

Low Carbon Economy

Policy and Project Review

Background Paper I



This background paper is an outcome of the project EFFECT – Dialogue Platform on Energy and Resource Efficiency in the Baltic Sea Region. EFFECT is a Thematic Partnership (TP) funded by Swedish Institute and led by the Council of the Baltic Sea States (CBSS) with its Unit Baltic 21. This paper has been written by Stefanie Lange Scherbenske and Liisa Perjo at Nordregio (Nordic Centre for Spatial Development) as partner in the project.

The paper is part of the collection and mapping of good practices, indicators and success factors on the transition to low carbon economy. This background paper shall support EFFECT partners in the pursuit of a common understanding of key terms such as low carbon economy and create a basis for further discussions in the project.

More information on EFFECT: <http://www.cbss.org/EFFECT>

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1 Introduction

Becoming a low carbon economy is a policy goal for both the *European Union* (EU) and the Baltic Sea Region (BSR). To tackle challenges such as climate change mitigation and adaptation, energy supply and the sustainable use of resources, a transition process towards a low carbon economy is needed. This requires awareness, involvement and engagement of stakeholders at all levels and smart and sustainable solutions, especially in the energy sector.

This document provides insight into the concept of the low carbon economy. Its implementation is exemplified by introducing different kinds of initiatives and projects, as well as indicators.

Since energy and resource efficiency are thematically prioritised in the Thematic Partnership Project EFFECT – Dialogue Platform on Energy and Resource Efficiency in the Baltic Sea Region, we have focused on energy efficiency related aspects when doing the policy and project review.

2 Low carbon economy – definition

Concepts such as green economy, green growth and low carbon economy became increasingly popular within the international discourse of institutions such as the OECD, UN and EU in connection to the financial crisis in 2008 as potential ways out of the economic crisis (Olsen 2012; Allen & Clouth 2012). Each of the concepts has been used in a variety of ways covering a range of concerns such as green innovation or climate change mitigation (Huberty et al. 2011; Allen & Clouth 2012).

The *United Nations Environment Programme* (UNEP) defines green economy as an economy “that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities”. UNEP’s definition is considered as the most widely used definition of green economy emphasising the importance of “getting the economy right” as a precondition for achieving sustainability (EEA 2011; UNEP 2011).

As one of the most active pioneering bodies in developing approaches to green growth, the OECD has defined the concept as “fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities” (OECD 2011).

The *European Environment Agency* (EEA) states that even though the concept of green economy is still debated, several institutions share a common understanding of it as an economy “in which policies and innovations enable society to generate more of value each year, while maintaining the natural systems” (EEA 2011). The concepts of green growth and green economy do not replace the concept of sustainable development. Instead they complement the concept of sustainability by emphasising the importance of the economy, and especially of innovations, for achieving sustainability (Olsen 2012).

When it comes to the concept of the **low carbon economy**, the focus is specifically on greenhouse gas (GHG) emissions. The concept of the resource-efficient low carbon economy has also been used. The concept emphasises the central role of resource-efficiency and energy efficiency for the economy. The low carbon economy has generally been understood as “an economy that produces minimal GHG emissions” (Regions for Sustainable Change 2013). It has also been defined in a relatively narrow sense as an economy “which is characterised by activities which emit low levels of carbon dioxide into the atmosphere” (Levy 2010). The *European Commission* (EC) creates a vision of a low carbon society as follows “we will live and work in low-energy, low-emission buildings with intelligent heating and cooling systems. We will drive electric and hybrid cars and live in cleaner cities with less air pollution and better public transport” (EC 2012).

The main objectives connected to the transition towards a low carbon economy are related to increased energy efficiency, clean and renewable energy, as well as green GDP via technological innovation, involving all sectors. The aim is to identify practices and technologies that produce less GHG emissions while not compromising economic growth. The use of renewable resources as well as energy efficiency shall be increased both in production and consumption (Regions for Sustainable Change 2013). In this respect, green growth is understood as means to make the transition to a sustainable (low carbon) economy (OECD 2009).

To facilitate the shift towards a low carbon economy, a mixture of measures is needed in the form of comprehensive policy responses to reduce carbon intensity. Governments must develop and provide supporting policies and measures, as well as financial resources (Regions for Sustainable Change 2013).

The low carbon economy concept emphasises the essential role of energy efficiency. Energy efficiency can involve the technical efficiency of energy services and/or non-technical factors such as behaviour. According to the *OECD* and the *International Energy Agency* (IEA), individual behaviour is an aspect of energy efficiency and brings together both technical and non-technical factors. Energy efficiency actually builds on both improving the technical energy performance and improving energy management or organisation (OECD & IEA 2012). For further reading on energy efficiency, please see the Background Paper II on Energy Efficiency in the Baltic Sea Region.

