Land Use Practices and Climate Change Adaptation: The European Experiences and an Austrian Case Study

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Introduction

I am very pleased to be here today to talk about climate change adaptation and land use in Europe, and the role European institutions and policy makers want to play by encouraging better decisions through better information and co- operation.

In the recent past the scientific community has had to work hard to raise awareness about the reality of climate change. Over recent decades, climate change research has focused primarily on the climate system impacts in general terms, and on mitigation. In the future, new challenges will be posed by the emergence of climate change adaptation policies across Europe. Climate policy integration and coherence will be essential in order to bring together the environmental, economic and social impacts of both adaptation and mitigation policies.

The majority of Europeans became aware of climate change in 2007 when the fourth assessment report of the International Panel of Climate Change was published (IPCC 2007, Alcamo 2007). Today, as a consequence, climate change is seldom out of the headlines. Importantly, this recognition has led to the political realization that urgent action is needed, not only for climate change mitigation, but also adaptation. The Intergovernmental Panel on Climate Change (IPCC 2007) defines mitigation thus: ”An anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks.”

While several country specific adaptation studies of EU are on the way and under comparison (e. g. Mickwitz et al. 2009), I limit myself to an own approach, which is related to six major Austrian land use types and possible climate change adaptation. My own research about climate change impacts and local adaptation is related to agriculture and tourism and started in the 1980s. Since then I am connected to the topic and pursued studies in Austria (e.g. Breiling 2008) and Japan (e.g. Breiling 2006).

Developments on the European Agenda

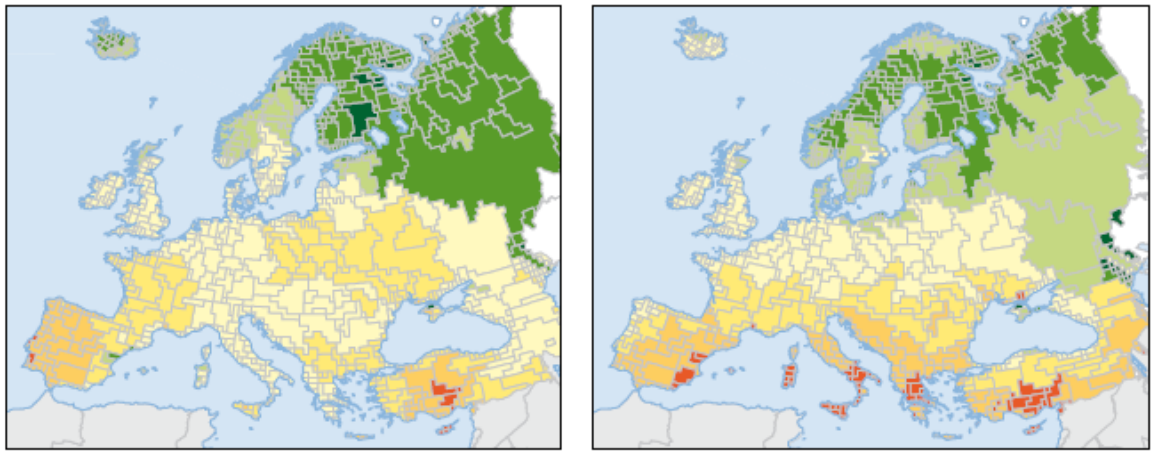
When the IPCC published its fourth assessment report two things were obvious. Climate change is real and the EU will not succeed in successfully completing the Kyoto protocol.

EU officials are aware that climate change is happening and that the effects cannot be avoided. More than 190 governments agreed in 2007 to work out a climate treaty by the end of 2009 in Copenhagen. There is broad support by parties for a science-based indicative goal for the reduction of greenhouse gases. Possible goals include halving greenhouse gas emissions by 2050 to limit a rise in temperature by 2°C Celsius above pre-industrial levels. Another goal is setting a low personal emissions quota for everyone.

Land use categories like agriculture, forestry, pastures and human settlements are sensitive to variations in the storage, fluxes, and quality of water that will be affected by climate change. Over the coming decades, climate change will have a significant impact on the quantity and quality of water resources both within Europe and globally.

