermore, a very responsive environment to support the development of biofuels came from the main political parties and from trade associations. Especially an alliance of the biofuels industry, oil companies and car manufacturers strongly called for the rapid introduction of biofuels. Thus the rather heavy use of biofuels in Germany is, of course, not only attributable to the strong environmental sensitivity but also to influential economic interests, which (maybe also driven by the population's environmental sensitivity) exerted some pressure towards a more comprehensive spread of biofuels. Finland, similar to Germany, has also been classified within the "leaders" as regards environmental sensitivity. Nevertheless, Finland's performance is rather in line with the two "laggard" countries of this work, i.e. the UK and Italy. The implementation in all three countries started with a strategy which was not in line with the European targets. The three countries justified this with rather different arguments, namely with cost-effectiveness arguments in Finland, sustainability concerns in the UK, and lack of agricultural capacity in Italy.

After the first generation of (diffidently used) economic instruments did not deliver positive results, the three "laggard countries" as regards biofuels policies introduced a regulatory instrument, similar in all three countries, which legally prescribes the quota of biofuels which have to be sold each year to assure the states to reach the Biofuels targets. Even though the target set by the UK is slightly smaller than the one in the Biofuels Directive and Finland committed itself to reach and possibly overachieve the target values only with second generation biofuels, the European Commission seems to accept these autonomous interpretations of the targets by some Member States, because the countries seem to be willing to concretely comply with them. As for Italy, according to a study by the European Parliament (2006), the implementation of the EU environmental Directives is generally delayed or missing, or the implementation does not reach the objectives set by the Directives. This was also visible in our study. However, after the European Commission started an Infringement Proceeding against Italy, efforts similar to those in the other countries have been made by the Italian Government to reach the 2010 target of the Biofuels Directive.

Building on the political science concept of "Europeanization", the four countries investigated in the case studies could be categorised according to their specific degrees and modes of domestic change (for details see section 3.1.2). The theory outlines five degrees of domestic policy change which result after EU Member States implement EU Directives (Jordan & Liefferink, 2004). The empirical analysis in this study shows that the situation in Germany can best be captured with the mode of *Absorption*. As the "misfit" between German regulations and EU requirements has been rather small from the outset, the national characteristics did not have to be modified and, with that, the EU requirements were simply absorbed at national level. Altogether, the Biofuels targets in Germany were reached more easily than expected with the low degree of "misfit" and the high commitment of institutions, associations and businesses in the accomplishment and the total fuel duty exemption playing a decisive role.

As far as the UK is concerned, the mode of policy change could best be described with the mode of *Accomodation*. The degree of "misfit" between UK regulations and EU requirements can be classified as medium. The introduced measures did not bring the hoped results and one of the main causes was that the validity of fuel duty exemptions was extended year by year, thus not facilitating a decisive involvement of the industries. This did not allow biofuels consumption to increase to an adequate extent in order to reach the EU targets. Anyway, the RTFO entered into force in April 2008 bringing a new

system of quota obligation among British policies which will contribute to let the UK reach the 5.75% of biofuels consumption for 2010.

The case of Finland can best be classified as *Rentrenchment* guided by its "realistic pragmatism". Finland (in principle being a role model for the proper implementation of EU policies) substantiated its non-accomplishment of the biofuels targets with two arguments: first, not having sufficient agricultural potential available in the country and, second, seeing biofuels not as the most efficient option to produce energy. Finland is much more research-oriented than the other three countries. Also in the field of alternative fuels it emphatically looks for more efficient solutions to develop internal biofuels production. In recent years, Finland has started implementing some measures to reach the EU targets on biofuels, but putting into evidence the unique features of Finland, the Finnish Government allowed itself to accomplish the targets in a longer term than the one fixed by the Biofuels Directive. The longer term is motivated by the time necessary to do research into the development and marketing of second-generation biofuels, the only type of biofuels which would legitimate the Finnish commitment towards the compliance with biofuels targets.

As for Italy, the reaction to the EU biofuels targets can best be described with the mode of *Inertia*. The existing "misfit" between Italian biofuels regulations and EU requirements can be classified as medium. Only few industries started producing more biofuels as the tax-exemption lasted only three years, not enough to support a long term enterprise development strategy. A further step towards missing the EU target was the fixation of a national biofuel target to 1% by 2005 instead of committing towards the 2.5% EU target, which led to an Infringement Proceeding. This sort of escalation provoked a kind of transformation of the Italian policy. The Infringement Proceeding of the European Commission built up sufficient political pressure so that the Italian Government took the necessary national measures; it adopted new national targets in line with the EU ones, it set up a system of quota obligations to be reached annually, and it set up a new fuel duty exempted contingent of biofuels from the new Italian policy strategy related to biofuels.

