



Seventh “Environment for Europe” Ministerial Conference

**Astana, Kazakhstan
21–23 September 2011**

Green Economy Success Stories from the UNECE Region

Submitted by UNEP

INFORMATION DOCUMENT



UNITED NATIONS

Green Economy Success Stories from the UNECE Region



GREEN *economy*

**Information Paper for the 7th Ministerial Conference
“Environment for Europe”**

“Astana Conference,” 21-23 September 2011

FIRST EDITION

CONTENTS

ACKNOWLEDGMENTS	3
INTRODUCTION	5
1. AUSTRIA – NATIONAL FRAMEWORK PROGRAMME FOR CLIMATE PROTECTION: KLIMA:AKTIV	7
2. CANADA (ONTARIO) – GREEN ENERGY AND ECONOMY ACT (FIT PROGRAMME) 11	
3. CROATIA – ENERGY EFFICIENCY IN BUILDINGS	15
4. CROATIA – PLASTIC PACKAGING WASTE MANAGEMENT	18
5. FINLAND – FOREST DIVERSITY PROGRAMME METSO	20
6. FRANCE – BONUS-MALUS FEEBATE PROGRAMME FOR VEHICLES	23
7. GERMANY – CLIMATE CHANGE PROGRAMME FOR THE BUILDING SECTOR	26
8. MOLDOVA – ORGANIC AGRICULTURE	29
9. SPAIN – EU LIFE+ AGRICARBON PROJECT	32
10. STOCKHOLM (SWEDEN) – GREEN AND SUSTAINABLE URBAN DEVELOPMENT ... 36	
11. SWITZERLAND – SWISSENERGY PROGRAMME	39
12. ENGLAND, UK – SUSTAINABLE PUBLIC TRANSPORT – THE GREEN BUS FUND	42
13. UKRAINE – ENERGY SECTOR DEVELOPMENT THROUGH CO-GENERATION TECHNOLOGIES	45
14. USA – NORTH COAST CONSERVATION PROGRAMME-THE CONSERVATION FUND	48
ANNEX 1:	49
CASE STUDY BRIEF PREPARED BY THE NORTH COAST FOREST CONSERVATION PROGRAM AND THE CONSERVATION FUND, PUBLISHED BY ECOAGRICULTURE PARTNERS AS PART OF THE FARM OF THE FUTURE PROJECT SERIES	49
ANNEX 2:	51
LIST OF OTHER CASES SUBMITTED TO UNEP	51

Acknowledgments

Green Economy Success Stories from the UNECE Region, an information document for the 7th Ministerial Conference “Environment for Europe” (Astana Conference) was prepared by UNEP.

Special thanks to Stephanie Weckend and Veronica Czajkowska who drafted the case studies.

Rie Tsutsumi (UNEP), Ivonne Higuero (UNEP) and Nick Bertrand (UNEP) led the preparation process, provided inputs and suggestions and brought the report to final production. Jimena Fernandez (UNEP) assisted in the case study review and verification process.

UNEP acknowledges with appreciation the information for the case studies provided by:

- Katharina Kowalski, and Robert Thaler from the Federal Ministry of Agriculture, Forestry, Environment and Water Management of Austria;
- Terrie Romano from the Canadian Consulate (Economic Affairs - Ontario);
- Željko Jurić from the Energy Institute Hrvoje Požar, Croatia;
- Aleksandra Anić Vučinić, University of Zagreb, Croatia;
- Maarit Loiskekoski and Heikki Granholm from the Ministry of Agriculture and Forestry of Finland;
- François Nonin from the Ministère du Développement Durable of France
- Christel Willenbrock and Djamila Koberstein from the Federal Ministry of Transport, Building and Urban Development, Germany;
- Viorel Gherciu of ProRuralInvest, Moldova;
- Emilio Gonzalez from Life +Agricarbon, Spain;
- Matt Sowter from the Department of Transport of the United Kingdom;
- Sergii Surnin from the Agency for Rational Energy Use and Ecology (ARENA-ECO) of Ukraine;
- Malin Parmander from City of Stockholm, Stockholm, Sweden;
- Liz Lord from the US Permanent Mission in Geneva, Switzerland.

For the case studies included in the Annex, UNEP would also like to thank the support provided by:

- Gerhard OMERSU (Austria)
- Michel Amand (Belgium)
- Detelina Peicheva (Bulgaria);
- Olga Ponizova (Eco-Forum);
- Leena Voutilainen and Henna Haapala (Finland);
- Bulat K. Yessekin (Kazakhstan);
- Edyta Sysło (Poland);
- Martine Rohn-Brossard (Switzerland);
- Oreola Ivanova-Nacheva (REC) and Kerem Okumus (Turkey);
- Oleg Dzioubinski (UNECE Secretariat).

Disclaimer

Whilst the information in this publication is derived from reliable sources and reasonable care has been taken in its preparation, UNEP cannot make any representation or warranty, express or implied, regarding the verity, accuracy, adequacy or completeness of the information contained herein. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of UNEP or concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent the decision or the stated policy of UNEP nor does citing of trade names or commercial processes constitute endorsement. UNEP does not accept any liability towards the readers and users of the publication for any inaccuracy, error, or omission, regardless of the cause, or any damages resulting there from. In no event shall UNEP have any liability for lost profits and/or indirect, special, punitive, or consequential damages.

Introduction

The UNECE region comprises 56 countries of highly diverse geographic, political and socio-economic characteristics; including some of the wealthiest nations of the world, and some which consider themselves models of sustainable development, and others still hosting some of the world's most extreme pockets of poverty and environmental degradation. Twelve of the latter countries are classified by the World Bank as low or low- medium income countries.

At the same time, the region harbours a rich cultural and environmental diversity. It is endowed with unique landscapes, ecosystems and species which embody economic, cultural and inherent values. The UNECE region has three of the five most forest-rich countries (the Russian Federation, the United States and Canada) and growing stock in forests per hectare is increasing in North America and in Europe (excluding the Russian Federation). Within these forests, there is a rich biodiversity: the Carpathian Mountains, for example, are host to over 60,000 wild species. However, while the area coverage of nationally protected areas has increased significantly in the region, it is still difficult to assess the conservation status of some important species and habitats.

Much of the land in the UNECE region is of a managed nature. Farmers manage almost half of the European Union's land area but represent less than 5% of the population in most Western European countries, while the five Central Asian countries are highly agrarian, with 60% of the population living in rural areas and agriculture accounting for over 45% of total number of employed. Across Europe and Central Asia, the farming sector is affected by a growing polarization between highly polluting, often water-intensive commercial agriculture and low-income, less productive farming systems that are being abandoned.¹

The economic structure of the countries in the UNECE region varies from highly service sector oriented countries in North America, the EU and non EU Western European countries to economies heavily depending on fossil fuels for manufacturing and industry in Eastern Europe, Caucasus and Central Asia (EECCA). While the services sector is growing in the EECCA, many countries in that subregion are dominated by a few sub-sectors, often with polluting and resource-intensive extractive industries. Fossil fuels, minerals and metals represent 65 percent of all exports from the EECCA.

Energy intensity of GDP varies significantly between subregions and countries: energy intensity of GDP in Western Europe is about one third lower than in North America, and less than half of most Eastern European and Central Asian countries.² The Russian Federation has the highest energy intensity among the G-8 economies and is 2.3 times higher than world average, twice that of the United States and 2.3 times higher than that of the European Union (adjusted by purchasing power parity).³ Annex I countries to the UNFCCC, decreased their emissions by 2%, however the USA, Russian Federation, Germany and the United Kingdom are amongst the 10 top emitting countries (ibid).

¹ EEA, 2007. *Europe's environment. The fourth assessment*. Copenhagen, Denmark. Available at: http://www.eea.europa.eu/publications/state_of_environment_report_2007_1

² UNECE, 2010. *The MDG's in Europe and Central Asia: Achievements, Challenges and the Way Forward*. Geneva, Switzerland. Available at: http://www.unece.org/commission/MDGs/2010_MDG.pdf

³ IEA, 2010 (Edition). *CO2 Emissions from Fuel Combustion Highlights*. Paris, France. Available at: <http://www.iea.org/co2highlights/co2highlights.pdf>

Some countries have succeeded in slowing resource and energy use, materials extraction and environmental pollution relative to their economic growth in certain subsectors. The relatively high efficiency of resource consumption in Western Europe is partially because of a clear tendency to outsource resource-intensive and polluting industry. Western and Central Europe have achieved a relative decoupling of material and energy use from economic growth. However, there is little evidence to show decoupling the global environmental impacts from European consumption in general. In North America, which experienced strong growth in per capita GDP, the ratio between energy use and GDP continued a slow but positive decline beginning in 1970, reflecting a shift to less resource-intensive production patterns, although the subregion remains among the most energy-intensive in the industrialized world.

In light of the above, there is an urgent need for the region to increase its investment in natural and human capital, reduce carbon emissions, adopt innovative and resource efficient technologies, create green jobs as well as promote the equal footing of the economic, social and environmental pillars of sustainable development. There is indeed a growing awareness in the UNECE region that greening the economy can help achieve sustainable development and eradicate poverty. Regional discussions in the run up to Rio+20 are helping outline how the green economy can be a tool to further integrate environmental and social considerations within the mainstream of economic decision-making. Consequently, for this Seventh “Environment for Europe” Ministerial Conference, the Committee on Environmental Policy Committee chose as one of the themes of the conference Greening the economy: mainstreaming the environment into economic development and a background paper has been prepared by UNECE and UNEP for the discussions in the ministerial roundtables.

UNEP has prepared for the Astana Conference this information document which showcases success stories from the UNECE region. It complements a compilation of developing country examples, published previously by the UNEP Green Economy initiative⁴. These success stories were compiled following a call for case studies disseminated to the region by UNEP through the UNECE secretariat.

The number of case studies received is an indication that the transition towards a green economy is already underway in this region. The stories selected for this publication show the extent of green economy related legislation, policies, initiatives and investments in a number of countries in the UNECE region. There may be nascent evidence that addressing environmental issues, i.e. reduction of greenhouse gas emissions, have resulted in social and economic benefits such as cost savings, job creation, health improvements, access to mobility improvements, and innovation. And we could also see that there are a variety of “entry points” in the various sectors for taking steps towards greening the economy, by addressing social and economic issues, which will also produce environmental benefits.

With this report, UNEP wishes to contribute to a growing body of lessons learned on efforts to transition to a green economy in the UNECE region and to build on the momentum. It should be considered as the first edition of such a compilation and we look forward to updating and expanding it over time. Your views and comments are welcome to help us improve the report.

⁴ UNEP, 2010. *Green Economy: Developing Countries Success Stories*. Available at http://www.unep.org/pdf/GreenEconomy_SuccessStories.pdf

1. Austria – National Framework Programme for Climate Protection: klima:aktiv

1.1 Introduction

The klima:aktiv initiative is a programme to support the implementation of Austrian federal climate strategy and Austria's market transformation towards a competitive low-carbon economy based on efficient and sustainable use of resources, the protection of the environment, and the establishment of innovative green technologies and production practices. The initiative was launched by the Federal Ministry of Agriculture, Forestry, Environment and Water Management in 2004. The overall objective of klima:aktiv is to decrease energy consumption and to reduce GHG emissions and climate change. To date, the initiative contributes to 1,46 million tonnes of CO₂ emission savings yearly.⁵ The programme has provided support for 43.000 projects.

“klima:aktiv” Partners

- Regions, cities, municipalities
- Companies and organizations
- Schools, Universities
- Citizens

The activities of klima:aktiv focus on four thematic clusters: buildings, renewable energy, energy efficiency, and mobility. They include:

- Consulting, training and education initiatives;
- Establishing clear and transparent standards (i.e. klima:aktiv building standards);
- Implementing quality assurance measures (i.e. for biomass district heating systems);
- Financial support for investment projects in climate friendly mobility (i.e. klima:aktiv mobil); and
- Awareness raising among the public.

The analysis will focus on the ‘mobility’ component of the klima:aktiv programme for this case study.

Table 1: Key figures

Clusters		Federal Public Investment in € 2004-2010	Federal Public Investment in € 2010	CO ₂ emissions saving per year (tons)
Mobility	Consulting, education, public awareness	15,6 million	3,0 million	450,000
	Financial support for projects	42,5 million	15,0 million	
Energy (Buildings, Renewable Energy, Energy Efficiency)		27,5 million	3,6 million	1,060,000
TOTAL		65,6 million	21,6 million	1,51 million

Source: Energy Agency Austria, 2011⁶

⁵ Initiative klima:aktiv, Status Report 2010 (P. 6)

⁶ Initiative klima:aktiv, Energy Agency Austria 2011

1.2 Impacts

Mobility

The Austrian transport sector alone accounted for 27 % of CO₂ emissions in 2009 with 21,7 million tonnes of CO₂ emitted.⁷ Klima:aktiv mobil is the federal Austrian programme to promote climate-friendly mobility launched by the Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management supported by the Austrian Chamber of Commerce, the Austrian Association of Cities and Towns, the Austrian Association of Municipalities and numerous companies, cities and organisations.

The programme motivates and provides financial support to cities, municipalities and regions, companies, tourism and leisure operations, schools and youth groups to develop and implement ways of reducing carbon dioxide emissions from transport. Measures implemented to date include the promotion of public transport, mobility management, car sharing, fleet changes to alternative-fuel vehicles, and improving facilities for cycling and walking.⁸ Some examples include:

- Regional programs and municipal projects for promoting cycling including e-biking
- Local dial-a-ride bus services in small villages allowing otherwise “immobile” persons to travel in an environmentally friendly way;
- “Pedi buses” or “walk to school” initiatives, through which students walk to school together and are guided by adults;
- Mobility centres (over 10) providing advice to travellers how to do intermodal⁹ low carbon trips;
- Mobility packages for tourism regions promoting environmentally friendly travelling by train, bus, cable cars, boats, bicycles and alternative vehicles
- Replacement of 5.300 vehicles by alternatively propelled ones to reduce CO₂ emissions (cars, scooters, busses, light and heavy duty vehicles) focussing on electro-mobility.

By July 2011, klima:aktiv mobil had launched more than 1.800 joint projects with companies, regions and cities, while municipalities had received technical assistance and financial support of €42,5 million which leveraged €271 million in additional funding and created or saved

Impacts on the other thematic clusters

Buildings

Through financing energy audits and information campaigns, klima:aktiv has enabled 1.600 assessments up to now to identify potential energy savings in service and residential buildings. Refurbishment projects have been initiated for 400 large residential buildings with over 13.000 flats. The initiative has developed a building standard as a benchmark for ecologically sound buildings, which serves as an orientation for all stakeholders and as a basis for training. The initiative contributes to a total savings of 400.000 tonnes of CO₂ emissions per year.

Renewable Energy

By conveying quality standards and technical know-how as well as providing information campaigns, klima:aktiv contributed to the doubling of solar thermal collector surface with 360.000 m² new installations per year since 2004. Due to quality management in heating plants, the efficiency of new wood heating plants was increased by 10%. The initiative contributes to over 500.000 tonnes of CO₂ emission savings annually.

