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Encouraging low carbon policies through a Local Emissions Trading Scheme (LETS)

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ABSTRACT

Local authorities are important actors to mitigate climate change. They can implement policies which can reduce emissions of greenhouse gases in sectors like transport, waste, agriculture and land use, land use change and forestry (LULUCF). They can also implement policies which can increase carbon dioxide removals. The European Union Emissions Trading Scheme (EU ETS) is one of the most important initiatives to reduce carbon dioxide emissions in the EU. It is a cap and trade scheme encompassing almost half of the European-wide carbon dioxide emissions. However, carbon dioxide removals and sectors associated with local authorities' responsibilities are not included in the EU ETS. The main objective of this paper is to propose an original cap and trade system, called LETS, designed to involve local authorities. The LETS was then tested and applied to all the local authorities in the mainland of Portugal covering emissions and removals of a single greenhouse gas (carbon dioxide) in the LULUCF and the transport sectors. The system proved to have the necessary conditions to be implemented and adaptable to other country contexts.

Introduction

Climate change is one of the most important threats to humanity. Human activities contribute to the emissions of greenhouse gases (GHG) and to the removal of these gases from the atmosphere. Therefore humanity has been singled out as responsible for a warming influence on the climate (IPCC, 2007). According to the *Stern Review* on the Economics of Climate Change (Stern, 2007), overall, mitigation measures are likely to cost less than the damage caused by the effects of climate change in a business as usual scenario. The Kyoto Protocol defined commitments for 2010 on the reduction of greenhouse gases emitted by the most industrialized countries. Several European Union (EU) countries are facing difficulties to achieve their objectives. Under those objectives, EU must reduce the overall emissions by 8%, but 5 years before 2010 (the commitment period) the overall reductions were only around 2% (Eurostat, 2008).

Climate change is a global threat but local and individual actions are essential to mitigate it. In this article, we focus on the potentials of local policies on climate change. In the first place we discuss which local policies can mitigate climate change. Secondly, we analyze the EU policies on climate change and how they are linked to local approaches. Finally, we propose a cap and trade system to encourage local policies to reduce CO_2 emissions and we study its application in respect of mainland Portugal.

Local policies on climate change

In this section, we analyze local policies which can reduce GHG emissions and boost their removal from the atmosphere. We approach a number of policies, in particular those dealing with urban planning, land-use, transport, forest areas (carbon sinks), waste, housing and energy.

Urban and land use planning

In urban areas, different land uses generate different activities, and each one has different metabolic systems which transform energy, water and other resources into energy, other materials and waste (Pauleit & Duhme, 2000). The transformation of fossil fuels into energy and CO_2 through various urban activities is an important impact of cities on climate change (Rees, 1997). Cities are CO_2 producers and have low carbon storage capacities (Whitford, Ennos, & Handley, 2001). Climate change policies should cover all human activities, and urban policies are also important to mitigate climate change. In this respect, Baccini (1997) explains the importance of reducing the energy spent in house heating and in transport of people and goods.

Land use planning is seen as an important instrument in the move to secure more sustainable urban development (e.g. Haughton, 1997; Mindali, Raveh, & Salomon, 2004). Despite this claimed importance, national and international perspectives have dominated climate change modeling and analysis (Grazi & van den Bergh, 2008). In a similar way, two recent FP7 projects, SUME

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(Sustainable Urban Metabolism for Europe)[1] and BRIDGE (sustainable uRban plannIng Decision support accountinG for urban mEtabolism),[2] emphasize the need to integrate the spatial dimension in the overall debate related to urban metabolism and climate change. Land use planning defines urban form, urban form influences energy consumption and, therefore, GHG emissions. A significant part of the energy consumed in the future is pre-determined when urban form and land uses are defined (Sadownik & Jaccard, 2001). The built environment plays a major role in sustainable development and studies on this issue can be important to control the environmental consequences of different urban forms (Crane & Scweitzer, 2003). As we have seen, land use planning is an important tool to influence GHG emissions, but there is a need to find out what are the ideal urban forms able to mitigate human impacts on climate change.

Banister (2008) argues that a sustainable city requires more than 25,000 inhabitants, medium densities, with mixed land use developments around the main public transport corridors and nearby transport interfaces. This urban form should keep trip distances short and accessible to walking or cycling. The discussion about density is one of the most important considerations. According to those promoting higher densities, the concentration of population, housing and employment would lead to shorter trip distances than diffuse developments. Short trip distances enable walking and cycling, leading to reduced fuel consumption (Newman & Kenworthy, 1989) and, therefore, GHG emissions in the transport sector. However, densities should not be raised to such a level that they bring about a negative impact on local environmental quality (Sadownik & Jaccard, 2001). Nevertheless, the main criticism in respect of density is related to its feasibility. Energy savings due to urban compaction should be low and can only be achieved through draconian policies (Breheny, 1995). According to the literature review carried out by van der Waals (2000) no drastic reduction of car trips can be expected over the next 20 years through the pursuit of compact urbanism, not only because cities are rather slow entities to change their own physical nature but also because many families prefer to live in low density areas (Breheny, 1997). Thus, we can see two opposite and contradictory tendencies: local governments, on one hand, tend to encourage urban intensification processes, and residents, on the other, tend to prefer larger private areas and low density neighborhoods (Mindali et al., 2004; Tapio, Banister, Luukkanen, Vehmas, & Willamo, 2007).