Climate change is expected to increase the amount of EU territory exposed to water scarcity as it aggravates existing pressures on water resources from, inter alia, pollution, overuse and population increase. A figure taken from a recent

Projected changes in annual river discharge in Europe for the 2070s compared with 2000



Source: European Environment Agency EEA 2007

At least 11% of the European population and 17% of its territory have been affected by water scarcity to date. Recent trends show a significant increase in water scarcity across Europe. Climate change is projected to lead to major changes in water availability across

Europe with increasing water scarcity mainly in southern Europe and increasing risk of floods throughout most of the continent. Since 1998 floods in Europe have caused some 700 deaths, the displacement of about half a million people and at least €25 billion in insured economic losses.

The higher water temperatures and extreme weather events such as flooding and droughts will also impact upon water quality and exacerbate existing problems of pollution.
These anticipated changes to water quantity and quality will have a wide impact, and will significantly affect key socio-economic activities across a range of sectors. It is also evident that climate change vulnerability and adaptation are insufficiently considered in the development of the policy areas that will be most affected, such as biodiversity and ecosystems and freshwater. Here in particular land use policies have an impact.
Plant species and birds, insects, mammals and other animal groups are moving northward and uphill. By the late 21st century, plant species are projected to have shifted several hundred kilometers to the north, forests are likely to have contracted in the Mediterranean and expanded in the north, and 60 % of mountain plant species may face extinction. A combination of the rate of climate change, habitat fragmentation and other obstacles could lead to a decline in European biodiversity. Successful adaptation to the impacts of climate change on water will therefore depend not just on effective national and European water regulations, but also on the extent to which water management can be integrated into other sectoral policies such as agriculture and energy policies (EU 2009b).

The length of the growing season of several agricultural crops has increased at northern latitudes, favoring the introduction of new species that were not previously suitable, but there has been a shortening of the growing season locally in the south. The variability of crop yields has increased as a consequence of extreme climatic events, such as the summer heat of 2003 and the spring drought of 2007. These changes are projected to continue (EEA 2008).
In the Mediterranean increases in water demand for agriculture are projected enlarging competition for water between sectors and uses. Climate change may also lead to a future decline in soil organic carbon stocks and thus a substantial future increase in CO2 emissions. Soils may also be more susceptible to erosion, especially in the Mediterranean. Soil degradation is already intense in parts of the Mediterranean and central-eastern Europe and contributing to an increased risk of desertification. Projected risks for future desertification are the highest in the same areas.
Wildfires are a serious threat to forests and ecosystems in Europe. The total burned area changes yearly mainly due to weather conditions. Projected temperature increases will increase the danger of forest fires and lead to more area being burned, more ignitions and longer fire seasons, especially in southern and central Europe (EEA 2008).