Energy Efficiency

Supporting companies interested in being more energy efficient, 200 public and 120 private companies have been given advice free of charge since 2004 on how to change over to energy efficient appliances and IT systems. Energy advisers have been trained to better support companies to make their production processes energy efficient, or renovate their facilities. The initiative contributes to a total saving of 160.000 tonnes of CO₂ emissions per year.

⁷ Press Release, Government of Austria; <http://umwelt.lebensministerium.at/article/articleview/86562/1/1467> (1.6.2011)

⁸ Website Initiative klima:aktiv; <http://www.klimaaktiv.at/> (1.6.2011)

⁹ Combining different modes of transport, i.e. train, bus, cycling, walking, cars, for travelling.

3.000 green jobs (such as employees for locally installed bus services, advisers in mobility centres, E-bike mechanics, eco-driving trainers etc.). Awareness and information campaigns inform the media as well as the citizens about the benefits of climate-friendly mobility like cycling and walking, alternative and electric vehicles and renewable energy, public transport and eco-driving as well as motivate to environmentally friendlier and healthier mobility. Overall, klima:aktiv mobil partners have saved more than 450.000 tonnes of CO₂ each year.¹⁰

Table 2: Key figures regarding the klima:aktiv mobil financial support programme

2007-2010	Employment	Saved CO ₂ emissions	Federal Public Investment in €	Leveraged funding in €
Transport (Mobility)	3000	450.000 tonnes	42,5million	271 million

Source: klima:aktiv mobil Förderungsprogramm –Leistungsbericht 2011; Energy Agency Austria, 2011¹¹

1.3 Way forward

Global climate change affects societies in a diverse, complex manner, involving a variety of institutions, market segments, and political fields. klima:aktiv tries to take a systemic approach to tackle this complexity and reduce climate change impacts, which makes the initiative an unique project within the European Union. This successful national initiative, which was originally supposed to run until 2012, is expected to be evaluated and expanded until 2020 as a major contributor to achieve the targets of the EU energy and climate package and to implement the Austrian Strategies on Climate and Energy. klima:aktiv will also contribute to the implementation of the new Austrian Master Plan on Green Jobs, jointly launched by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management and the Austrian Chamber of Commerce, which aims to create new 100,000 green jobs¹² by 2020.

Education and training...One of the most innovative features of klima:aktiv is its approach to capacity building, training and education. For the year 2010 alone, the initiative supported 97 education programmes and trainings with over 1.000 participants.¹³ So far, since 2004, over 5.000 renewable energy installers, energy consultants, planners, architects and eco-driving trainers have been successfully trained through the initiative.¹⁴ For 2011, similar participation rates are expected.

Involvement of stakeholders...Through advising and supporting financially local and regional governments in climate protection activities, 94 municipalities have included climate change policies in their community policy (in form of “e5” or “European Energy Award”; 17 more than in 2009 with 77 municipalities).¹⁵ Klima:aktiv also involves and links over 200 business partners in the private sector, for example, financial institutions and insurance companies, for the promotion of clean technology credits and investments.¹⁶ Consumers are informed through public awareness campaigns and invited to participate in the initiative by purchasing green products and technologies.¹⁷ More than 1.800 companies, regions and communities, tourism

¹⁰ Government of Austria

¹¹ Initiative klima:aktiv, Energy Agency Austria 2011

¹² In addition to 200.000 green jobs (as of 2011). Ministry of Agriculture, Forestry, Environment, Water Management

¹³ Initiative klima:aktiv, Status Report 2010 (P. 6)

¹⁴ Initiative klima:aktiv, Status Report 2010 (P. 1)

¹⁵ Initiative klima:aktiv, Status Report 2010 (P. 6)

¹⁶ Initiative klima:aktiv, Annual Report 2009 (P. 8)

¹⁷ Initiative klima:aktiv, Annual Report 2009 (P. 9)

operators, institutions, schools and youth groups have become klima:aktiv mobil partners implementing concrete projects for climate friendly mobility. Over 20.000 people have been trained in fuel-saving driving throughout Austria.

Establishment of effective regulatory frameworks... With a lifespan of over seven years, the initiative has become one of the key instruments of Austria's climate and energy strategy to enhance market transformation. The main advantages of a market transformation are (a) comparably low costs and (b) highly sustainable effects.¹⁸ This long-term approach increases the confidence of investors and markets. By introducing quality standards for climate friendly products and services and by establishing quality management systems, companies can work with clear and effectively enforced guidelines and reduce business risk.

Klima:aktiv presents a case study demonstrating the potential returns on investing in climate friendly mobility, energy efficiency and the renewable energy sector by following the concept of market transformation.

¹⁸ Website Initiative klima:aktiv; <http://www.klimaaktiv.at/> (7.6.2011)

2. Canada (Ontario) – Green Energy and Economy Act (FIT Programme)

2.1 Introduction

In Canada, energy and climate protection policy is largely a matter of provincial jurisdiction, due in part to the wide-ranging differences in geography and resource endowment from province to province. The country's ten provinces and three territories therefore develop and enforce their own energy and climate change strategies and policies. The role of the federal government is to sign international agreements, coordinate information exchange, represent Canada at international organizations (e.g. WTO) and intervene in energy issues concerning multiple provinces.

The province of Ontario accounts for roughly 25% of Canada's total energy generation, making it the second largest energy generator after the province of Quebec. In 2010, Ontario's energy mix was: 32% nuclear, 24% natural gas, 22% hydroelectric, 18% coal and 3% wind. Its total energy capacity was 35.465 MW.¹⁹ As Ontario is experiencing economic and population growth, the province is challenged by the rise in energy demand. Due to limited investments to expand electricity production capacity in the last decades, coupled with the shutting down of multiple coal and nuclear facilities by 2014, the province is facing a significant capacity problem. A lack of 24.000 MW, or 80 % of today's capacity, is forecasted for 2025.²⁰ The Ontario Power Authority (OPA) develops the province's energy plan such as the Long Term Energy Plan 2010-2030, focusing especially on renewable energies and is the contracting authority for the FIT Programme.

In October 2009, the Canadian province of Ontario launched Bill 150 on the Green Energy and Economy Act (GEA), enabling the first North American Feed-In Tariff (FIT) Programme for renewable energies. FITs guarantee specific payments for each kilowatt-hour (kWh) of electricity produced by a renewable energy source during a determined timeframe and are used as a policy tool to transition to a green economy.

The overall goal of the GEA is to foster a clean energy economy in Ontario by:

- helping Ontario phase out coal-fired electricity generation by 2014 (the largest climate change initiative in Canada);
- attracting new and redirecting existing investments to boost economic activity and the development of renewable energy technologies;
- creating green industries and jobs.²¹

2.2 Benefits

The Act's aim is to increase Ontario's share of renewable energies to 37% by 2025 by means of a FIT Programme, and thereby make renewable energies the largest component of its total energy mix. If realized, the use of renewable energies for electricity supply in 2025 will be twice as high as in 2005. The amount of 15.700 MW to be produced by renewable energies will be largely generated by hydroelectricity and wind energy, followed by solar energy and biomass.

The Ontario FIT Programme is based on the experience and lessons learned from similar programmes around the world, especially Germany's Renewable Energy Sources Act from the year 2000. Contrary to Germany, however, the fixed tariffs paid for electricity generation

¹⁹ Statistics Canada, 2010

²⁰ Ontario Ministry of Energy, 2010

²¹ Ontario Ministry of Energy, 2009, <http://www.mei.gov.on.ca/en/energy/gea/>

from a renewable energy source are higher (e.g. for onshore wind energy: 13,5 CAD\$/kWh in Canada and 12,33 CAD\$/kWh for Germany). Although contracts are awarded, as in Germany, for 20 years, Canada does not use a decreasing rate of tariffs after a certain amount of years into the contract, as does Germany (e.g. after 5 years the 12,33 CAD\$/kWh turn into 6,73 CAD\$/kWh for onshore wind energy).²² Unique to the Ontario FIT Programme and to expedite renewable energy projects, are also the streamlined environmental approval processes that have been put in place by authorities (e.g. environmental impact assessments).

Ontario's electricity sector is a \$15-billion annual industry. The total capital cost for Ontario's Long Term Energy Plan including the FIT-Programme is estimated to be \$87 billion over the programme's life from 2010 to 2030. The FIT-Programme differs from other similar programmes in the world, as the costs of the FIT-programme subsidies are born directly by electricity ratepayers rather than being financed by taxpayers. It adds approximately 1,5% or about \$2 a month to an average household electricity bill in Ontario.

2.3 Impacts

So far, Ontario's Green Energy Act has led to the creation of over 20.000 new jobs and the province aims to have a total of 50.000 jobs created by the end of 2012.²³ Most of the employment is long-term and was created in manufacturing processes, due to domestic content requirements for renewable energy projects and hence the establishment of wind, solar and bioenergy manufacturing companies across the province.²⁴

Through the FIT Programme, more than 2.000 MW from sustainable, renewable sources has been connected to the grid up to now, and the elimination of coal-fired generation is on schedule with eight coal units closed and two more scheduled to close later this year. Coal-fired generation is the single largest source of air pollution in Ontario and eliminating all 19 coal units from the supply mix will be the largest climate change initiative in Canada. Coal plants produce carcinogens, smog, greenhouse gases, acid rain and pollution, which causes 120.000 illnesses a year in Ontario alone and amounts to health costs of about CAD\$3 billion.²⁵ According to the OPA, the removal of coal plants by 2014 is expected to reduce CO₂ emissions in Ontario's electricity system from 33 to 7 million tons of CO₂ per year, which would be a 79 percent reduction.²⁶

Ontario signed or offered more than 21.000 contracts to small, medium and large clean energy projects and about CAD\$16 billion in private sector investment, as well as investment in manufacturing. Adjusted for population, in the first year of its feed-in tariff programme Ontario awarded contracts for more than three times as many solar power installations than Spain did in its first year of the programme in 2007, and more wind and solar power contracts than France did in its first year of the programme in 2001. Ontario's Sarnia Photovoltaic Power Plant with a capacity of 80 MW is to date the largest solar photovoltaic farm in the world.

The GEA targets specifically local municipalities, First Nations²⁷ and Métis communities to build, own and operate their own renewable energy projects, by relying on similar community-owned renewable generation models as in Germany or Denmark (e.g. aboriginal price incentives for the feed-in tariffs). As a result, nearly 16 percent of all contracts awarded

²² See Table 1 on Price Schedule for Ontario FIT Programme

²³ Ontario Ministry of Energy, 2011 - <http://news.ontario.ca/mei/en/2011/07/green-energy-act-creates-20000-jobs.html>

²⁴ Ontario Ministry of Energy, 2011 - <http://www.mei.gov.on.ca/en/news/>

²⁵ <http://www.thestar.com/news/ontario/article/869588--four-more-ontario-coal-fired-generating-units-shut-down>

²⁶ Ontario Power Authority 2011 - <http://powerauthority.ca/>

²⁷ Aboriginal peoples in Canada who are neither Inuit nor Métis

in the first year went to community groups, representing almost 400 MW of renewable energy capacity. Many of these are owned by First Nations peoples and act today as a stimulus for Aboriginal economies across the province.²⁸

2.4 Way forward

All in all, Ontario's FIT-Programme empowers the private sector to develop clean power projects to replace the coal plants that the province needs to close by 2014. It also provides a big boost to green manufacturing with a target of creating 50.000 new jobs by the end of 2012.

In effect since 2009, the future success of the programme will be determined by investors in projects and in manufacturing facilities, which will depend on their confidence in the programme's stability.

²⁸ Ontario Power Authority 2011 - <http://powerauthority.ca/>

Table 1: Price Schedule for Ontario FIT Programme

Feed-In Tariff Prices (FIT) for Renewable Energy Projects in Ontario (Green Energy Act)				Feed-In Tariff Prices (FIT) for Renewable Energy Projects in Germany (EEG)		
Technology	Project size	Canadian tariff in CAD-¢/kWh	Canadian tariff in Euro-¢/kWh*	Project size	German tariff in CAD-¢/kWh*	German tariff in Euro-¢/kWh
Biomass						
	≤ 10 MW	13.8	10.30			
	> 10 MW	13.0	9.70			
Biogas						
On-Farm	≤ 100 kW		14.55	≤ 150 kW	15.33	11.44
On-Farm	> 100 kW ≤ 250 kW	18.5	13.80	≤ 150 kW	15.33	11.44
Biogas	≤ 500 kW	16.0	11.94	≤ 500 kW	12.06	9.0
Biogas	> 500 kW ≤ 10 MW	14.7	10.97	≤ 5 MW	10.84	8.09
Biogas	> 10 MW	10.4	7.76			
Waterpower						
	≤ 10 MW	13.1	9.78			
	> 10 MW ≤ 50 MW	12.2	9.10			
Landfill gas						
	≤ 10 MW	11.1	8.28			
	≥ 10 MW	10.3	7.69			
Photovoltaic						
Rooftop	≤ 10 kW	80.2	59.85	≤ 30 kW	38.51	28.74
Rooftop	> 10 kW ≤ 250 kW	71.3	53.21	> 30 kW ≤ 100 kW	36.62	27.33
Rooftop	> 250 kW ≤ 500 kW	63.5	47.39	> 100 kW ≤ 1 MW	34.65	25.86
Rooftop	> 500 kW	53.9	40.22	> 1 MW	28.89	21.56
Ground mounted	≤ 10 kW	64.2	47.91			
Ground mounted	> 10 kW ≤ 10 MW	44.3	33.06			
Wind						
Onshore	Any size	13.5	10.07	Any size	For five years: 12.33 Then: 6.73	For five years: 9.2 Then: 5.02
Offshore	Any size	19.0	14.18	Any size	17.42	For 12 years: 13.0

Source: Canadian German Chamber of Industry and Commerce, 2011

*Exchange Rate CAD/EUR, 07.02.2011 (Bank of Canada)

Data: Ontario Power Authority, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

3. Croatia – Energy Efficiency in Buildings

3.1 Introduction

Following the ratification procedure in all Member States and Croatia, the accession of Croatia to the European Union is foreseen for 1 July 2013. In line with the harmonization of its energy legislation with the EU acquis and based on the EU Directives (2002/91/EC old & 2010/31/EU new) on the energy performance of buildings (EPBD), the framework for compulsory energy certification of the new and existing buildings was introduced into Croatian legislation in 2008.

Energy consumption in the Croatian building sector represents around 25% of the total primary energy supply or around 40% of the final energy demand in Croatia. The share of CO₂ emissions from the building sector in the total CO₂ emission from all stationary and mobile energy sources in Croatia is between 15% and 20%.²⁹

In April 2010, Croatia adopted the National Energy Efficiency Programme for the period from 2008-2016 as well as the First National Action Plan on Energy Efficiency for the period from 2008 to 2010 to support implementation of the two EU Directives 2006/32/EC and 2002/91/EC. The programme and plan are based on the Act on Energy Efficiency in Final Consumption, which was enforced in 2008. The Act regulates energy efficiency programming on national and local level, obligates the public sector to introduce energy management practices and sets limits for the direct consumption of energy by each sector.³⁰

EU Energy Performance of Buildings Directive (EPBD):

Directive 2002/91/EC is the main legislative instrument at EU level to achieve energy performance in buildings.