3 Low carbon economy in EU policies

In the **Europe 2020 Strategy**, the *European Commission* (EC) outlines three priorities: smart growth, sustainable growth and inclusive growth. Under the priority of sustainable growth, competitiveness, combating climate change and clean and efficient energy are highlighted actions. Under “Clean and efficient energy”, specific objectives have been defined: 20% increase in energy efficiency, 20% of energy from renewable sources that shall help to reduce oil and gas imports, as well as costs and emissions, to secure energy supply and to create jobs. A resource efficient and low carbon economy is the policy goal (EC 2010).

“Resource efficient Europe” is one of the flagship initiatives under the Europe 2020 Strategy and aims “to increase certainty for investment and innovation by forging an agreement on the long-term vision and ensuring that all relevant policies factor in resource efficiency in a balanced manner” (EC 2011c). Thus, the flagship initiative provides a long-term framework for actions in a variety of policy areas, such as climate change, energy, transport, industry and biodiversity and stresses the importance of coordination between the areas (EC 2011c). The initiative published two relevant roadmaps, which are described in the following:

In 2011, the **Roadmap for moving to a competitive low carbon economy 2050** was whereby the EU set up targets related to climate efforts and emphasised the need for innovation and green growth. The roadmap states that energy efficiency will be a key driver in the transition process. The EU could use approximately 30% less energy in 2050 than in 2005. The roadmap further includes an analysis of the current situation in terms of GHG emissions in different sectors and sets sectoral targets for decreasing the emissions. The biggest reduction goals are set to the “power” sector (93-99% reduction by 2050) and the “residential and services” sector (88-91% reduction by 2050). The overall target is to reduce the domestic emissions of the EU by 80% by 2050 compared to 1990 (EC 2011a).

It is stressed that to facilitate reductions in all sectors, innovation and new green technology needs to be promoted. Further, large and sustained investments are needed to develop and establish, amongst other things, various forms of low carbon energy sources, passive housing, carbon capture and storage systems, advanced industrial processes and electrification of transport which are key components of low carbon economy. According to the roadmap, the increase in public and private investment is estimated to be approximately 270 billion euros annually. It is essential, but also challenging, to unlock the investment potential of the private sector and individual consumers and promote additional public-private financing mechanisms (EC 2011a).

The **Roadmap to a resource efficient Europe** was also published in 2011 and outlines how to “transform Europe's economy into a sustainable economy by 2050”. It identifies the key challenges and opportunities in three action lines including transforming the economy, addressing the natural capital and tackling key sectors. The roadmap identifies three conditions that must be fulfilled to reach the target of becoming a resource efficient, low carbon economy. First, Europe will have to take coordinated action in a wide range of policy areas assisted with political support and visibility. Second, it is essential to act rapidly because of long investment lead-times. Many actions require an upfront investment and have long pay-back times even though they can bring actual economic benefits for the EU in the following decades. Third, consumers must be empowered to move to resource-efficient consumption and to drive continuous innovation (EC 2011b).

In March 2013, the EC adopted a **Green paper on a 2030 framework for climate and energy policies**. The paper contributes to developing the 2030 framework and builds on the experiences and lessons learnt from the 2020 framework while also taking the long-term targets of the roadmaps for 2050 into consideration (see above).

The green paper discusses, among other things, what kinds of mid-term targets should be set for 2030, how to promote coherence among policy instruments and how to address the differing capacity of EU Member States in EU policy. It does not provide solutions, but turns to the Member States, EU institutions and other stakeholders for their views concerning lessons learnt from the 2020 framework, targets to be included and instruments to be used (EC 2013a).

In the Baltic Sea Region, the “transition towards a climate adapted and low carbon Baltic Sea Region” is one of the aims of the **European Strategy for the Baltic Sea Region** (EUSBSR) under the Horizontal Action (HA) Sustainable development and bio-economy. The Baltic Sea Region shall become a model region for the green economy, building upon experiences in developing sustainable energy solutions and environmentally friendly technologies in various sectors such as agriculture, forestry and health. Green public procurement and energy efficiency are content to flagship projects (e.g. EFFECT) outlined under the HA (EC 2013b).

4 Innovative Energy Transition – project examples

Energy transition (including energy efficiency) is an essential part of the transition towards a low carbon economy. The concept of energy transition is used to describe the process towards increased energy efficiency and the increased use of renewable energy sources, including a significant change in energy policy. **Energy transition means a transition from fossil or nuclear energy to renewable energy, from centralised to decentralised energy production and from wasting energy to rational energy use** (i.e. energy efficiency) (REScoop project 2013¹).

As the focus of the EFFECT project is on energy efficiency, we will look especially at innovative energy transition as a part of the transition towards a low carbon economy. This chapter provides an overview of what has been done concerning the transition towards increased energy efficiency in different transnational projects in the EU.