While in this thesis national-level activities were assessed by building on the theory of "Europeanization" and the policy instruments heuristic, *local-level* activities were investigated using an own conceptual framework which contains the following explanatory factors: (i) national-level regulations and support, (ii) the system of local self-government, (iii) support from the local citizens, (iv) support from the local businesses, (v) access and acquisition of EU funds, and (vi) horizontal networking between cities (for details see Figure 1 in chapter 3.2).

At first glance, the summarising Table 14 at the end of chapter 10.2 above provides a rather complex, somehow unclear picture. When taking a closer look, one sees however some interesting patterns. Direct *national support* aimed at the local level in the form of an economic instrument can be found only in Helsinki. In the case of Berlin, one sees even a partly antagonistic relationship between national and local goals and measures. Berlin enjoys high political and financial autonomy, which allows the local goals regarding biofuels development to be discrepant with the national ones, and after the first project no support has been given by the national level to the local level. In London, on the one hand, aid has been explicitly denied as far as a project was concerned; on the other hand, the Green Cars Initiative is run exclusively with funds from the UK Government. In Milan no national support was identified.

Regarding the system of *local self-government*, a relation between the degree of local autonomy and the number of projects implemented could only be found in Berlin, where all four projects found have been co-financed by the Berlin Government. In London, although classified as the least powerful local authority among the four cities, the number of projects is high and London Boroughs are directly involved in two projects and indirectly involved in two other projects which have been co-financed by the IEE Programme of the EU. The case of Milan also provided a noteworthy insight: there, it is the

municipally-owned companies that manage the biofuels projects. This clearly demonstrates that local authorities managing local businesses can become a proactive driving force for projects.

*Environmental sensitivity* – which in Table 14 above has been referred to as "*support from national citizens"* – is a less useful explanatory factor for local-level actions than it is at national level. A possible parallelism can be found between environmental sensitivity and support from local businesses, i.e. the analysis has shown that where environmental sensitivity is high, also businesses are more involved in local-level projects. This pattern of positive reinforcement can be seen in Germany, while in the UK we see strong commitment from local businesses in London, although in the literature the UK is classified as a "laggard" in environmental sensitivity.

*Local businesses* have been strongly involved in Berlin, where each of the projects found is co-financed by local companies. In London, they play also a relevant role, being active in three out of seven projects. In Milan, the municipal companies cannot be considered as "classical" businesses, as the Milan Borough is the most powerful shareholder in both companies, and therefore support from local businesses was classified as being absent in Table 14 above. In Helsinki, strong participation of national businesses has been observed; in Table 14 this does however not correspond to the category of "local business".

Berlin and London have been rather active in the *access to and the acquisition of EU funds.* As they are also the two largest cities in our set of case studies, a correlation between the size of a city and its ability to 'tap' EU funds can be expected.

*Inter-city networking* could especially be found in Berlin and London. Networking activities were frequently coupled with and supported by EU financed projects. Cities' horizontal networking in this case is the result of the participation to EU programmes, therefore this form of networking is increasingly prone to take the form of networks with a European scope. This gives the cities the possibility to learn the rules of the EU game, which means how to comply with the constraints of participation in EU programmes, and how to strengthen institutional capacity (through exchange of knowledge, know-how, innovation) and so to gain relevance in a more and more polycentric system of multilevel governance (Kübler & Piliutyte, 2007).

In summary it can be said that national-level support and the degree of local self-government did not have any explanatory power in our set of four city case studies. National support was not connected to the number of projects run; in fact in Berlin and London, where the largest number of projects are run, there is a weak presence of national funds. Similarly, there can also be seen no direct relation between the strength of local self-government and a city's activity level. In fact, all four cities can be classified as moderately to very powerful but the activity levels are still rather heterogeneous. For the last four explanatory factors, interesting relations could be found in our case studies. In political contexts where environmental sensitivity is high and environmental protection issues are strongly felt, like in Berlin, and where support from local businesses is strongly involved, more activities related to biofuels could be expected. Interestingly, London was classified as the city where the activity is the highest among our case studies, with a quite strong presence of local businesses, even though the UK has been classified as a "laggard" in the environmental sensitivity and also the national implementation of the Biofuels Directive has been rather slow. Finally, a correlation between cities' activity levels, the successful acquisition of EU funds and the degree of inter-city networking could be found. It seems that the participation in EU financed projects enhances local networking among cities, which, in turn, stimulates policy transfer, disseminates best practices and builds horizontal relations of trust and familiarity which in the long term pushes cities to set more implementation measures and provides various opportunities for cities to influence the legislative process at European level (Kübler & Piliutyte, 2007).