Under this Directive, the Member States must apply:

- Minimum requirements with regards to the energy performance of new and existing buildings;
- Ensure the certification of their energy performance;
- Require the regular inspection of boilers and air conditioning systems in buildings.

Energy Sector Development Strategy of Croatia:

- Achieve EU Renewable Energy Sources (RES) targets of 20% in the gross final energy consumption, as well as 10% of biofuels and other renewable fuels in transport energy consumption by 2020 (2.2% of total RES share);
- Keep the share of electricity consumption generated from RES (including large hydro power plants) at current level of 35% until 2020 (9.2% of total RES share);
- Expected contribution of heating and cooling from RES in the gross final energy consumption at the level of 8.6% by 2020.

The implementation of the EPBD is the overall responsibility of the Ministry of Environmental Protection, Physical Planning and Construction (MEPPPC) together with the Ministry of Economy, Labour and Entrepreneurship.

The new energy efficiency in buildings regulations following EPBD implementation are also in line with the overall Energy Sector Development Strategy, adopted in October 2009.³¹

²⁹ National Case Study of Croatia, Energy Institute Hrvoje Požar for the United Nations Economic Commission for Europe, Energy Efficiency 21 Programme, April 2010.

³⁰ Implementation of the EPBD in Croatia, European Commission, Directorate-General for Energy, Concerted Action-Energy Performance of Buildings, January, 2010.

³¹ Implementation of the EPBD in Croatia, European Commission, Directorate-General for Energy, Concerted Action-Energy Performance of Buildings, November, 2010.

3.2 Benefits

The implementation of the EPBD in Croatia has resulted in minimum energy performance requirements for all new buildings and for major renovations. It also mandates an energy performance certificate for all buildings when constructed, sold or rented. To enforce the new regulation, the 2006/2009 legislation on thermal energy saving and heat retention through the Technical Regulation on Thermal Energy Saving and Heat Retention in Buildings was established. In 2010, the EPBD was transposed by two further acts, the Physical Planning and Building Act and the Act on Efficient Energy Use in Direct Consumption.³²

The EPBD has also created further incentives for Croatia to encourage active solar systems and other heating and electricity systems based on renewable energy sources in the buildings sector. For instance, for new buildings with a total useful floor area over 1 000 m², Croatia enforces technical, environmental and economic feasibility studies of alternative systems such as decentralised energy supply systems based on renewables before construction starts.³³

A supporting scheme for renewable energy sources (RES) electricity generation (feed-in tariffs) already exists since 2007, while preparation of sub-laws for subsidizing RES heating & cooling (RES-H/C) production is foreseen by The Act on the Production, Distribution and Supply of Thermal Energy in 2012.

3.3 Impacts

The energy certification of buildings started in April 2010 with new residential and non-residential buildings. The certificate contains general data on the building such as the building's energy class, data on thermal and technical systems of the building, climate conditions, energy demand, economically feasible measures for the improvement of the energy performance of the building and more. The energy certificate or the energy inspection of buildings for the purpose of issuing the energy certificate can only be carried out by persons authorized by the MEPPPC. In order to ensure that there are experts for energy certification of buildings, a tendering procedure was carried out. Based on this procedure, nine institutions were granted approval for carrying out training programmes. The training programme started in September 2009 under the supervision of the Ministry. By the end of 2010, more than 650 engineers had completed it. Furthermore, the Ministry has authorised more than 150 experts for the implementation of the energy certification in the period from April to November 2010.³⁴

The Environmental Protection and Energy Efficiency Fund was established in 2003 to provide co-financing for programmes and projects related to measures of energy efficiency improvements in the public building sector, in households, in the industry and service sector. The fund provides loans, grants and subsidies to stimulate cost-effectiveness of operations, reduce energy consumption and increase competitiveness of green technologies. Projected revenues for 2011 amounted to €148.65 million, with a budget of €17.66 million for energy efficiency and renewable energy projects and programmes.³⁵

Croatia has an increasing rate of 1% per year in housing stock; however an important existing building stock of more than two million apartments remain of which around 45% were built

³² Implementation of the EPBD in Croatia, European Commission, Directorate-General for Energy, Concerted Action-Energy Performance of Buildings, November, 2010.

³³ Executive Summary Report on the Interim Conclusions of the Concerted Action, European Commission, Directorate-General for Energy, Concerted Action-Energy Performance of Buildings, February, 2010.

³⁴ Implementation of the EPBD in Croatia, European Commission, Directorate-General for Energy, Concerted Action-Energy Performance of Buildings, November, 2010.

³⁵ Environmental Protection and Energy Efficiency Fund, Croatia

before 1970. The implementation of the EPBD has led to significant energy savings and CO₂ emissions reduction, especially through energy efficient refurbishments.

In the period from 2004-2010, 22 projects were carried out and 56 projects were in progress in the sustainable building sector. All projects are related to the improvement of energy efficiency of buildings with regard to lighting and heating systems, energy efficient building envelopes³⁶ and substitution of the primary energy source in boiler plants as well as optimisation of combustion systems. From 2004-2010, a total of €3.2 million were disbursed for these projects.³⁷

The implementation of the EPBD has also helped in optimizing support mechanisms to speed up RES markets development and associated services (e.g. installers of RES-H/C equipment). Hence, employment opportunities in the RES industry have increased. All in all, the implementation of RES-H/C sublaws has led to a better position of Croatia on the EU RES market.

3.4 Way forward

A revision process of the energy efficiency in buildings legislation in Croatia is currently in preparation to accommodate the enforced EU EPBD Directive and EU RES Directive, and make improvements based on the experiences so far. This includes for example new RES-H/C sublaws under The Act on the Production, Distribution and Supply of Thermal Energy to promote and define the source and the amount of financial incentives for different RES-H/C technologies such as biomass, solar thermal and geothermal.³⁸

In addition to the effective application of existing and new regulations, national information and communication campaigns will be increased to raise awareness of building owners and users. This includes improvements in the incentive framework for energy efficiency in buildings.

³⁶ The building envelope is the interface between the interior of the building and the outdoor environment.

³⁷ Implementation of the EPBD in Croatia, European Commission, Directorate-General for Energy, Concerted Action-Energy Performance of Buildings, November, 2010.

³⁸ National Case Study of Croatia, Energy Institute Hrvoje Požar for the United Nations Economic Commission for Europe, Energy Efficiency 21 Programme, April 2010.

4. Croatia – Plastic packaging waste management

4.1 Introduction

In 2005, the European Parliament and Council Directive 94/62/EC on packaging and packaging waste were completely transposed into Croatian legislation, in line with its accession planned for 2013. The Directive aims to prevent the production of packaging waste and at reusing and recycling packaging to reduce the final disposal of this waste.³⁹

The Ministry of Environmental Protection, Physical Planning and Construction (MEPPPC) adopted the Ordinance on Packaging and Packaging waste in 2005, providing a legal basis for a system for the separate collection and recycling of packaging waste. This is financed by the Environmental Protection and Energy Efficiency (EPEE) Fund, who collect revenue from fees paid by producers for bringing packaging into the market.

The new waste management regulations following the implementation of this Ordinance are also in line with the overarching Strategic Development Framework 2006-2013.

During the 1990s the quantity of packaging waste in Croatia continuously increased. In the late 1990s, total annual quantity of packaging waste amounted to 320,000 tons, occupying an additional 2.4 hectares of land every year. Along with the harmonization with EU legislation regarding waste management regulations, Croatia's Waste Management Strategy passed in 2005 has been crucial for the development of the national waste management strategy and significant progress has been made.

Under this regulatory framework, there are a number of economic instruments in place and a comprehensive system for efficient packaging waste management. Producers who are placing packaging on the market have to pay fees to cover the expenses of the collection and removal of their packaged products. These fees go to the EPEE Fund, who uses these funds to dispose of the waste collected through an authorized collector, who dispatches PET, aluminium and tin (Al/Fe) cans, and glass packaging to waste packaging management centres, of which there are 24 in Croatia.

4.2 Impacts

Prior to 2006, there was a previous legislation on waste management (Ordinance on Handling Packaging Waste) which had limitations and Croatia's capacity for processing packaging waste were limited. With the transposition of the EU Directive on Packaging and Packaging Waste in 2006, the waste management situation began to improve. The implementation of the producer fees, collected by the EPEE Fund and used to implement the waste management system, led to drastic improvements in the collection of packaging waste: more waste packaging was collected in the first 3.5 months of the new and improved system (January to April 2006) than in the whole of the previous year.

Types of fees for the producers who are placing packaging on the market:

- *Disposal fee*, depending on the type of material of the packaging, with the purpose of covering the disposal costs for the packaging waste
- *Returnable fee* of 0.5 HRK/unit, for packaging of beverages for one-time use, with the purpose of enticing giving an incentive for the return of used packaging (this is refunded to the producer following the sale of the product)
- *Simulative fee* only to be paid by the producers ...

³⁹ The information used for this case study has been primarily drawn from "Management of Packaging Plastic Waste Especially PET in Croatia: On-going Practices", Aleksandra Anić Vučinić, UNEP, 2011 (to be published).

From 2007 to 2009, 57,4 tonnes of PET packaging were collected, of which 53,8 were recycled. 152.3 tonnes of glass packaging and 3,7 tonnes of Al/Fe packaging were collected, all of which were recycled.

Since the start of the programme in 2006, more than 4.000 jobs were created in the waste management system, and the success of the system has sparked the interest of economic entities in establishing new recycling plants which would further create several hundred green jobs. Such progress would entail additional new employment in other related segments of the system, such as transportation, sorting, and new employees at the ECEE Fund.

4.3 Way forward

Since Croatia's efforts to join the EU, they have directed more efforts into their environmental policy and have embarked on a variety of strategies related to environmental issues. This waste packaging management system which was introduced in 2006 is continuously improving. An efficient waste management sector is key in the transition to a Green Economy.

5. Finland – Forest Diversity Programme METSO

5.1 Introduction

The Forest Biodiversity Programme METSO, initiated in 2008 and running until 2020, enhances Southern Finland's network of protected areas and safeguards forest biodiversity in privately-owned forests across the region. METSO aims to halt the ongoing decline in forest biotopes and species and establish stable favourable trends in forest biodiversity by 2020. METSO is both an acronym for the programme and the Finnish name of the capercaillie, a primitive old growth forest bird. It is based on the experience gained during the implementation of the programme's pilot phase in 2002-2007 and encourages stable favourable trends for Southern Finland's forest ecosystems. METSO was approved in 2008 together with a new National Forest Programme for 2015. It is a collaborative effort between Finland's Ministry of the Environment and the Ministry of Agriculture and Forestry.⁴⁰

The programme is an example of a payment for ecosystem services (PES) scheme where protected areas are designated based on voluntary conservation agreements between authorities and forest owners. Conservation is based on forest owners' voluntary competitive tendering. Authorities compare tenders and choose the most suitable sites and negotiate conservation agreements with the forest owner. Agreements can be of temporary or permanent nature, depending on the nature of the conservation site in question.⁴¹

In total, the programme defines ten forested habitats to be potentially preserved. The site selection criteria define which habitats are to be protected under the programme. It covers the most important habitats and structural features in Finland's forests in terms of biodiversity. Another important criterion is the proximity of potential sites to the current network of protected areas and impacts on economic or social activities.

Measures under the METSO Programme:

- Ecological site selection criteria
- Restoration and nature management of habitats in protected areas
- Development of Finland's network of protected areas
- Safeguarding biodiversity in privately-owned forests
- Cooperation networks
- Organisation of natural values trading and related cooperation
- Habitat management measures in commercially managed State forests
- Ensuring biodiversity in municipal recreation forests and national hiking areas
- Advice to forest owners and training of forest professionals
- Communications
- Improving the knowledge base
- Developing monitoring, information systems and statistics
- Inventories of habitats and species
- Monitoring and evaluation of the Programme

Forest owners are compensated according to the Nature Conservation Act (1096/1996) or the Act on the Financing of Sustainable Forestry in the Finnish legislation (1094/1996). Some areas can also be purchased by the State to be designated as permanently protected areas. Measures under the programme are financed through the annual framework budgets allocated to the Ministry of the Environment and the Ministry of Agriculture and Forestry. To date, funding of up to €182 million until 2012 has been put in place. As over 75% of forests are owned by 600.000 non-industrial private forest owners in Southern Finland (61% of the whole

⁴⁰ MESTO Factsheet 2010, Ministry of the Environment and Ministry of Agriculture and Forestry, Finland, 2010.

⁴¹ Government Resolution on the Forest Biodiversity Programme for Southern Finland 2008-2016 (METSO), Finnish Government, 2008.

country), the funds of the programme are mainly channelled to private forests owners, forest companies, municipalities and congregations.⁴²

5.2 Benefits

The METSO Programme has applied new forestry methods for commercially managed forests based on a forest-owner-centred approach. It represents a departure from centralised governing of nature conservation to an emphasis on voluntary conservation contracts between forest owners and authorities. Forest owners benefit from independent decision-making and the possibility to retain their property rights in the available conservation schemes.

The aim is to:

- Advance social acceptability of forest biodiversity conservation and minimize conflicts between landowners and nature conservation authorities;
- Improve the forest owner's attitudes towards biodiversity conservation;
- Increase economic cost-efficiency in biodiversity through a PES mechanism, as the bidding system by forest owners for conservation agreements with authorities lowers information rents and thereby the size of PES.⁴³

5.3 Impacts

The programme aims to protect over 96.000 hectares of ecologically valuable forests by establishing permanent conservation areas and making fixed term conservation contracts (20 years) on private lands or by acquiring land by the State. In addition, 82 000-173 000 hectares of sites with natural values will be preserved in commercially managed privately owned forests by making environmental forestry subsidy agreements (10 years) or by nature management work. Up until 2010, over 30.000 hectares of state-owned forests and mires inside conservation areas have been restored. METSO also has increased the number of existing protected areas to include a total area of 10.000 hectares of state-owned commercially managed forest previously designated for conservation. The state forestry agency Metsähallitus also drafted land use plans to prioritise the conservation of biodiversity in ecologically important areas, aiming to expand and interlink forest areas of value to biodiversity.⁴⁴

From 2008 to 2009 alone, METSO yielded 3,661 hectares of strictly protected areas, totalling a compensation of €17 million. This includes formercommercially managed forests owned by the state and areas offered for protection voluntarily by landowners. During this period, another 18.900 hectares have been conserved in privately-owned forests with other policy instruments. These include the financing of sustainable forestry, nature management of commercially managed forests, and environmental subsidies. The restoration and active management of ecologically valuable forest habitats within protected areas is another important way to help safeguard forest biodiversity in Southern Finland. During the period 2008–2009 Metsähallitus Natural Heritage Services has purposefully managed and restored 6.400 hectares of forest habitat in protected areas. Ecological inventories of protected areas have additionally continued, covering 18.000 hectares over the two-year period.⁴⁵

⁴² The Forest Biodiversity Programme for Southern Finland (METSO) 2008-2016, Ministry of the Environment and Ministry of Agriculture and Forestry, Finland, 2010.