A long-term process on the local and regional levels, supported by the national and EU levels, is currently facilitated within partnerships such as the *European Association of local authorities in energy transition* (earlier: Energy Cities network), *Regions for Sustainable Change* or projects such as EFFECT.

The *European association of local authorities in energy transition* has drafted an extensive guidebook with 30 proposals for the energy transition of cities and towns. The guidebook can be downloaded online². The proposals are grouped thematically into:

1. Empowering local actors.
2. Knowing territories' resources and flows.
3. Rethinking finance in general.
4. Inventing new local governance.
5. Urban planning as a way of reducing energy use (Energy cities 2013).

The role of the public sector is central in facilitating energy transition. Local policy needs to address energy issues. All sectors should preferably be included when identifying local energy potentials and

¹ More information on the project can be found at <http://www.rescoop.eu/energy-transition>

² The document “30 Energy Cities' proposals for the energy transition of cities and towns” can be downloaded at http://www.energy-cities.eu/IMG/pdf/CahierWEB_AvecExemples_EN.pdf

territorial resources. In local physical planning, energy transition can in practice be implemented by preparing retrofitting plans for the entire building stock, for example (European Association of local authorities in energy transition 2012).

The *Regions for Sustainable Change* (RSC) project has produced a handbook for European regions called *Building a Low-Carbon Economy*³. The handbook provides tools, methods and guidance, combined with good practice examples from various regions. The four main themes of the handbook present the steps to be taken towards a low carbon economy: 1) establishing a low carbon baseline, 2) prioritising actions, 3) strategic planning and 4) monitoring progress. It also provides policy recommendations targeted to European regions, the EC, national policy makers and experts.

The handbook lists 10 development steps that regions should take to move towards a low carbon economy. In many cases the steps are also applicable at the local level:

1. Ensure the availability of adequate and regularly updated information and data on the regions' emissions characteristics.
2. Decouple emissions and energy use from growth through multiple energy efficiency and renewable energy solutions.
3. Develop policies for energy efficiency and increase the use of renewables.
4. Develop integrated strategic and policy planning for low-carbon development.
5. Prioritise cost-effective low-carbon measures that have benefits for the climate, the economy and the social domain.
6. Establish adequate institutions with delineated responsibility and secure strong regional leadership for achieving low-carbon growth.
7. Actively involve business stakeholders, scientists, academics and the public in the decision-making process.
8. Raise awareness among the public and the business sectors to encourage low-carbon consumer and production choices.
9. Use regional public investment funds as a catalyst for investing in low-carbon development by prioritising spending in stimulating the decarbonisation of the economy.
10. Regularly monitor the region's emission performance to identify where reductions are most efficient (Regions for Sustainable Change 2011).

In the following section, we present a number of finalised and on-going EU projects that concentrate on energy efficiency and the transition process towards a low carbon economy. The projects provide a few examples on how the transition process can be tackled practically and what kind of measures are suitable for implementation. Some of the projects are still on-going and have not published any concrete outcomes yet. We will observe these projects closely and integrate relevant results in our work later on where applicable.

³ The handbook can be downloaded at: <http://www.rscproject.org/docs/RSCStrategicHandbook.pdf>

Project example I: ENSURE (Energy Savings in Urban Quarters through Rehabilitation and New Ways of Energy Supply)

The ENSURE project is financed through the CENTRAL EUROPE Programme and strives for the development of strategies concerning energy retrofits of the building stock and energy efficiency in urban development. The project partners represent local authorities, regional development agencies, research institutions, residential building cooperative, an NGO and a regional finance institution. The project focuses on urban development, energy retrofitting and network of energy info point, financing mechanisms and knowledge management.

The project has produced a best practice publication and a manual for energy efficient urban development, including policy recommendations. The manual underlines the role of innovative financial instruments for energy efficient urban development as the “secret ingredient”. Innovative financial schemes can be targeted at different groups (e.g. public or private owners) or for different uses (e.g. residential or commercial building stock) and different technologies. Also, local or regional climate-energy funds can be developed to support climate measures. The entire manual can be downloaded at the project website: <http://www.ensure-project.eu/>

Project example II: MUSIC (Mitigation in Urban Areas: Solutions for Innovative Cities)

The INTERREG IVB project MUSIC is a cooperation project between cities and research institutes in Northwest Europe focusing on transition processes - aiming at making CO2 reductions an integral part of urban planning processes. The participating cities use a specific transition management method including a series of workshops with numerous stakeholders resulting in a local sustainability vision and action plan. The phases of the urban transition management are described as: preparation and exploration, envisioning and backcasting, agenda building and target setting, experimenting and implementing and finally monitoring and evaluation.