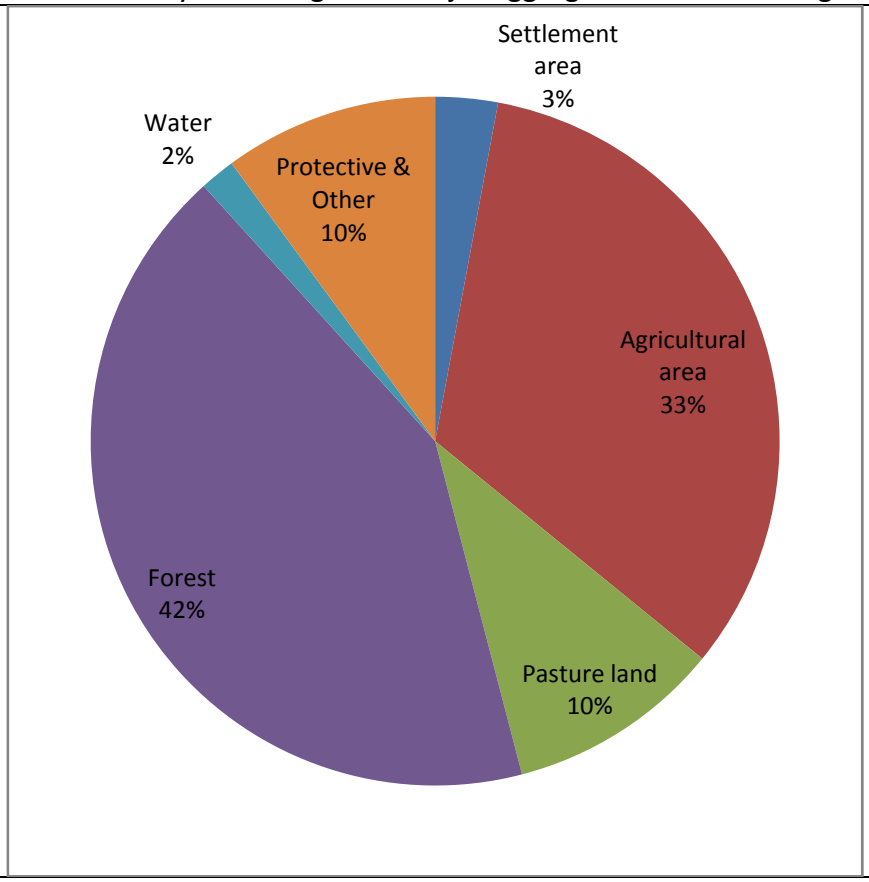
The EU target of a global temperature increase of 2 °C by 2050 is an average expectation (EU 2007). The main vulnerable areas in Europe where impacts are expected to be worse are mountainous regions, coastal zones, the Mediterranean and the Arctic. In light of this it is encouraging to see progress on adaptation in the EU. The European Commission has just issued the White Paper on a 'European adaptation strategy' (EU 2009). In parallel national adaptation strategies are being developed or implemented by many countries such as Denmark, Finland, France, Hungary, the Netherlands, Spain and the United Kingdom.

Examples of adaptation measures include: health/heat action plans, vaccination, health system planning, flood risk planning and early warning systems, drought and water scarcity risk management, water demand management, coastal and flood defenses, natural hazard monitoring, reinforcing the built environment, land-use management, and greening of cities. Some of the emerging policy measures and responses include health and heat action plans (WHO 2008), coastal and flood defenses, natural hazard monitoring and reinforcing the built environment, namely the ”Climate action and renewable energy package”(EU 2008)

Land use adaptation: the Austrian experience

With regard of the White Paper on climate adaptation, land use is described twice in the document (EU 2009a, p70, p75). First time under chapter 9 as resource in close relation to soils - Cross cutting Issues: Water, Land, Biodiversity and Ecosystems - and second time under chapter 10 in relation to land use activities or sectors related to agriculture, forests, fisheries and aquaculture, energy, infrastructure and buildings.

Fig. 2 The Austrian territory according to six major aggregated land use categories



Source: Statistik Austria 2008, aggregated to main categories.

Based on the land statistics of Austria, I will mention six land categories and their potential. Traditionally the land category corresponds directly to a certain activity like in the case of agriculture land - agriculture and forest land - forestry. Today we have to see the land category and economic activity in a differentiated way. Land use categories are classes with similar landscape features. They serve multiple uses and provide ecosystem services not

necessarily economically evaluated yet. I will exemplify this taking Austria – a country with 8.2 million people and 84,000 km² area that has not yet issued a climate adaptation plan - as an example.
The agricultural area covers 33% of Austria. It includes arable land, meadows in valleys, orchards and wine yards. This land use category represents the entire agricultural area in lower elevations. Most agricultural cultivars are replanted every year and the selection of more appropriate plant varieties is possible in case of a changing climate. In the east of Austria test plots for rice production were established. While from environmental point of view this is possible, trade agreements prohibit an extension of rice in Austria. In general trade relations within EU and with other regions outside EU are well established and there is not much freedom to change food crops, even it would be favorable from climate adaptation point of view. Instead energy crops became popular and produce mainly – state supported – bio-fuels. While adaptation works well in the case of annual crops, it becomes more difficult in case of multi-annual orchards and wine yards that can be up a few decades in place. This is still shorter than productive forests harvest periods are. Forest – this only includes productive forest - is accounting for 42% of Austrian land area. Depending on altitude and general conditions, it takes 70 years to harvest trees in average. This means a wise decision would be to plant species with a warmer optimum.