Sprawl is commonly viewed as an unsustainable option although there is no consensus among academics and planners about the notion of 'a right density'. Diffuse developments increase distances between trip origins and destinations and, as a consequence, traveled distances. Such developments not only increase air pollution and energy consumption but also increase infrastructural and public service costs. They have negative impacts on historical city centres and as well as other physical and social costs (Ewing, 1997). The effectiveness of environmental policies in diffuse areas is also criticized by Ewing (1997), emissions and congestion taxes (defended by dispersion enthusiasts) are instruments which local authorities usually do not implement due to political pressures.

Land use diversity can be associated with density. Compact urban environments are more able to promote land use diversification than low density areas (Kenworthy & Laube, 1996). For many types of services and specialized commerce, low density areas are not able to provide sufficient consumers to make viable these economic activities, and that is why highly specialized activities tend to look for central locations. Tapio et al. (2007) argue that urbanisation processes should promote functional density instead of population density. Ewing (1997) considers that an urban pattern with land use diversity, good connectivity to the main road network, sidewalks and bicycle lanes is an appropriate approach to suburban areas planning. Decreasing energy consumption is a major benefit, obtained through linked trips and shorter trip lengths.

However, sceptics about diversity argue that while behavioural changes may be sought, they cannot be assured. Major land use changes may not lead to decreasing trip lengths. For instance, in an empirical study in the San Francisco Bay Area, residents' attitudes seemed far more associated with travel patterns than with land use characteristics (Kitamura, Mokhtarian, & Daidet, 1997). Moreover, if the promotion of full compatibility between uses is not well planned, diversity can give rise to an increase of energy consumption (Mindali et al., 2004).

The integration of different policies, adapted to the different characteristics of different cities, should require a more balanced approach. There are varying perspectives and no consensus about the best policies. The main conclusion is that, even though we do not have a doctrine (or path) of urban and land use planning policies for the mitigation of GHG emissions, the planning literature recognises that land use planning itself is an instrument which can have a significant influence on climate change.

Transport

As we have referred to before, urban and land use planning can affect the transport sector emissions. For this reason, local authorities play an important role in the control of air pollution associated with transport (Monni & Raes, 2008). However, over the last decades, the low density, car dependent model has become dominant (Banister, 2007). All forms of transport are bound to consume energy, we use calories to walk, fuel to move cars, electricity to power the metro and aircraft fuel to fly (Zegras, 2007). Carbon dioxide emissions in this sector depend on the distance traveled by each passenger, on the vehicle occupation, on the fuel used to produce energy and on a CO_2 emission factor (Monni & Raes, 2008). According to these authors, economic growth induces higher trip lengths, more frequent trips and a lowering of vehicles occupancy rates. The main challenge is to change these tendencies. And the idea is not to prohibit the use of cars but rather to design cities with quality and with an acceptable scale so that residents do not have the need to use the car so often (Banister, 2008). Thus, land use and transport are complementary issues. But land use planning is not the only instrument which local authorities have to mitigate GHG emissions in transport. Local authorities influence emissions through infrastructural policies, regulatory measures, changing citizen's behaviour and developing public transport options.

Infrastructure is a major factor in determining modal choice. For instance, European cities which have the highest road lengths per person also have the highest energy expenditure (Mindali et al., 2004). By creating bus and bicycle infrastructure, local authorities can influence more people to use public transport and the bicycle, therefore reducing transport emissions (Grazi & van den Bergh, 2008) The attractiveness of a bicycle network will be higher if it provides direct links to destinations without conflicting with other forms of traffic (Huwer, 2000).

Circulation taxes are a particular kind of regulatory measure. They are seen as strategic policies which can decrease car dependence (Sadownik & Jaccard, 2001). Urban toll ring charging can be associated with CO_2 emissions, and parking taxes can also be an instrument to decrease car use (Grazi & van den Bergh, 2008). In several world cities studied by Kenworthy and Laube (1996), public transport use is higher when there are fewer central parking places as compared to the number of jobs. Integrated policies are required to secure behavioural change. In Freiburg, Germany, for instance, a policy to promote cycling is pursued alongside car

[1] http://www.sume.at.
[2] http://www.bridge-fp7.eu.