⁴³ The Forest Biodiversity Programme for Southern Finland (METSO) 2008-2016, Ministry of the Environment and Ministry of Agriculture and Forestry, Finland, 2010.

⁴⁴ Interim assessment of the METSO Forest Biodiversity Programme for Southern Finland – English summary, Ministry of the Environment and Ministry of Agriculture and Forestry, Finland, 2010.

⁴⁵ Results of the Evaluation of the METSO Programme 2008-2009, Ministry of the Environment and Ministry of Agriculture and Forestry, Finland, 2010.

METSO also supports forest conservation in municipalities. An increasing number of municipalities have started mapping valuable natural sites in their forests according to the programme selection criteria. METSO offers financial support to protect these sites.

The collaboration between forestry and environmental organisations will be further improved and official advisory services for forest owners will be developed. Forestry-related training and communications will be enhanced. Additionally, research and monitoring will be advanced to improve the knowledge base on forest biodiversity and to help in determining the best ways to preserve it. Under the programme, €2 million per year are allocated to support both basic and applied research on forest biodiversity.⁴⁶

5.4 Way forward

The METSO Programme has shown the benefits a flexible harmonisation of different forms of forest use and voluntary, state-subsidised protection of forest resources. Its new bottom-up and voluntary approach to conservation in return for financial compensation has raised the interest of private forest owners.

The large pool of involved actors (i.e. private forest owners, forest industry, NGOs, forestry organisations and interest groups, researchers and authorities) has increased acceptance, importance and political reliability of the programme.

⁴⁶ Interim assessment of the METSO Forest Biodiversity Programme for Southern Finland – English summary, Ministry of the Environment and Ministry of Agriculture and Forestry, Finland, 2010.

6. France – Bonus-Malus Feebate Programme for Vehicles

6.1 Introduction

The French Bonus-Malus Feebate Programme for Vehicles was introduced under the Grenelle de l'Environnement law in December 2007. One of the main objectives of the law is to prepare the French automotive market and its consumers for tighter emission performance standards in vehicles. One example is Regulation (EC) No 443/2009 introduced within the EU 20-20-20 commitments, which sets an average target of 130g CO₂/km for new passenger cars to be reached by improvements in vehicle motor technology by 2015.⁴⁷

The Feebate programme consists of a financial reward (*bonus*) for purchasers of environmentally friendly new cars and a financial penalty (*malus*) for those buying cars emitting high levels of CO₂. This is known as the "*bonus/malus*" scheme. The aim is to make the scheme revenue-neutral to the public budget.

The payments and the penalties are based on a sliding scale. The less (or more) carbon dioxide emitted, the greater the payment or penalty, respectively. Under the scheme, a rebate (*bonus*) is paid to purchasers of new passenger cars emitting 110g CO₂/km or less, which represents about 31% of car sales in France. The bonus is supplemented by an extra payment of up to €300 when the acquisition of the vehicle is accompanied by the substitution of a vehicle that is more than 15 years old. A maximum bonus of €5,000 is awarded to purchases of cars emitting no more than 60g CO₂/km. The bonus is deducted from the price paid to the car dealer and is identified on the purchase bill.⁴⁸

Table 1: Bonus/Malus Payment Scheme

Rate of CO ₂ /km	Amount of bonus/malus in 2011 (EUR)
60g and less	5000 €
Between 61 and 90g	800 €
Between 91 and 110g	400 €
Between 111 and 150g	0 €
Between 151 and 155g	-200 €
Between 156 and 190g	-750 €
Between 191 and 240g	-1600 €
Starting 241g	-2600 €

Conversely, buyers of new vehicles that emit more than 151 g CO₂/km pay a penalty (*malus*). This affects approximately 25% of new vehicles sold. Starting at €200 for vehicles between 151-155g, payment fees can go up to €2.600 for those emitting over 241g CO₂/km. In France, dealers usually register new vehicles at the prefecture and will bill the *malus* under registration costs. New owners registering their new vehicles pay the penalty themselves when obtaining their car registration documents.⁴⁹

Buyers of vehicles emitting between 111-150g CO₂ will not receive a bonus nor will they pay a tax. This "neutral zone" applies to about 44% of vehicle purchases.⁵⁰

The threshold points for payments or penalties are adapted every year to encourage ongoing development efforts.

⁴⁷ French Commissariat Général au Développement Durable, Le Point Sur, Une évaluation du bonus malus automobile écologique, Nr. 53, May 2010

⁴⁸ Ministère de l'écologie, du développement durable, des transports et du logement, Overview on the Bonus écologique, <http://www.developpement-durable.gouv.fr/Le-bonus-ecologique-c-est-facile.html>

⁴⁹ Ministère de l'écologie, du développement durable, des transports et du logement, Overview on the Bonus écologique, <http://www.developpement-durable.gouv.fr/Le-bonus-ecologique-c-est-facile.html>

⁵⁰ Ministère de l'écologie, du développement durable, des transports et du logement, Overview on the Bonus écologique, <http://www.developpement-durable.gouv.fr/Le-bonus-ecologique-c-est-facile.html>

6.2 Benefits

The programme results in important environmental gains. Through financial compensations or penalties depending on CO₂/km emitted, consumers are encouraged to take CO₂ emissions into account in their decision-making when buying a new vehicle. Hence, consumer awareness of CO₂ levels emissions by type of vehicle and manufacturer increases, which leads to favouring greener vehicles. Furthermore, more efficient cars lead to less fuel consumption and economic gains for vehicle owners.

Alongside environmental gains, the scheme also stimulates innovation in the automotive industry, with regards to the production of fuel-efficient vehicles. It provides incentives for vehicle manufactures to invest in research and development of efficient technology, produce greener vehicles and concentrate their marketing and sales efforts on these. The initiative also makes an important contribution to removing old polluting vehicles and replacing them with less polluting ones.

6.3 Impacts

In France, more emission-efficient vehicles have seen an increase in market share. Matriculation of new fuel-efficient vehicles below 130g CO₂/km and beneficiaries of the bonus have grown by 30% in 2007, 45% in 2008 and 56% in 2009. At the same time, new vehicles emitting over 160g CO₂/km that fall under the malus scheme have decreased from 24% in 2007 to 14% in 2008 and to 9% in 2009.⁵¹

The average reduction in CO₂ emissions for new vehicles has been 9,2g CO₂/km between 2007 and 2008 and 6,3g CO₂/km between 2008 and 2009, whereas before the programme the average reduction amounted to only 1-2g CO₂ per year. The average consumption of CO₂/km for new vehicles has hence decreased from 149g CO₂/km in 2007 to 131g CO₂/km in 2010. With the average 12% decrease in CO₂ reduction in new vehicles offered on the market, France has become one of the leaders in Europe for fuel-efficient vehicles. New vehicles emitting less than 100g CO₂/km have increased from 20 in 2010 to 56 models in 2011 on the French market. Vehicles offering diesel motors or highly efficient petrol engine powers have benefited mostly.⁵²

Of the 1.141.272 bonus rewards awarded in 2010, 962,572 (84%) requests were between the thresholds of 101-120g (total of €513 million). This is followed by 85.760 (7,5%) requests between the thresholds of 121-130g (total of €13,9million).⁵³

At the start of the programme, additional funding was necessary to bridge the gap between payments rewarded as bonuses and payments received as penalties. Furthermore, governmental taxes for fuel products saw falling revenues as a result of fuel savings of more emission-efficient cars. In 2008, the deficit to be covered by the public budget amounted to €141 million (€71 million in bonus-malus differences and €76 million reduced tax revenue) and 2009 to €306 million (€184 million in bonus-malus differences and €122 million in reduced tax revenue). Following threshold and market adjustments, the deficit was reduced significantly (see Table 2). Energy savings related to decreasing fuel consumption are

⁵¹ French Commissariat Général au Développement Durable, Le Point Sur, Une évaluation du bonus malus automobile écologique, Nr. 53, May 2010

⁵² French Commissariat Général au Développement Durable, Le Point Sur, Une évaluation du bonus malus automobile écologique, Nr. 53, May 2010

⁵³ Ministère de l'écologie, du développement durable, des transports et du logement, Bilan annuel du dispositif bonus écologique, 2010

estimated at €296 million in 2008 and €453 million in 2009 and hence were higher than the economic costs.⁵⁴

According to modelling, the programme contributes to total French CO₂ emission reductions of 3% yearly, whereas and helped France show an overall reduction of 6% between 2007 and 2008, compared to the average reduction of CO₂ emission in the EU15 of 3% during the same period. The benefits in terms of CO₂ emission reductions are estimated at 1,9 million tonnes of CO₂ in 2008 and 3 million tonnes in 2009, resulting from decreased fuel consumption in France.⁵⁵

Macroeconomic impacts, such as on employment, have not been analysed by the French government to date. The programme, having been initiated at the beginning of the financial crisis in 2008, has nevertheless certainly counterbalanced the crisis in the automotive industry positively and hence it can be assumed to have contributed to saving jobs while creating green jobs at the same time.

6.4 Way forward

The programme contributes to consumer awareness and change of consumer choices by creating a strong incentive framework for fuel-efficient vehicles.

The programme also encourages the automotive industry to invest in more fuel-efficient vehicle research. It also places the industry in a good position to respect the EU regulations that will start in 2015 (threshold of 130g per CO₂/km for new vehicles obligatory).

It is apparent that the progressive reduction of emissions thresholds in the Grenelle de l'Environnement law permits market transformation adaptation and a dynamic regulative framework, which is needed for greening the economy in a sustainable and progressive way.

⁵⁴ French Commissariat Général au Développement Durable, Le Point Sur, Une évaluation du bonus malus automobile écologique, Nr. 53, May 2010

⁵⁵ French Commissariat Général au Développement Durable, Le Point Sur, Une évaluation du bonus malus automobile écologique, Nr. 53, May 2010

7. Germany – Climate Change Programme for the Building Sector

7.1 Introduction

Initiated in 2001, the German climate change programme for the building sector has become an integral part of Germany's energy strategy. It represents today, along with the Energy Conservation Ordinance (Energiesparverordnung/EnEV), the most important instrument for energy efficiency and climate change protection in the building sector. The initiative in its current design was established in 2006. It is one of the main tools to reach Germany's climate change and energy efficiency targets of 2020/2050. In the building sector, Germany aims to reduce heat consumption by 20% by 2020 and primary energy consumption by 80% by 2050. The refurbishment rate for existing building stock, currently at 1% per year, is intended to double to 2% per year.⁵⁶

Heating, domestic hot water and lighting alone in public and private buildings account for around 40% of Germany's primary energy consumption and 20% of total CO₂ emissions. In residential buildings, around 85% of total household energy consumption is dedicated to heating and domestic hot water. The highest energy saving potentials remains in Germany's existing building stock with over 18 million residential and 1,5 million non-residential buildings. 75% of these buildings were constructed before the country's first Heat Insulation Ordinance in 1978 and were thus often erected with a – from today's perspective – poor energetic standard. Energy intensive operation costs (e.g. heating & cooling) have thus become an important expense for Germany's households.⁵⁷

The programme is funded by the German promotional bank KfW Bankengruppe. It is aimed at the residential housing sector and includes different promotional initiatives such as loans and grants targeting homeowners, private builders, landlords and housing companies. Programmes for new energy efficient construction consists of loans of up to €50,000 per housing unit. Today, over 40% of new residential buildings in Germany are supported by the programme and hence exceed the Energy Conservation Ordinance Building requirements.⁵⁸

For energy efficient refurbishments, different levels of grants and loans are made available according to investments made. Grants per refurbished housing unit are based on a percentage calculation on how much of the maximum primary energy requirement specified by the Energy Conservation Ordinance the building consumes. The best standard (KfW Efficiency House 55) receives the highest financial support.⁵⁹

Financial grants according to energy efficiency reached:

- 17,5% for a KfW Efficiency House 55, not more than € 13.125;
- 15% for a KfW Efficiency House 70, not more than € 11.250;
- 12,5% for a KfW Efficiency House 85, not more than € 9.375;
- 10% for a KfW Efficiency House 100, not more than € 7.500;
- 7,5% for a KfW Efficiency House 115, not more than € 5.625;
- 5,0% for the implementation of individual measures, not more than € 2.500.

In addition, the programme offers

⁵⁶ German Federal Ministry of Transport, Building and Urban Development, Climate Change Programme for the Building Sector, Overview - <http://www.bmvbs.de/SharedDocs/DE/Artikel/IR/energieeffizientes-sanieren.html>

⁵⁷ German Federal Ministry of Transport, Building and Urban Development, Climate Change Programme for the Building Sector, Overview - <http://www.bmvbs.de/SharedDocs/DE/Artikel/SW/kfw-programm-energieeffizient-sanieren-im-rahmen-des-co2-gebaeudesanierungsprogramm-des-bundes.html>

⁵⁸ German kfW Promotion Bank, Programme Overview - http://www.kfw.de/kfw/en/Domestic_Promotion/Our_offers/Housing.jsp

⁵⁹ German kfW Promotion Bank, Programme Overview - http://www.kfw.de/kfw/en/Domestic_Promotion/Our_offers/Housing.jsp

attractive conditions for loans of up to €75,000 per housing unit for energy efficient refurbishment combined with a repayment bonus calculated on the loan amount.

7.2 Benefits

The climate change programme for the building sector has permitted the following three beneficial outcomes:

- Reinforced measures to improve energy efficiency in Germany's building stock lead to a decrease in CO₂ emissions of buildings during their entire life-cycle and create long term climate change protection. The programme enables CO₂ emission reductions of 5 million tonnes every year during the 30-year life-cycle of the implemented energy efficient measures. Since 2006, this means total CO₂ emission savings of 148,3 million tonnes.
- Modernization and refurbishment of windows, isolation of building envelopes⁶⁰ and new heating and ventilation systems allow overall reductions in heating and electricity costs, lead to more independence from rising energy prices for owners and tenants and healthier living conditions. Estimates by the German government show that programme energy savings account for the approximate energy production of two nuclear facilities.
- Energy efficient construction and especially refurbishments lead to long-term economic growth in the construction sector and create employment. Local construction small and medium enterprises (SMEs) benefit from the most of these emerging contracts. In 2010 alone, the programme helped to create and maintain 340.000 construction jobs.⁶¹

Repayment bonus for financial loans according to energy efficiency reached:

- 12,5% for a KfW Efficiency House 55
- 10% for a KfW Efficiency House 70
- 7,5% for a KfW Efficiency House 85
- 5% for a KfW Efficiency House 100
- 2.5% for a KfW Efficiency House 115

7.3 Impacts

From June 2006 to June 2011, the KfW supported 1 million loans and grants to refurbish existing buildings energy efficiently and construct new residential buildings according to KfW Efficiency House standards. From 2006 to 2010 around €6.8 billion of funds were made available to support the programme. This support leveraged funds from the private sector which resulted in total investments of €84 billion so far. Hence, the ratio of public to private investment between the years 2008-2010 was 1:12, that is to say €1 billion in public funds triggered €12 billion in total new investment.⁶²

⁶⁰ The building envelope is the physical separator between the interior and the exterior of a building.