In recent years energy forests were established – mainly on former less productive agricultural fields – that can be harvested after 10 years. Because of this, Vienna community decided to build a bio-mass electricity plant that was finished in 2006. It provides a capacity of 38 MW, enough to supply 100.000 people with energy and heat. At the moment it is the largest bio-mass electricity plant in Europe, but it is hoped that soon others will be in place and take up production. There exist smaller municipalities like Bruck in Lower Austria – that realized at first a CO2 neutral energy supply (European Commission, Energy Directorate, 2009). This explains why ambitious aims of CO2 neutral resource supplies are feasible in some regions of Austria. Several contracts with bio-mass suppliers were necessary to fulfill the demand in bio-mass. A condition for this is continued state and EU support. Due to the new policies, the climate action and renewable energy package (EU 2008) seems to be assured and there is rather the danger that supply gets limited.

The remaining quarter of Austrian land is related to four land use categories. Austria has 2% water area and is water rich, one can find only occasionally drought periods, but floods, like experienced in 2002 can have serious impacts. As compared to most other European countries, in particular the Mediterranean ones, Austria is in a favorable condition. However, since two decades water of Alpine regions is used more intensively than previously. The reason for this is to produce snow artificially. Warmer winters showed soon evidence that one can no longer rely on natural snow supply. The reduction of two thirds of Alpine glaciers (IPCC 2007) since 1980 is sad evidence that favorable natural conditions for skiing are no longer available. So far adaptation costs up to € 5 per m³ artificial snow, roughly 0.4 m³ water (Breiling 2008). The snow mass needed increases in particular in warm winters, like the one in 2006/07 and the cost for adaptation has already ruined tourist companies in smaller scale lower elevations resorts. Without public support there would be even more companies out of business. During 1988 and 2008, the number of tourist companies reduced from 89,000 to 68,000 (Statistik Austria 2009). In particular the smaller ones have to give up, while ironically climate change induced increased demand for the remaining companies. Winter tourism was growing despite less favorable natural conditions. How long such a

development can go on and when a turning point is reached, remains unclear. The high cost of adaptation using large amounts of water and energy is not sustainable and greenhouse gas emissions assumingly sharply increased over the last decades, but no analysis is available so far.

Alpine pastures, the fourth category, accounting for 10% of the land, provide much more income in winter tourism and in the vegetation free period than in feeding cattle and sheep during the summer month. In non touristic places pastures are endangered to be consumed by forest as they are no longer maintained by humans and the economic base for their cultivation is not given. In touristic places the natural pastures – the origin of skiing – were complemented by new ski-tracks/pastures at the expense of forest area.

The fifth category is protective forest and rock land covering the highest altitudes of the country and another 10% of the land. Similar to pastures a problem with non management of remote areas can appear and might be more dangerous than long term climate change impacts. While in touristic places avalanche protection facilities are built, the resilience of the protective forest is decreasing, a problem not caused but eventually triggered by climate change. One assumes that plant and forest diseases can more easily enter this most vulnerable land use type of Austria.

The sixth land use category relates to the overbuilt environment and traffic infrastructures accounting for 3% of the Austrian territory. The major part of it is urban areas, but some parts are also in rural areas. This category is most endangered by extreme events like floods. Hazard zone planning is a long established tradition in Austria, but the increase in tourism with the peak in 1993, and the still growing winter tourism (Breiling 2006) needed much more settlements and infrastructures even in zones that were not especially safe. On the other side, overbuild human environments are not susceptible with regard to rising temperatures as indoor environments can usually be regulated. A rather new problem is that people stay much longer inside their houses and cars. Only a small portion of perhaps 5% to 10% of life time is spent outside in nature and thereby the observation of the environment gets limited.

In the case of Austria and some other European countries in particular Malta and Cyprus, tourism is missing as an economic activity in the EU White Book on Climate Change Adaptation, despite tourism generates several times more income than agriculture, forestry and fisheries do together and is globally growing. While the Mediterranean islands are mainly used for summer tourism, Austria is the most intensive winter tourism country and adaptation to cope with the warmer climate are going on since more than 20 years.

Structural measures of climate adaptation in Austria propose a separate analysis of urban and rural areas, but combined and well targeted approaches to solve urban issues and a possible neglect of rural landscapes simultaneously. Where ever there is enough land decentralized local resource supplies could reduce the import need. Bio-fuels from arable land and energy forests reduce the dependence on fossil fuels and can reduce greenhouse gas emissions. Little progress was done so far in the largest field of climate adaptation, in winter tourism. It is assumed that the current practice can be improved considerably.