After having summarised the factors influencing national-level activities and the factors influencing local-

level activities, let us, finally, look at possible parallelisms between the two hierarchical levels. Here, the analysis of the four pairs of case studies actually shows some relations between implementation at national level and commitment at local level. In Germany, where the implementation has been successful at national level, a strong commitment can be found at city level as well, although the biofuels which want to be favoured are different. Due to the debate recently emerged about sustainability of biofuels Berlin criticizes the efforts of the German Government to bring forward biodiesel and bioethanol and has decided to shift its support from biofuels to biogas

In the UK, many efforts have been brought forward at national level, however, it has not been done in a consequent way, so the overall results at national level are still not positive. The national government has been speaking about biofuels and has aimed at its promotion since the Biofuels Directive was passed. This is reflected also in the large number of activities in London, promoted not only from local authorities but also from local businesses.

In Finland, the criticism towards first-generation biofuels at national level also reflects itself at local level: In Helsinki, no project on first-generation biofuels is run and there is only on one big project financed by the national oil producer on second-generation biofuels promotion.

In Italy, the uncertain implementation of the Biofuels Directive, which has gained a more serious approach only since the last couple of years, has not motivated the local authorities in committing themselves in a large number of projects on biofuels. Only in the last two years the municipal companies in Milan have committed themselves towards the promotion of biofuels, which has happened in parallel to the stronger commitment showed at national level.

Even though all the city level measures are still in an early phase, they are increasingly gaining importance, as the theory of multilevel governance, illustrated in section 3.1.1 wants to point out. In this study, an increasingly strong commitment and an increasing scope of activities at the local level in parallel to the implementation at national level can be observed. This means that although not directly involved, somehow local authorities finance and put into practice projects which are in line with what happens at national and European levels, reflecting a perspective of the local authorities which goes beyond the local one. Furthermore, these projects have a potential to become important “test cases” for policies that may, in the future, be implemented at the national level as well. In this work, the phenomenon of multilevel governance and the tight interaction and interdependence between the national and the local level have been evidenced, although not enough data are still available to understand if the projects may have the power to influence policy/decision making processes at national level in the future.

Learning and diffusion effects can not only be expected between the local and the national level, i.e. vertically, but also between cities, i.e. horizontally. This study has shown that horizontal networking in particular takes place where money from the EU finances local projects and the partners of the projects create horizontal networks. Because of the limited scope of this study, it is not possible to affirm definitely, if there has been an influence and which kind of influence there has been emanating from these network modes of communication and exchange of information between cities and what impact it has on the policy making at national and supranational levels. It is only possible to affirm that thanks to the networks local authorities become conscious of how important action at local level is. One of the potential benefits of networking is the continuous update to keep up with European state of the art in policy making. This is the first step towards a clearer awareness that with strong local-level activities also national and supra national targets can be reached, which is another principle grounding the multilevel governance concept. This is why it is important to gain more understanding of the strengths of this mode of governance and increase the involvement of local authorities in tackling future climate challenges.

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# Annex 1: Energy values and conversion factors

In Table 15 the energy values and toe conversion factors are expressed.

The amount of energy released by burning one tonne of oil is: 1 tonne of oil equivalent = 41 868 000 000 joule = 41.868 GJ

| Fuel | Energy content (MJ per litre) | Conversion factor (toe/m$^3$) |
|---|---|---|
| Petrol | 32,5 | 0,78 |
| Diesel | 35,9 | 0,86 |
| LPG | 24,7 | 0,59 |
| PPO | 33,6 | 0,80 |
| Biodiesel | 33,6 | 0,80 |
| Ethanol | 21,3 | 0,51 |
| ETBE | 26,9 | 0,64 |

Table 15: Energy values and toe conversion factors
Source: (Dutch Government, 2006)

Following the data expressed in Table 15, 5 litres of biodiesel correspond to 168 MJ. (5 · 33.6 = 168).

If we assume that the total annual fuel consumption of the Nation XY is composed by 800 litres of petrol and 695 litres of diesel and 5 litres of biodiesel, the percentage of biodiesel in the total fuel consumption expressed in energy content is:

(5 · 33.6) / (800 · 32.5) + (695 · 35.9) + (5 · 33.6) =

168 / 260Comparison of local-level policies00 + 25130 + 168 =

168 / 51298 = 0.0032 % of biofuels in total annual fuel consumption of the Nation XY.