⁶¹ German Federal Ministry of Transport, Building and Urban Development, Climate Change Programme for the Building Sector, Overview - <http://www.bmvbs.de/SharedDocs/DE/Artikel/SW/kfw-programm-energieeffizient-sanieren-im-rahmen-des-co2-gebaeudesanierungsprogramm-des-bundes.html?nn=36226>

⁶² German Federal Ministry of Transport, Building and Urban Development, Climate Change Programme for the Building Sector, KfW Internal Evaluation of Programme Impacts

	Accepted applications in 2011(e)	Accorded Loans/Grants in 2011 (e) (Mio €)	Supported Investment in 2011(e) (Mio €)	Supported Housing Units	Secured or created jobs in 2011 (e)	CO2 emissions reduction in 2011 (e)
Energy Efficient New Construction	20.674	1.807	7.118	40.309	113.900	71.200
Energy Efficient Retrofit	25.915	1.114	1.565	78.184	25.000	203.900
TOTAL	46.589	2.921	8.686	118.493	138.900	275.100

For the year 2011, over €936 million in public funds have been made available. This includes the €500 million in the Special Federal Energy and Climate Fund. In the cabinet decision of June 2011 concerning the future implementation of Germany's energy strategy, the government has decided to reinforce financial incentives for investments in the energy efficiency of the building sector.⁶³

7.4 Way forward

The programme is continuously being developed and improved. For the years 2012-2014 additional financial funds will be made available through the Energy and Climate Fund with a total yearly funds of €1,5 billion. In March 2011, funding for highly energy efficient refurbishment measures (e.g. isolation, windows, heating and ventilation systems) was re-introduced, combined with measures to ensure a good quality of planning and construction. Moreover, since April 2011 the programme also includes all municipal and social infrastructure buildings in the non-residential sector.

The German government foresees a continuation and progressive expansion of the programme in order to fulfill its obligations under climate change protection targets, to increase energy efficient refurbishments and continue to create strong market employment incentives for German SMEs. The German government is considering alternative incentives in the domestic hot water market starting 2015.

⁶³ German Federal Ministry of Transport, Building and Urban Development, Climate Change Programme for the Building Sector, Internal Overview provided for UNEP

8. Moldova – Organic Agriculture

8.1 Introduction

In an effort to shift to a more low-carbon economy, Moldova is taking measures to convert more of its agricultural land from conventional to organic farming.⁶⁴ Organic farming differentiates itself from conventional farming by ensuring the restricted use of chemical and synthetic inputs, prohibition of genetically modified crops, and wide crop rotation. There is a growing wealth of evidence pointing to the environmental benefits of organic farming compared to conventional farming, making organic agriculture very attractive to agriculture-based economies wishing to make a transition to a green economy.

Moldova's economy relies heavily on agriculture. Agricultural production and food processing activities contribute to 30% of national GDP and 70% of exports. This is due to Moldova's favourable climate, high quality black soil, and geographical location close to large markets.

Due to the increasing international demand for organic products coupled with the significant environmental benefits, the Moldovan government has taken significant steps towards promoting organic agriculture through many tools including regulations, subsidies, and institutional development. There has been an organic marketing law in place since 2005 (Law on Ecological Agro-Food Production Nr. 115-XVI), harmonized to EU and international requirements. Within the Ministry of Agriculture, a Department for Organic Farming and Renewable Resources was established for further promotion of organic agriculture. Courses and training sessions on organic farming practices are organised annually by the Ministry of Agriculture. In 2010, 2% of total agricultural subsidies were dedicated specifically to the organic sector, and this helped fund a 3-year support scheme for farmers converting to organic methods: allocating US\$56/ha in the first year, US\$32/ha in the second year, and US\$24/ha in the third year of the conversion period. In 2009, 600 tonnes of organic vegetables were sold on the local market with a 20% government subsidy, providing farmers with a premium price.

Main certified organic export products include:

- wine
- shelled walnuts
- dried fruits
- sunflower seeds
- sunflower oil
- soy seeds
- barley

Other actors in the organic agriculture arena have fostered the development of the local market for organic products. Two local certification companies have been established in Moldova: *Certificate-ECO* and *CRPA-Inspect*, who are accredited and authorized to act in the local market, and have agreements with different international organic certification companies. The non-governmental organization (NGO) *ProRuralInvest*, established in 2003, has aimed to contribute to the development of the rural sector and biodiversity conservation by providing assistance, training, consultancy services, seminars, and demonstrations in the field.

8.2 Benefits

The restricted use of external inputs such as chemical and synthetic pesticides and fertilisers promotes a variety of environmental gains. Through the increased use of natural fertilisers such as livestock manure and natural enemies of pests, there are gains to biodiversity by increasing the organisms in the soil. The lack of artificial inputs also has a positive effect on water quality by avoiding chemical run-offs into nearby lakes or streams. Further, the use of

⁶⁴ The information used for this case study is primarily extracted from "Potential of Organic Agriculture in the Republic of Moldova for Transitioning to a Green Economy", Viorel Gherciu, UNEP 2009.

organic seeds (non genetically modified) and planting crops that are appropriate to the local climate will keep the soil in good quality and prevent erosion.

According to a study by the Research Institute of Organic Agriculture (FiBL), a leading expert information centre on organic agricultural practices, organic practices emit 35-37% less greenhouse gases than conventional practices, and sequesters significantly more carbon in the soil.⁶⁵ This, seen on a large scale, would have significant impact on the carbon footprint of Moldova.

Organic farms use fewer inputs and this reduces costs of fertilizers and pesticides for farmers and relieves the country of the need to subsidize costly inputs and their negative impacts on the environment. These lower costs, coupled with higher prices typically received for organic products, lead to a higher profitability for the farmer.

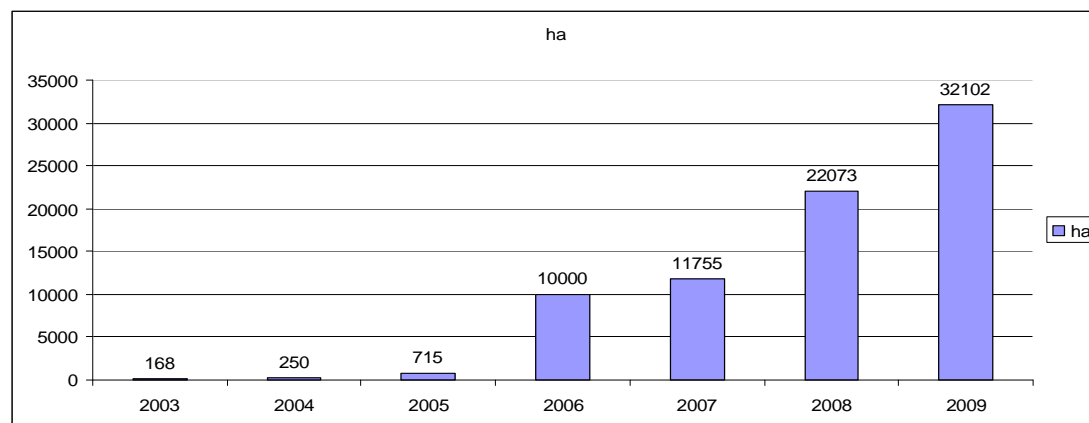
As a labour- and knowledge- intensive field, organic agriculture presents new employment opportunities. More labourers are needed on the farms compared to conventional farms; certification staff and advisory workers are needed to support organic agriculture practices; and jobs are created in the subsequent steps of the value chain of organic products, e.g. processing, grading and packaging.

8.3 Impacts

In the period of 2005-2009, the organic sector in Moldova increased from 715 hectares in 2005 to 31,102 hectares in 2009, a 45-fold increase. Approximately 2% of arable land is dedicated to organic farming - this is the highest proportion of organic farming in the Eastern Europe, Caucasus and Central Asian (EECCA) region.

In 2009, 32,374 tons of organic products were exported with a value of €34.6 million, representing 11% of the total agricultural export value.

Figure 1: Growth of organic sector in Moldova, 2003-2009



Source: Gherciu 2010

This proportion is expected to increase to 5% of arable land in 2020. It is estimated that if organic agriculture is applied to this area, 50,000 tonnes of greenhouse gas emissions would be saved per year compared to conventional farming. Organic farming practices increase the organic matter in soil, increasing its potential to sequester carbon, at an estimated equivalent of 2 tonnes of CO₂ per hectare per year.

⁶⁵ FiBL, 2007

8.4 Way Forward

Within the EECCA region, the Moldovan government has played a crucial role in promoting organic agriculture. In a country where the agriculture sector plays a major role in the economy, converting to organic practices can have a significant effect on climate change mitigation through the reduction of greenhouse gas emissions, and can bring other social and economic benefits, such as an increase in decent green jobs.

To realise the growth targets for this sector, the government must continue to give recognition and support, and mainstream organic practices into the country's overarching agricultural policy.

9. Spain – EU LIFE+ Agricarbon project

9.1 Introduction

From 2010 to the end of 2013, studies are being undertaken on 90 hectares of agricultural land across three demonstration farms in southern Spain to study and evaluate advantages of sustainable agricultural methods. Coordinated by the Spanish Association for Conservation Agriculture-Living Soils and supported by the EU LIFE+ programme, it aims to encourage the use of these methods throughout Spain by supplying detailed information and evidence of their efficiency and environmental benefits to serve as a basis for technical and legislative decision-making. The sustainable agricultural methods being demonstrated are Conservation Agriculture (CA) and Precision Agriculture (PA). Conservation Agriculture (or no-tillage) refers to practices which protect the soil from degradation while improving its quality and biodiversity. It is based on three principles: minimum soil alteration, permanent soil cover, and wide crop rotation. Precision Agriculture consists of techniques aimed at gaining a more detailed knowledge of the conditions in which plant variations are cultivated, making for a management system that is adapted to local conditions. In comparison to conventional agriculture (or tillage), these practices improve the organic matter of the soil, increasing its potential for carbon sequestration, and provide other environmental benefits, such as increased natural biodiversity and prevention of soil erosion.⁶⁶

Outlined below are the five objectives of the Agricarbon project and the actions taken to fulfil them:

Objectives	Actions
<p>1. Demonstration of adaptability of herbaceous crops planted under CA to new climate scenarios derived from global warming.</p> <p>2. Showing the agricultural sector that these sustainable and atmospheric GHG concentration-reducing techniques are at least equally productive and more efficient in the use of inputs than conventional agricultural techniques.</p>	<p>Based on the establishment of a network of three pilot farms, with 90 hectares of demonstration farms of herbaceous crops under two soil management systems (conventional agriculture tillage vs. CA supported by PA) studies detailed below will be made to provide sufficient information to serve as a basis for technical and legislative decision-making.</p>
<p>3. Setting up of a digital platform to evaluate CO₂ emissions and energy consumption in farms based on the area's climate characteristics, the crops grown and the agricultural practices employed</p>	<p>Based on studies of GHG emission reductions resulting from actions derived from the establishment of the first two objectives, a space specializing in evaluating energy and CO₂ emissions will be reserved for farms on the web site of the project., with action protocols set up for this purpose, thus supplying information to farmers wishing to start CA and PA techniques.</p>

⁶⁶ EU LIFE+ Agricarbon, www.agricarbon.eu

<p>4. Generation of an extensive knowledge bank of climate change mitigation effects by the reduction of atmospheric GHG concentrations from the establishment of sustainable agriculture techniques like CA and PA.</p> <p>5. Promotion and dissemination of CA and PA techniques in order to supply sufficient information and tools to agricultural sector agents (public administrations, private companies, research and farming organizations) for them to take suitable measures to favour the progressive establishment of sustainable agricultural practices.</p>	<p>By communicating all the results produced from carrying out the project, dissemination actions at different levels (practical, technical and scientific) will be accomplished. For practical applications of sustainable agricultural techniques, audiovisual material and diverse technical guides will be published, and technical training and countryside day courses oriented towards the training of farmers, agricultural company technicians and legislators will be held. Additionally, it is proposed to hold a congress at European level to convey to the scientific and technical community the results of the project and thus promote more research in public and private centres.</p> <p><i>All information in this table from EU LIFE+ Agricarbon website, www.agricarbon.eu</i></p>
--	---

9.2 Benefits

It is becoming increasingly clear that traditional agriculture methods, such as crop residue burning and tilling to control weeds, are generally harmful to the environment. These techniques, along with the use of uncontrolled chemical fertilizers and pesticides, increase soil degradation and erosion, impair water quality, reduce biodiversity, and are very input- and energy- consuming. This makes conventional agriculture costly and harmful to the land on which it is practiced. CA, on the other hand, involves practices which make minimal impact on natural biodiversity and soil structure and composition. Organic matter and fertility levels of the soil increase, making it less prone to erosion. In turn, the reduced amount of soil sediment (a side effect of erosion) improves surface water quality. It is less energy consuming and thus leads to a comparable reduction in energy consumption and CO₂ emissions compared to traditional agriculture.

As well as environmental advantages with CA, there are economic benefits for the farmer. In conventional agriculture, operations require higher inputs of fertilizers, machinery investment and maintenance, and there are cost savings to be made by switching to CA which is less input-heavy. According to the European Conservation Agriculture Federation (ECAAF), a conservation agriculture system saves an estimated 97 EUR per hectare on machinery depreciation and maintenance costs, and permits a fuel saving of an average of 31.5 litres per hectare annually; outweighing for the extra costs of conservation tillage techniques (application of herbicides and direct sowing machinery). In Southern Europe, the average annual cost reduction in conservation crops compared to conventional tillage systems ranges from 40 and 60 EUR per hectare, and many farmers are strongly motivated by cost savings.