Final remarks

Climate change policy integration and coherence should be viewed in the context of multi-level governance. Measures undertaken or suggested at the EU level – such as the EU and the White Paper on climate change adaptation (EU 2009a) – interact with those originating at the national, regional and local levels. The outcomes of policy integration materialize as concrete actions, taken partly in terms of management or regulation, but mainly in the form of the changed practices of target groups. These actions are normally implemented at the local level.

In this context top down communication and the provision of easy to access information is crucial. The EU is required to support sustainable development and help achieve significant and measurable improvement in Europe's environment, through the provision of timely, targeted, relevant and reliable information. It is inevitable that land use policies aimed at climate change mitigation or adaptation will interact with other policies. Interaction may take place during policy preparation or implementation, but happens in particular when decisions are made by target groups.

A final aim is to bring all relevant issues of climate change into an integrated state. So far, Europe is still far away from a climate framework directive analogous to the water framework directive of 2000 that substituted smaller EU directives (such as nitrates) to a larger framework. But there are a lot of individual smaller directives (such as industrial emissions and emission trading schemes, Directive 2003/87/EC or Directive on the promotion of the use of renewable energy 2008/17086/08) that could be integrated to a larger framework in particular after the COP15 conference in Copenhagen in December 2009. Mainstreaming different adaptation and mitigation activities will become of utmost importance during the next decade.

References:

Alcamo, J., J.M. Moreno, B. Nováky, M. Bindi, R. Corobov, R.J.N. Devoy, C. Giannakopoulos, E. Martin, J.E. Olesen, A. Shvidenko, (2007). Europe. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 541-580.

Breiling M. (2008). “Snow in Kitzbühel: how winter tourism is adapting to climate change” in “On Snow”. Edt. Günther Moschitz, Museum Kitzbühel. Pp 88-109.

Breiling M. (2006). Rural Tourism. Rural Tourism: Experience from Austria and Opportunities for Japan. in "Landscape Planning and Horticluture" Journal of Awaji Shima Landscape Planning and Horticultural Academy ALPHA. Vol. 7/1, pp. 1-11

Europan Commission, Directorate General for Energy and Transport (2009). http://www.managenergy.net/actors/A2346.htm

EEA (2008). EEA Briefing: Impacts of Europe's changing climate.

EEA (2007). Europe's environment. The fourth assessment of the Pan European Region. Executive summary. Sixth Ministerial Conference, Belgrade.

EU (2009a). Commission staff working document accompanying the WHITE PAPER Adapting to climate change: Towards a European framework for action. Impact assessment. Brussels, SEC(2009) 387/2

EU (2009b). Commission staff working document accompanying the WHITE PAPER Adapting to climate change: Towards a European framework for action. Climate Change and Water, Coasts and Marine Issues.

EU (2008). Climate action and renewable energy package.

EU (2007). Communication of 10 January 2007, entitled: "Limiting Global Climate Change to 2 degrees Celsius - The way ahead for 2020 and beyond" [COM(2007) 2 final - Not published in the Official Journal].

IPCC (2007). Fourth Assessment Report. Working Group II Report "Impacts, Adaptation and Vulnerability", p. 878

Mickwitz P., F. Aix, S. Beck, D. Carss, N. Ferrand, C. Görg, A. Jensen, P. Kivimaa, C. Kuhlicke, W. Kuindersma, M. Máñez, M. Melanen, S. Monni, A. Branth Pedersen, H. Reinert and S. van Bommel (2009). Climate Policy Integration, Coherence and Governance. PEER-Report No 2. Helsinki: Partnership for European Environmental Research. 92pp.

Statistik Austria (2009). Tourist companies and tourist beds on January 21st, 2009. www.statistik-austria.at

Statistik Austria (2008). Statistical Yearbook of Austria 2008. Table 1.13 Area and type of land use as of January 1st, 2005.

WHO (2008). Heat-Health Action Plans. 46pp.

Wien Energie (2009). Information about Europe´s largest biomass electricity plant Wien Simmering http://www.wienenergie.at