The energy savings achieved both in CA and PA, mainly derived from a more efficient use of machinery and reduction in inputs, added to the effects from the increased potential of the soil as a carbon sink, make these agronomic practices a very useful tool in the fight against climate change in the agricultural sphere, which contribute to 10% of the GHGs in Europe (EU data).⁶⁷

⁶⁷ LIFE+ Agricarbon project, ECAAF
http://www.ecaf.org/index.php?option=com_content&task=view&id=107&Itemid=51

9.3 Impacts

Energy efficiency

The Agricarbon project, which has been in progress since the start of 2010, already has preliminary results regarding energy efficiency, carbon sequestration and carbon dioxide reduction. In the demonstration plots studied, cereal cultivations under CA and PA practices have demonstrated a reduction in energy use up to 60%, due not only to the lower hours of labour required, but also to the lower use of fertilizers.⁶⁸

In terms of fossil fuel consumption, the use of CA for growing cereals (in winter and summer), oil-producing plants and pulses represents an average savings of fossil fuel of approximately 54% compared to conventional agriculture, due to the reduction of mechanized operations.⁶⁹ An increase of energy productivity was observed by 25% to 75%. In other words, yields increased considerably with the same amount of energy input. This is of particular importance as farmers will obtain a higher output while keeping their costs the same.⁷⁰

Carbon Sequestration

Soil management is identified as one of the best tools for climate change mitigation and adaptation, and according to sustainable practices, CA introduces important changes in the dynamics of soil carbon sequestration and promotes this process as well. Crop residues left on the soil surface and no mechanical soil disturbance reduce the rate of mulch decomposition and decrease the mineralisation of soil organic matter due to reduced air flow, resulting in a lower accessibility of microorganisms and increased soil carbon. Therefore, the reduction of tillage reduces and slows the decomposition of plant matter, which promotes the storage of atmospheric CO₂ (fixed in the plant and returned to the soil as plant debris) in the soil. Thus, the soil will have the task of storing atmospheric CO₂, thereby helping to mitigate the emission of greenhouse gases generated by other activities. It is common to find major differences in OM content between no-tillage (NT), CA approach for arable land, and traditional tillage (TT) soils. CA is an alternative that can help reduce GHG, mainly due to that carbon-fixation processes in the soil through an increase of the organic matter and to the decrease in the intensity of tillage. So far, the Agricarbon projects have indicated that on average, 70% more carbon can be fixed or sequestered in the soil compared to conventional practices.⁷¹

CO₂ emission reduction

The project is showing that important carbon dioxide emissions can be saved by using CA practices compared to conventional agriculture. The data collection campaigns in the different demonstration plots have found that CO₂ emissions in CA are 70-90% less, due to the use of less powerful machines and less fossil fuels consumed in a no-tillage system.⁷²

⁶⁸ Written communication from E.J. González-Sánchez, Executive Director of the Spanish Association for Conservation Agriculture-Living Soils (AEAC-SV), 2011

⁶⁹ Written communication from E.J. González-Sánchez, Executive Director of the Spanish Association for Conservation Agriculture-Living Soils (AEAC-SV), 2011

⁷⁰ Written communication from E.J. González-Sánchez, Executive Director of the Spanish Association for Conservation Agriculture-Living Soils (AEAC-SV), 2011

⁷¹ Written communication from E.J. González-Sánchez, Executive Director of the Spanish Association for Conservation Agriculture-Living Soils (AEAC-SV), 2011

⁷² Written communication from E.J. González-Sánchez, Executive Director of the Spanish Association for Conservation Agriculture-Living Soils (AEAC-SV), 2011

9.4 Way forward

The results of the Agricarbon project are expected to promote a better understanding of the benefits of CA and PA and foster the development of legislative measures to further support the implementation of these methods in Spain and in Europe. At the end of the project there will be detailed technical, practical and scientific documentation on the effects of CA and PA on atmospheric greenhouse gas concentration reduction. Making available to European and national authorities sufficient knowledge about these practices could serve to set up environment policies in the agricultural domain, with the two-fold reducing and adapting intention indicated in the European Commission Communications COM (2007) 2 final 'Limiting Global Climate Change to 2 degree Celsius- The way ahead for 2020 and beyond' and COM(2007) 354 final, Green Paper 'Adapting to climate change in Europe-options for EU action' and in Article 3.4 of the Kyoto Protocol on changes in agricultural soil uses.⁷³

The data already collected shows that CA and PA practices have a very positive effect on the environment, while being more productive and economically beneficial for the farmer. If this sector is invested in and expanded in Spain and in Europe, it will represent an important step towards mitigating climate change and moving towards a Green Economy.

⁷³ LIFE+ Agricarbon project, ECAF
http://www.ecaf.org/index.php?option=com_content&task=view&id=107&Itemid=51

10. Stockholm (Sweden) – Green and Sustainable Urban Development

10.1 Introduction

Stockholm

- Capital of Sweden
- 850,000 residents
- Area: 209 km² (including 21 km² of water)

Designated as the first European Green Capital by the European Commission in 2010, Stockholm has embarked on numerous initiatives to create a model sustainable urban environment in the past years. Through its Vision 2030 and enabled by its sixth consecutive Environmental Programme (2008-2011), Stockholm invests in strategic sectors such as clean energy and transport, which together account for 43% of all greenhouse gas emissions in the European Union.⁷⁴ In 2009, Sweden emitted 60 million tonnes of greenhouse gases. Compared with 2008, this is a decrease of 3,6 million tonnes. Emissions were around 17% below 1990 levels. Greenhouse gas emissions from domestic transport totalled 20,3 million tonnes, while from the energy sector emissions amounted to 24,2 million.⁷⁵

Initiatives under the City's Environmental Programme include:

Environmentally efficient transport: Around 670 million individual journeys are made each year on a network with more than 2000 buses and 1.000 train and metro carriages. Clean energy fuels most of Stockholm's public transport system. All rail services are operated with certified renewable electricity, and all city buses run on renewable energies. Traditional cars are replaced by clean vehicles, which now amounts to nearly 100 000. Since 2006, Stockholm has levied a congestion tax on all Swedish-registered vehicles driving in and out of the city centre at extended office hours. These charges have cut traffic and emissions by 10-15%.⁷⁶

Environmental Programme (2008-2011) goals

1. Environmentally efficient transport
2. Goods and buildings free of dangerous substances
3. Sustainable energy use
4. Sustainable use of land and water
5. Waste treatment with minimal environmental impact
6. A healthy indoor environment

Sustainable energy use: Stockholm has a century-old tradition of waste incineration and converting household waste to energy. The Strategic Waste Management Plan for 2008-2012 calls for increasing the amount of food waste collected and treated. It has set a target to treat at least 35% of the food waste from restaurants and grocery stores – and 10% of food waste from households. To achieve this, it promotes a separate collection food waste from restaurants. Today, more than 70% of householders have access to district heating, produced partly by energy extracted from waste.⁷⁷

Waste treatment: 25% of the city's waste is recycled and is composted, resulting in an environmentally effective waste system. Waste water is treated in two plants that serve a combined population of 1 million. The water is treated with advanced technology for removing nitrogen and phosphorous, exceeding the ambitions of the EU Urban Waste Water Directive. Biogas is produced in the waste-water treatment plant and then upgraded for use in public buses as well as private cars and taxis. The excess heat in the sewage water is recovered for domestic heating.⁷⁸

⁷⁴ European Green Capital, Stockholm European Green Capital 2010, European Commission, 2010.

⁷⁵ National Inventory Report 2011, Swedish Environmental Protection Agency, Sweden, January 2011.

⁷⁶ The Stockholm Environment Programme 2008-2011, City of Stockholm Executive Office, 2008.

⁷⁷ The Stockholm Environment Programme 2008-2011, City of Stockholm Executive Office, 2008.

⁷⁸ The Stockholm Environment Programme 2008-2011, City of Stockholm Executive Office, 2008.

10.2 Benefits

By 2030, the population of Stockholm is expected to increase by 200.000 to 1 million residents. High environmental standards for all new urban districts are central to the development of Stockholm, which has been successful in achieving growth while maintaining sustainability.

To achieve the target of becoming fossil-fuel free by 2050, environmental issues play a key part in the city's programme of work. Consequently, environmental issues are successfully included in the city's budget, operational planning, reporting and monitoring. The aim of the city council is to build a large consensus regarding environmental targets and goals. Clean technology companies work together with the city planners on the collective goal of environmental improvement.

10.3 Impacts

Results of Stockholm's environmental programme

- 1,000 parks (30% of city area)
- Seven nature reserves within city boundaries (and more than 200 in the surrounding area), 1 cultural reserve and 1 city national park
- 95 kg of recycled refuse annually per citizen
- 12.000 trees in the city centre
- 29 official beaches
- World's largest district cooling network
- Set to become fossil-fuel free by 2050
- Hosts 2.700 clean-tech companies

With its six Environmental Programmes, Stockholm has been able to take several positive steps towards sustainability during the last decade. Despite its northern location and an increasing population, Stockholm has reduced its greenhouse gas emissions by 25%, from 5,4 tonnes per person in 1990 compared to about 3,4 tonnes per person in 2009. By 2015, the goal sets 3,0 tonnes per person and calculations indicate that this is likely to fall to 2,8 tonnes by that time.

The amount of greenhouse gas emissions released by each inhabitant of Stockholm is half the national average. In Sweden as a whole, CO₂ emissions are only 6 tonnes per capita, as compared to the European average of 10 tonnes per capita.⁷⁹

This is made possible by the high proportion of renewable energy for heating houses and other premises, reduced traffic congestion, cleaner vehicles and green electricity. For instance, Stockholm foresees increasing the number of buses fuelled by biogas from 129 in 2009 to 500 in the coming years. Stockholm Transport also uses some 400 ethanol buses and a dozen of ethanol-hybrid buses, comprising the world's largest ethanol fleet. In 2008, one-quarter of buses in the region ran on renewable energy, a figure expected to reach 50% by 2011. By 2025, all public transport will be fossil-fuel free. Over the last decade, the number of bicycle trips by Stockholm residents has jumped 80%, owing in large part to the expansion of cycling paths and lanes, and the fact that it is a fast and efficient way to travel, together with Stockholmers' growing interest in health and physical exercise. Stockholm is connected today by over 760 km of bike lanes.⁸⁰

The conversion from oil heating to district heating has reduced greenhouse gas emissions by 593.000 tonnes since 1990.⁸¹ The use of district heating with advanced pollution control and optimized processes has limited the number of small, old oil boilers. This has not only cut CO₂ emissions, but has also helped reduce emissions of sulphur dioxide and other hazardous substances, thereby radically improving air quality.

Healthy living conditions for Stockholm's citizens are furthered by the management of Stockholm's parks, green areas and the conservation of its natural resources such as the seven

⁷⁹ European Green Capital, Stockholm European Green Capital 2010, European Commission, 2010.

⁸⁰ European Green Capital, Stockholm European Green Capital 2010, European Commission, 2010.

⁸¹ The Stockholm Environment Programme 2008-2011, City of Stockholm Executive Office, 2008.

nature reserves through the Stockholm Park Programme. Today, 95% of the city's inhabitants live within 300 meters of green areas. Water makes up over 10% of Stockholm's surface area which offers opportunities for swimming, picnics, boating and other recreational activities.⁸²

10.4 Way forward

Stockholm is growing and city administrators have to redefine and develop environmental standards continuously to maintain the balance between retaining the city's unique character, while at the same time being a sustainable and attractive place for people to live and work.

An example of this effort is the Stockholm Royal Seaport, one of Europe's largest urban development projects, which seeks to become a global showcase for sustainable urban development. The city area which will accommodate more than 10.000 apartments and 30.000 work spaces, plans to be fossil-fuel free by 2030, to reduce carbon emissions below 1,5 tonnes per person by 2020, and to cement Stockholm's reputation as a truly climate-adapted city.⁸³

⁸² European Green Capital, Stockholm European Green Capital 2010, European Commission, 2010.

⁸³ European Green Capital, Stockholm European Green Capital: Role Model for Europe, Report on Sustainable Urban Development Seminar, Brussels, May 2010.

11. Switzerland – SwissEnergy Programme

11.1 Introduction

Targets of SwissEnergy Programme:

- **Climate:** To reduce CO₂ emissions by 10 percent by 2010 relative to 1990 levels, in accordance with CO₂ legislation;
- **Electricity:** To limit the increase in electricity consumption to a maximum of 5 percent relative to 2000 levels;
- **Renewable energy:** To increase the contribution of renewable energy towards electricity production by 0,5 TWh, and towards heat production by 3,0 TWh.

The SwissEnergy programme was launched by the Swiss federal government in 2001. It replaces the Energy 2000 Action Plan which ended in 2000. The programme's principal objectives are to promote efficient energy use and the use of renewable energy, support Switzerland's energy and climate policy goals through concrete measures, and thus to ensure a sustainable energy supply. The overlying quantitative goals of SwissEnergy are in line with the objectives of its CO₂ Act and commitments within the scope of the International Climate Convention and Kyoto Protocol emissions reductions targets.⁸⁴ Alongside these goals, the programme also significantly stimulates a green economy by generating investment and creating employment.

The annual budget for SwissEnergy amounts between 25 and 74 million Swiss Francs (CHF) per year.⁸⁵ The programme management concentrates on five priority sectors: building modernisation, renewable forms of energy, energy efficient appliances and electric motors, rational use of energy and use of waste heat by industry and energy efficient and low-emission mobility.

The main activities of SwissEnergy are voluntary agreements, funding measures favouring energy savings, promotion of renewables, dissemination of research information and energy consumption standards for buildings, equipment and vehicles. The aim is to achieve a 10% reduction of consumption of fossil fuels, an increase of less than 5% of electricity consumption, and an increase of consumption of renewable energy by 0,5 TWh.⁸⁶

SwissEnergy Programme Budget:

Year	Amount in CHF (million)
2001	74
2002	67.6
2003	63.4
2004	49.1
2005	42.5
2006	41.8
2007	38.7
2008	39.8
2009	25.9
2010	26.9

SwissEnergy's main function is as a provider of incentives and as an instrument for implementing a clearly defined and credible Swiss energy policy. To achieve the set targets the programme is relying on a broadly based network in which all participants in the energy and climate policy act in coherence. Its activities are carried out in partnership with about 30 organisations. They include cantons and municipalities, plus industrial, consumer and environmental associations. Its management (co-ordination, control and marketing) is the responsibility of the Swiss Federal Office of Energy.

The partner organisations fall into two groups: cantonal energy desks implement cantonal programmes, while industry and trade associations, consumer associations, NGOs and municipalities are in charge of sectoral programmes at the national level. These programmes comprise areas such as building codes and standards, voluntary agreements to avoid the CO₂ tax, promoting energy-efficient appliances and improving car fleet efficiency.

⁸⁴ EnergieSchweiz in der 2. Etappe – mehr Wirkung, mehr Nutzen – Die Strategie für EnergieSchweiz 2006–2010, Swiss Federal Office of Energy, EnergieSchweiz, 2005.

⁸⁵ 9th Annual Report of SwissEnergy 2009 / 2010 – Hub for future energy use, Swiss Federal Office of Energy, EnergieSchweiz, 2010.

⁸⁶ EnergieSchweiz in der 2. Etappe – mehr Wirkung, mehr Nutzen – Die Strategie für EnergieSchweiz 2006–2010, Swiss Federal Office of Energy, EnergieSchweiz, 2005.

11.2 Impacts

As a 10-year programme, SwissEnergy has had various impacts. The effectiveness of the funds employed (excluding federal contributions to the Cantons) has improved considerably over the life time of the programme. To achieve savings of one kilowatt-hour of energy in 2009, a required subvention of 0,09 cents was necessary, 6% less than in 2008. In 2003, the amount required was at 0,6 cents. This shows how strong the leverage achieved by the funds used by the SwissEnergy programme is and how efficient the programme has become through experience and continuity.⁸⁷

The programme also contributed to the support of the economy and the labour market. Promotion measures introduced by the SwissEnergy programme generated investments and expenditure for operating and maintenance of about CHF 1,4 billion (2008: approx. CHF 1,19 billion). The impact on employment coupled to this expenditure, including the estimated impact in 2009 arising from earlier measures, is estimated at about 6,800 people per year. The greatest impact on investment and employment was observed in the renewable energy sector followed by the second most important pillar, public sector and buildings.⁸⁸

Other impacts include:

- In 2009, the voluntary measures promoted by the SwissEnergy programme achieved an additional impact – savings or substitution by renewable sources of energy – amounting to 3,9 petajoules (PJ). This corresponds to about 0,5% of Switzerland's energy consumption. In 2009, the programme enabled the production of an additional 575 GWh of heat and 23,5 GWh of electricity from renewable sources of energy;
- The impact of all the continuing voluntary measures implemented by the SwissEnergy programme since 2001 increased in 2009 by 21% to 27,1 PJ compared to 2008;
- The energy-related impact of continuing voluntary measures implemented by the SwissEnergy programme and Energy2000, its forerunner, rose by 7% to 35,9 PJ and savings in CO₂ (incl. outlying processes) amounted to 2,8 million tonnes, or more than 4% of Switzerland's total CO₂ emissions.⁸⁹

It is estimated that without SwissEnergy and its predecessor, Energy 2000, CO₂ emissions would be approximately 2,8 million tonnes higher than the present-day level and the consumption of fossil fuels would be approximately 7,9% higher than it is today. Furthermore, Switzerland's overall electricity consumption would be around 4,7% higher than the current level.⁹⁰

11.3 Way forward

In 2010, Switzerland's overall energy consumption rose to the new record level of 911.550 terajoules, an increase of 4,4% over 2009. The main causes were the much colder weather, positive developments in the economy and continuing growth in the population.⁹¹

⁸⁷ 9th Annual Report of SwissEnergy 2009 / 2010 – Hub for future energy use, Swiss Federal Office of Energy, EnergieSchweiz, 2010.

⁸⁸ 9th Annual Report of SwissEnergy 2009 / 2010 – Hub for future energy use, Swiss Federal Office of Energy, EnergieSchweiz, 2010.

⁸⁹ 9th Annual Report of SwissEnergy 2009 / 2010 – Hub for future energy use, Swiss Federal Office of Energy, EnergieSchweiz, 2010.

⁹⁰ 9th Annual Report of SwissEnergy 2009 / 2010 – Hub for future energy use, Swiss Federal Office of Energy, EnergieSchweiz, 2010.

⁹¹ Energy consumption higher than ever – Press Release, Swiss Federal Office of Energy, June 2011.

On 11 June 2010, the Federal Council adopted the concept for the SwissEnergy Action Programme to run for a further ten years from 2011 on. This shows the effectiveness of the programme until now and the fact that in such a dynamic environment a broad platform such as the SwissEnergy programme is a necessity. In the long term the programme is committed to achieving the ideal of the 2.000 watt society. In the next stage the priorities will remain the same: buildings, renewable energies, efficiency of appliances, electric motors and road vehicles, efficiency in industry and services and in mobility.⁹²

The new challenge the programme sets itself is to encourage work in cross-sectors that unite the various aspects of the programme, to get a systematic overview and thus create more synergies. Hence the newly introduced cross-sector field “Municipalities and agglomerations” underlines the fact that the focus is not solely on the building or the car, but rather on the question of where the buildings stand, what effect cars have on traffic, how settled areas are tapped in to make people mobile and the overall accessibility to renewable and more efficient energy sources.⁹³

⁹² 9th Annual Report of SwissEnergy 2009 / 2010 – Hub for future energy use, Swiss Federal Office of Energy, EnergieSchweiz, 2010.

⁹³ 9th Annual Report of SwissEnergy 2009 / 2010 – Hub for future energy use, Swiss Federal Office of Energy, EnergieSchweiz, 2010.

12. England, UK – Sustainable public transport – The Green Bus Fund

12.1 Introduction

The Green Bus Fund is a government-funded aid scheme which supports transport operators in England to buy low carbon buses. It is illustrative of a public-private partnership, where the British government works directly with private bus operators. Transport companies and local authorities compete for funding by placing bids for grants for the purchase of new low carbon buses. These grants bridge the gap between the cost of a low carbon bus and that of its standard diesel equivalent, giving a financial incentive to purchase the low carbon alternative. A low carbon bus is defined as a bus that can achieve the Low Carbon Emission Bus (LCEB) target of emitting at least 30% less greenhouse gas emissions than its equivalent diesel bus of the same passenger capacity.⁹⁴ Buses subsidized through this scheme must meet this minimum environmental standard. There have been two rounds of funding thus far, with a £30 million budget in 2009-2010 and a £15 million budget in 2010-2011.

The Green Bus Fund aims to support new transport technologies to help “green” the transport sector by stimulating the market for low carbon buses. In 2009, low carbon buses made up only 0.2% of buses operating in England, despite their environmental benefits. The goal of the Fund is to boost the introduction of hundreds of new low carbon buses, showcasing the government’s intention to target investments in areas that promote green growth, including sustainable local transport.

The scheme, organised by the Department for Transport, is part of a wider government commitment to combat climate change. Under the Climate Change Act of 2008, the United Kingdom is responding to the threats of climate change and moving towards a low-carbon economy through a set of legally binding emission reduction targets, or carbon budgets. Four carbon budgets are currently set in law, each covering a five-year period, running in total until 2027. This is part of the Government’s commitment to reducing GHG emissions by 80% by 2050 relative to 1990 levels.

Goals to be achieved through Local Transport Plans

1. Support economic growth
2. Reduce carbon emissions
3. Promote equality of opportunity
4. Contribute to better safety, security and health
5. Improve quality of life and a healthy natural environment

The transport sector accounted for 37% of total energy consumption in the UK in 2010⁹⁵ and is therefore an area where cutting greenhouse gas emissions would have a significant impact in helping the UK meet its ambitious climate change targets. At the local level in England, all local authorities are required, under the Transport Act 2000, to develop Local Transport Plans (LTPs) which must make reducing GHG emissions a central goal. LTPs are thus an important aspect of transport planning in England. Reliable transport is crucial to creating

sustainable communities and it therefore has a significant role to play in achieving Government targets for carbon emission reductions.⁹⁶

⁹⁴ Low Carbon Vehicle Partnership, <http://www.lowcvp.org.uk/lceb/what/index.asp>

⁹⁵ Energy Consumption in the United Kingdom: 2011, Department of Energy and Climate Change <http://www.decc.gov.uk/assets/decc/11/stats/publications/energy-consumption/2325-factsheet-transport-energy-consumption.pdf>

⁹⁶ Energy Saving Trust, 2009

12.2 Benefits

Many environmental and economic benefits can be expected as a result of the Green Bus Fund grants. Low carbon buses have high emission reduction potential by allowing better energy efficiency and relying less on fuel. The low carbon buses emit 30% less CO₂ than standard diesel buses and this is an important step towards lowering the impact of road transport on climate change and in helping the UK meet its carbon reduction goals. The low carbon buses also meet the latest Euro standards and therefore help to reduce air pollution, especially important in large urban or congested areas.

The new low carbon buses, most of which will be hybrid-electric, will consume less fossil fuels, providing bus operators with the economic benefit of fuel savings.

Furthermore, the Fund's investment in the transport sector aims to stimulate the market for low carbon transport alternatives and foster further research and development in green technology. The funding will support investment in more low carbon buses as well as addressing the information gap about their performance by requiring successful bidders to share information with industry peers.⁹⁷ Investment in sustainable transport is important in the context of the transition to a Green Economy as it encourages a shift from personal cars to public transport systems, a vital shift necessary for the reduction of GHG emissions from the transport sector.

12.3 Impacts

In the first round, £30 million worth of grants were awarded to 24 bus operators, subsidising the purchase of a total of 349 new low carbon buses.⁹⁸ In the second round, a budget of £15 million was awarded to 14 bus operators, allowing for the purchase of 169 new low carbon buses.⁹⁹ 97% of the new buses will be hybrid-electric vehicles, and the remaining 3% will be all-electric.¹⁰⁰

Green Bus Fund buses will all be in operation by March 2012. Already 187 low carbon buses are in operation in the cities of London, Oxford, Manchester, Reading, Hull, Leeds and Durham.¹⁰¹

Applicants had to commit to sharing information regarding fuel savings and CO₂ emissions to the Department for Transport on a quarterly basis for at least three years after the low carbon buses start operating.¹⁰² As an estimate, according to the Department for Transport, the introduction of these new buses will reduce CO₂ emissions by 16,000 tonnes a year.¹⁰³

The Fund will enable transport operators and councils in every region across England to operate low carbon buses. As more low carbon buses are produced and sold, costs will be reduced. This is likely to encourage green technologies and stimulate the market for low carbon buses, an industry in which the UK is a world leader.¹⁰⁴

⁹⁷ "15m Government funding for green buses", Press release, Department for transport, 6 April 2011

⁹⁸ Department for Transport, <http://assets.dft.gov.uk/publications/green-bus-fund/winningbidders.pdf>

⁹⁹ Department for Transport, <http://assets.dft.gov.uk/publications/green-bus-fund/2010winningbidders.pdf>

¹⁰⁰ "England to have over 500 new green buses", Press release, Department for Transport, 6 April 2011

¹⁰¹ "England to have over 500 new green buses", Press release, Department for Transport, 6 April 2011

¹⁰² Green Bus Fund Round 2 Bidding Document, Department for Transport, <http://assets.dft.gov.uk/publications/green-bus-fund/round2-bidding.pdf>

¹⁰³ Written communication with Matt Sowter, Department for Transport, 2011

¹⁰⁴ "£30 Million for Green Buses to save jobs and reduce CO₂", Press release, Department for Transport, 4 December 2009

12.4 Way forward

The success of the Green Bus Fund has demonstrated the environmental awareness of transport operators in England and their willingness to incorporate low carbon buses into their fleets. Targeted investment by the government in the public transport system is an important step in moving towards a Green Economy by reducing the costs to the environment (and thus society) that come with an over-reliance on personal cars.

Continued government investment in sustainable, reliable and low carbon public transport could take a number of different paths. It could extend its focus on vehicles and continue to help fund low carbon buses, not only to add to existing bus fleets, but to replace existing diesel and petrol-based bus fleets. It could also turn to investment in green transport technology and renewable energy to stimulate the growth in technologies for alternative fuels and low-carbon vehicles.

The Departments for Transport; Business, Innovation and Skills; and Energy and Climate Change have joined forces and put together experts and funding to establish an Office for Low Emission Vehicles. They are committed to reducing the impact of road transport on the environment and keeping the UK automotive manufacturing industry in a leading position, so as to better embrace opportunities of this rapidly expanding market. These efforts are likely to prove significant in achieving the UK government's climate change targets.

13. Ukraine – Energy Sector Development through Co-Generation Technologies

13.1 Introduction

Creation of energy-generating capacities based on co-generation technologies is one of the most important trends of the modern energy sector development¹⁰⁵. In addition, co-generation is considered today as one of the means to reduce greenhouse (CO₂) and harmful (NO_x, SO₂) gas emissions in the energy sector. In this regard, Ukraine has developed a new alternative electric power sector based on large-scale usage of co-generation technologies and an ambitious approach to their implementation.

Currently, Ukraine uses combined production technologies to generate about 9% of its electric power. A total of 3.100 MW of electric power generating capacities are installed through combined heat and power plants (CHP). However, most of the combined production technology plants date from the Soviet period, have low fuel efficiency and require modernization.¹⁰⁶

Main sectors applying co-generation technologies:

- Municipal heat supply;
- Industrial heating power sector;
- Gas and transportation system (use of residual waste energy potential);
- Agrarian and industrial complex (in energy biotechnologies);
- Social and business sectors (health care, training and sport complexes, etc.);
- Modernization of existing condensation power plants (CEPP) based on the use of co-generation technologies.

Behind the reform of the Ukrainian energy sector stands the adoption of the law “On Heat Supply” in 2005. It ensures the conditions for reliable heat supply to households.

Furthermore, the law also creates incentives to modernize the energy sector by regulating heat supply systems based on the implementation of co-generation technologies (e.g. renewable heat technologies), state-of-the-art energy-saving technologies, and applying devices of metering and regulation of consumed heating power.¹⁰⁷

The additional law “On Combined Production of Heating and Electric power (Co-generation) and Usage of Residual/Waste Energy Potential” of 2005 further regulates issues of implementation and operation of CHP and creates incentives for economic entities to use co-generation technologies.

13.2 Benefits

Ukraine has a significant potential for the implementation of co-generation technologies in different sectors, such as in the fuel and energy, machine-building and chemical industry. Co-generation technologies have become an integral part of the modern energy sector development in Ukraine owing to government policy reforms. They have created an attractive framework for investors with payback periods for co-generation capacities between 1,5-5 years, depending on plant complexity, energy carrier prices and type of equipment. The minimum cost for construction of a CHP ranges today between USD 300-600/kW, with construction terms normally not exceeding 1-1,5 years.¹⁰⁸

¹⁰⁵ National Case Study Ukraine, Agency for Rational Energy Use and Ecology (ARENA-ECO) for the United Nations Economic Commission for Europe, 2010

¹⁰⁶ National Case Study Ukraine, Agency for Rational Energy Use and Ecology (ARENA-ECO) for the United Nations Economic Commission for Europe, 2010.

¹⁰⁷ Ukraine: Improving Energy Efficiency and Promoting Renewable Energy in the Agro-Food and other Small and Medium Enterprises (SMEs) in Ukraine, Project Proposal UNIDO for the GEF, April 2011.

¹⁰⁸ National Case Study Ukraine, Agency for Rational Energy Use and Ecology (ARENA-ECO) for the United Nations Economic Commission for Europe, 2010.

Combined generation of heating and electric power permits a 20-30% reduction of fuel consumption. Calculations by the Ukrainian government foresee that the replacement of every 1.000 MW of exhaust capacities of heat electric power plants with co-generation plants would allow for savings of up to 1,5 million tonnes of conditional fuel per year. It would also lead to a reduction of 4 million tonnes of CO₂; 2.500-3.000 tonnes of NOX; 50.000 tonnes of SO₂; and about 25.000 tonnes of solid waste a year.¹⁰⁹ In boiler houses, combined generation of heating and electric power enables installing up to 6.000 MW of electric power-generating capacities followed by the industrial energy sector accounting for about 8.000 MW. Based on Ukraine's gas transportation system, it would be possible to create up to 2.000 MW in new capacity.¹¹⁰

13.3 Impacts

Co-generation technologies in Ukraine have led to:

- Increased fuel usage efficiency, which is the highest in the heating power sector running over 90% and, subsequently, low prime cost of generated energy;
- Significant reduction of harmful emissions, including greenhouse gas emissions;
- Lower costs of generated energy transportation as co-generation plants must be located physically close to its heat user. This is because it is not practical to transport heat over any distance.

To date, over 130 cogeneration plants with a total capacity of about 270 MW have been commissioned in various industries and sectors:

- 58 plants in the fuel and energy industry;
- 8 plants in the machine-building industry;
- 3 plants in the chemical industry;
- 7 plants in building and construction;
- 16 plants in the housing and utilities sector;
- 31 plants in the agricultural sector;
- 8 plants in the trade industry;
- 4 plants in the services sector.¹¹¹
- Examples of co-generation units installed are the JSC "Zasyadko Mine" (24 units, 3,03 MW each), the CJSC "Illyichevsk Oil and Fat Plant", (4 units, 1,41 MW each), the National Bank of Ukraine, Bank Note Paper Mill, Malyn town (2 units, 1,05 MW each) and the Building Materials Plant, Kyiv Region (2 units, 0,33 MW each).

Additional impacts of co-generation technologies:

- Parallel modernization of heat-generating equipment;
- Reduction of transmission and distribution equipment;
- Limitation of deficient maneuvering capacities since CHP can operate in peak-load conditions;
- Creation of social and economic opportunities, such as jobs and the promotion of research and development.
- Co-generation plants can use both conventional types of fuel (coal, natural gas, heating oil, uranium) and renewable energy sources such as biomass or geothermal energy.
- Co-generation plants are also built closer to populated areas, which causes them to be held to higher environmental standards.

¹⁰⁹ National Case Study Ukraine, Agency for Rational Energy Use and Ecology (ARENA-ECO) for the United Nations Economic Commission for Europe, Project "Financing Energy Efficiency Investments for Climate Change Mitigation", 2010.

¹¹⁰ National Case Study Ukraine, Agency for Rational Energy Use and Ecology (ARENA-ECO) for the United Nations Economic Commission for Europe, Project "Financing Energy Efficiency Investments for Climate Change Mitigation", 2010.

¹¹¹ National Case Study Ukraine, Agency for Rational Energy Use and Ecology (ARENA-ECO) for the United Nations Economic Commission for Europe, Project "Financing Energy Efficiency Investments for Climate Change Mitigation", 2010.

Policy reforms have also stimulated the creation and usage of CHP. Owners of co-generation plants have been entitled to free access to electric networks and sale of generated energy as well as granted a right to sell generated energy to the Wholesale Electric Power Market of Ukraine. Moreover, tariffs on power and heating power generated by co-generation plants do not include a target extra charge (taxation) until 2015.

13.4 Way forward

Ukraine has created a sound enabling legislative and regulatory framework for the development and implementation of co-generation technologies.

To ensure further development of CHP implementation, amendments to the basic laws to create conditions for timely modernization and upgrading of co-generation plants are currently in negotiation. In that light, Ukraine's parliament is currently reviewing a draft law that would introduce amendments to the "On Heat Supply" law, as well as to the "On Priority Directions of the Innovative Activities in Ukraine (on stimulation of development of cogeneration technologies)" law. If adopted, these amendments are likely to improve the regulations governing cogeneration and hence enable further investment in co-generation technologies.¹¹²

¹¹² Ukraine: Improving Energy Efficiency and Promoting Renewable Energy in the Agro-Food and other Small and Medium Enterprises (SMEs) in Ukraine, Project Proposal UNIDO for the GEF, April 2011.

14. USA – North Coast Conservation Programme-The Conservation Fund

Summary

The North Coast Forest Conservation Program and The Conservation Fund authored the case study summarized below entitled, “Financing Biodiversity, Water Quality, and Climate Change Mitigation in the Big River and Salmon Creek Forests of California” which was published by EcoAgriculture Partners and submitted to UNEP by the USA. The full case study summary is included in this report in Annex 1 and the full case study can be accessed online at the following address: http://www.ecoagriculture.org/documents/files/doc_360.pdf

The North Coast of California is a unique ecoregion with rich biodiversity and economically productive forests. Animal species such as the northern spotted owl, marbled murrelet, mountain lion, salmon, and steelhead can be found there, as well as plant species including Redwood and Douglas fir. However, the region is undergoing development pressures that would increase fragmentation of the forest ecosystem and put at risk the sustainability of economic activities and ecological integrity of the area. As a result, forest landowners need innovative economic tools to maintain the forests intact and continue producing sustainable ecological and economic benefits.

The Conservation Fund is a non-profit organization that works with communities, government and corporate organizations in the United States to provide tools and strategies that bring economics and the environment together to fulfil their conservation priorities. It works with partners to conserve land, train leaders and invest in conservation. The case study highlights the purchase by The Conservation Fund of two large tracts of land on the Northern Coast: The Big River (11.770 acres) and Salmon Creek Forests (4.250 acres) to demonstrate how innovative financing opportunities can promote sustainable forestry that provides habitat restoration, water quality protection, climate change mitigation and local jobs.

The ecosystem services associated with the Big River and Salmon Creek Forests are (1) permanent protection of open space and fish and wildlife habitat, (2) water quality protection and enhancement, and (3) climate change mitigation. The Conservation Fund was able to access payments for ecosystem services at levels sufficient to fund the purchase of the forests and meet its debt service, management and other financial obligations while permanently protecting the forests, enhancing water quality, and increasing carbon sequestration.

Annex 1:

Case Study Brief prepared by The North Coast Forest Conservation Program and The Conservation Fund, published by EcoAgriculture Partners as part of the Farm of the Future project series

FARM OF THE FUTURE

Working lands for ecosystem services

BIG RIVER and SALMON CREEK FORESTS | Northern California

The Big River and Salmon Creek Forests are located along the Northern Coast of California. The Conservation Fund purchased these properties to demonstrate how innovative financing opportunities can promote sustainable forestry that provides habitat restoration, water quality protection, climate change mitigation, and local jobs.

The Conservation Fund's 11,770-acre Big River property and 4,250-acre Salmon Creek property are part of a stretch of Redwood and Douglas fir forests that comprise one of the richest and rarest ecosystems in the world. The temperate rainforests in this region provide critical wildlife habitat and are highly productive economically, supporting nearly half of the state's annual timber revenues and 16 percent of the local jobs. Many of California's forest-based communities are at a crossroads: timberland divestitures and growing development pressures in the region threaten the long-term sustainability of these forests and the ecosystem services they provide. The Conservation Fund purchased the two forest properties to protect them from development and to maintain them as financially viable, working forests.

The new forests. The Conservation Fund's sustainable harvesting plan maintains productive timberland that generates carbon credits, improves water quality, and conserves habitat for coho salmon, steelhead trout, and spotted owl. The lands are now permanently protected under a conservation easement from subdivision, development, overharvesting, and conversion to non-forest uses. Land stewardship practices involve:

"Light-touch" timber harvests. Sustainable management practices include reduced harvests below historical levels and lengthened rotations. Light-touch harvests and restoration activities provide timber revenues, improve stand conditions, and generate employment for local foresters, loggers, and equipment operators. On average the forests produce nearly three million board-feet of high quality Redwood and Douglas fir saw timber per year, contributing to the local economies of Fort Bragg, Ukiah, and other communities in Mendocino County.

Carbon sales. The Conservation Fund diversifies forest revenues by selling carbon offsets through California's Climate Action Reserve. The Conservation Fund has contracted to sell 1,094,578 Climate Reserve Tonnes (CRT, a verified metric ton of sequestered carbon dioxide) expected to be produced by the forests between 2007 and 2016. Carbon offset buyers include Pacific Gas and Electric Company, the Disney Company, and United Parcel Service. The total value of the CRTs sold and contracted for sale exceeds \$7,000,000.

Riparian habitat restoration and preservation. New management practices have restored riparian habitat for coho salmon and other species. Sediment, nutrient, and temperature loading to the watershed are minimized by widening riparian buffers and keeping the land in forest cover. Using silvicultural techniques such as single-tree selection ensures functional buffers and promotes forest and aquatic diversity.

Wildlife protection. The parcels' proximity to other large forest tracts and protected lands allows for the creation of a landscape-scale preserve with connectivity, leading to a higher-functioning ecosystem. Twenty-two northern spotted owl activity centers are found within the two forest

parcels and so is habitat for nine other endangered or threatened species. The forests' Redwood habitat provides food, cover, and special habitat features for 193 wildlife species.

The business model. The Conservation Fund was able to purchase the Big River and Salmon Creek Forests through an innovative combination of state grants and a low-interest loan. Using the existing State Revolving Fund mechanism usually reserved for financing “grey” infrastructure projects like municipal wastewater plants, the Conservation Fund secured a below-market-rate loan from the State of California to finance a substantial portion of the land purchase and water restoration activities.

The lower debt-service payments represent a savings of almost \$500,000 a year, allowing the Conservation Fund to reduce the amount of timber sales needed for income and realize its “light-touch” harvest objective. As a supplementary income source, carbon sales have provided a substantial hedge against fluctuating and downward-trending timber prices. The new carbon income stream also makes standing timber more economically competitive.




LESSONS LEARNED

Creative financing is often needed. The use of the State Revolving Fund highlights the potential for leveraging existing public finance vehicles to bring ecosystem services projects to fruition. In addition to the low-interest loan, the purchase could not have moved forward without private support and dedicated funding from two other state agencies, the Coastal Conservancy and the Wildlife Conservation Board. The State grants provided nearly 30 percent of the funding, and public agency recognition of the value of forest ecosystem services was fundamental to preserving these working lands.

Diversify, diversify. With the dramatic decline in the price of delivered logs in 2009 and 2010, the revenue from the sale of carbon offsets enabled the Conservation Fund to break even on the land purchase and make loan payments. Payments for ecosystem services diversify income sources and alleviate financial risk, making sustainable management an attractive strategy.

Conservation takes teamwork. Involving stakeholders from all relevant sectors, including loggers, restoration contractors, state agencies, and conservationists, provides the strong foundation required for the long-term success of a multidisciplinary effort such as working forest conservation.

Four-Year Average Revenue, 2007-2010

Source	Revenue	Percent
 Delivered logs	\$1,509,404	53%
 Carbon offsets	\$1,029,688	36%
 Charitable contributions	\$285,391	10%
 Restoration grants	\$17,009	1%

Initial land purchase was possible due to a grant for watershed services and a low interest loan.
Revenue calculations and all financial information provided by the landowner.



Farm of the Future case studies were produced by EcoAgriculture Partners with support from the USDA Office of Environmental Markets. Funding was provided through a cooperative agreement with the USDA Natural Resources Conservation Service.



(Note: Photographs from the original have been removed because of file size limitations)

Annex 2:

List of other cases submitted to UNEP

Austria – Growth in Transition

Timeframe: 2007 - ongoing

Project: To trigger a multi-stakeholder dialogue on economic growth and sustainability. Currently, a set of policy papers is being developed by various stakeholders for the second international conference “Growth in Transition” in Vienna, 2012.

Belgium – Federal Action Plan for Sustainable Public Procurement (circular P&O/DD/1)

Timeframe: 2009-2011

Scope: National

Sector: public procurement

Belgium – Brussels Sustainable Economy Project

It aims at creating economic activity and green jobs by stimulating the most promising sectors

Timeframe: 2009-2013

Scope: Local

Sector: renewable energy, green building, waste, water, green chemistry and green and white biotechnology and sustainable food

Financing scheme: € 2 million

Belgium – Local Agenda 21 (Programme)

Through its “agenda-Iris-21” programme, the Brussels Environment Administration provides financial and methodological support since 2007 to 14 municipalities and 5 public centres for social assistance (CPAS) implementing local Agenda 21 projects.

Timeframe: 2007 – present

Scope: Municipalities

Sector: energy efficiency, renewable energy, waste, water

Belgium - Wallonie Plan Marshall 2.vert

Timeframe: 2009-2014

Sector: All sectors are included

Social Benefits: development of green jobs

Financing scheme: €388 million.

Belgium – Programme fédéral “Politique des Grandes Villes”

Timeframe: 2001- present

Scope: Local

Social Benefits: development of green jobs

Financing scheme: €10 million per year per city

Bulgaria – Green Public Procurement (GPP)

Timeframe: 2009 – ongoing

Development of a National Action Plan on GPP (in the adoption process) and the establishment of a central purchasing body. The first GPP for purchasing of recycled paper proved to be successful.

Bulgaria – Green Job: Introduction of economic incentives to green jobs

Timeframe: 2011 (starting)
Economic Incentives: State subsidies to employers, who continuously hire unemployed persons for 'green jobs', for up to 6 months (240 BGN per month).

Croatia - Reform to Promote Renewable Energy Sources in Building Sector: A Case Study prepared under UNECE's Financing Energy Efficiency Investments for Climate Change Mitigation (FEEI) Project

The study identifies potentially attractive investment projects on Renewable Energy Sources – Heat and Cool production (H/C). Missing secondary legislations for (RES-H/C) were also identified.

Sector: renewable energy, building

Finland – Development of diesel engines for ships with reduced emissions at Wärtsilä (Initiative R&D)

Timeframe: 2004 – present

Scope: Local

Sector: transportation

Financing Scheme: Public-private funds

Eco-innovation: Increase of public-private partnerships (e.g. ABB), Co-operation between Wärtsilä and universities.

Resource and Energy Efficiency: Efficiency rating of up to 76 % of engines.

Environmental Gains: Reduction of particles, sulphur dioxides and nitrous oxides.

Kazakhstan - River basin plan for Balkhash Lake conservation and green economy development

Scope: Local

Sector: ecosystem management

Plan: To develop target indicators and key lines of action for the conservation of Lake Balkhash

Poland - Green Investment Scheme (National Fund for Environmental Protection and Water Management (NFEPWM))

Initiative through the Polish Act on Management of GHG Emissions and EU

Directive 2006/32/EC on Energy Efficiency

Timeframe: July 2009 – present

Scope: National

Sector: energy efficiency, renewable energy (bioenergy and wind Energy)

Financing Scheme: €80 million for geographical information system, €7-8 billion for energy efficiency actions in 2010-2017

Resource and Energy Efficiency: More than 1 TWh energy savings in 2186 projects in 2009

Russian Federation (Moscow) - Energy Efficiency Lighting Systems in Moscow, Moscow region and Nizhniy Novgorod region - Regional Task Programme

Timeframe: 2008 – present

Scope: Local

Sector: energy efficiency

Financing scheme: US\$160.000 (US\$25.000: Grant of Global Development Alliance)

Economic/Financial gains: US\$47.000 in energy savings

Switzerland - Federal Council's Decision for a Green Economy

Six fields of action are:

- Master Plan Cleantech – strategy to advance clean technologies;

- Fiscal system – examining measures to create ecological incentives;
- Elaborating measures for a resource-efficient Information and communication technologies;
- Environmental product information, examining measures;
- Beyond GDP – elaborate indicators for the environmental situation;
- Elaborating instruments to consider environmental impact of new decrees.

Switzerland – Economic Instruments

Economic Instruments: CO2 tax, Gebäudeprogramm (financial support for investments in buildings to improve energy-efficiency), distance-related fees for heavy vehicle