In practice, the participating cities implement pilot projects to test the local action plans and planning tools. For instance, in Aberdeen, a school is being renovated to become more energy efficient, while at the same time raising the awareness of students and their parents on energy efficiency. In Rotterdam, new cooperation models between public and private sectors are being developed to make public buildings less energy consuming. The models are applied to swimming pools and smart roofs. The City of Ludwigsburg is building an energy neutral community centre in a socially and economically weak district where residents get information on energy reduction measures.

The project has also published an urban transition manual that can be downloaded on the project website: <http://www.themusicproject.eu/>

Project example III: RENERGY (Regional Strategies for Energy Conscious Communities)

RENERGY is an INTERREG IVC project developing more efficient energy policies at the local and regional level by means of interregional cooperation. It also contributes to the increased competitiveness and economic modernisation of Europe by turning urban spaces from energy consumers to energy producers.

The project has 11 partners from different parts of Europe, representing regions and municipalities, research institutions and universities, municipalities and innovation and building agencies. In practice, the project is being implemented through case studies and energy labs. The case studies are used to find and analyse best practices. The energy labs are used to identify gaps and needs at the regional level, discuss the case studies and maximise the transfer of knowledge for the regional implementation plans and policy recommendations. The project runs between 2012 and 2014 and is expected to result in a number of outcomes, including policy-oriented cooperation, energy-technology databases, identification of tools for developing efficient energy management strategies at local level, as well as increased funding opportunities to improve energy efficiency. For more information, see <http://www.renergyproject.eu>

Project example IV: RE-GREEN (Regional Policies Towards Green Buildings)

RE-GREEN is an INTERREG IVC project aiming at improving regional development policies and promoting green regions. "Greening" the building sector through the enhancement of energy efficiency and the use of renewable energies through green public procurement policies is a specific focus of the project. The project partners represent local authorities, energy agencies and research institutions. The project aims to identify and transfer good practices and to develop policy tools and instruments related to greening buildings.

The project started in 2012 and is on-going until the end of 2014. Expected outcomes include a good practices guide, policy recommendations, a system of indicators for green buildings and innovative policy tools in green public procurement. For more information, see <http://www.re-green.eu>

5 Indicators

The partnership *Regions for Sustainable Change* emphasises the importance of indicators and benchmarking for the success of the transformation process. They developed a low-carbon indicators toolkit for governments at different levels. The indicators shall help relevant authorities and institutions to measure the state of play, formulate recommendations and decisions, as well as to define strategies respectively targets. Benchmarking is introduced as a tool to monitor the process.

The following tables depict examples of indicators relevant to energy efficiency (state of play and in buildings; table 1 & 2) and concerning the transition process (table 3). The indicators have been developed within some of the projects presented above. By introducing the indicators here, we want to inform the partners and inspire the work in EFFECT. This creates a basis for the upcoming work in the project.

Table 1: Examples of indicators to assess the state of play (Source: Regions for Sustainable Change 2013 & Odyssee project 2013⁴)

Examples of indicators	Measure unit
CO2/GHG emissions (total)	Tonnes of CO2 or CO2 equivalent
GHG emissions per capita	Tonnes of CO2 equivalent
CO2 emissions per capita	
GHG /CO2 emissions from energy production and use	Tonnes of CO2 or CO2 equivalent
Emissions from energy consumption for electricity generation	Tonnes of CO2 or equivalent
Annual growth in greenhouse gas emissions (also by sector)	Change in emissions (%)
Final energy consumption (FEC)	TOE
Total/final energy/electricity use per capita	TOE/capita
Electricity consumption	TOE or kWh
Structure of energy supply	Percentage
Energy imports, net (by fuel type or country of origin)	Tonnes
Energy prices (with and without) taxes and subsidies for households	USD
Overall energy efficiency gains (industry, transport, households) since 2000	Percentage
Energy efficiency gains in households since 2000	Percentage
Knowledge of climate change	A Gallup poll measures the percentage of respondents expressing awareness of climate change.
Percentage of green consumers	The percentage of people responding "I always do" or "I generally do" when asked "When you buy goods or services, do you select them after considering their impact on the environment?" is tabulated.

⁴ The project, its database and publications can be assessed under: <http://www.odyssee-indicators.org/>

Table 2: Examples of indicators related to energy efficiency in buildings (Source: Regions for Sustainable Change 2013; Odyssee project 2013 & EnSURE project 2011)

Examples of indicators	Measure unit/description
Emissions from public electricity and heat production	Tonnes of CO ₂ or CO ₂ equivalent
CO ₂ /GHG emissions by sector	Tonnes of CO ₂ equivalent
Emission intensity trend in construction and manufacturing sector	Kg/USD
CO ₂ emissions per surface unit	Kg/m ² /year
CO ₂ emissions from the building and the quarter	Tonnes/year
Emissions from the local government/public sector	Tonnes of CO ₂ equivalent
Annual growth in greenhouse gas emissions (also by sector)	Change in emissions (%)
Electricity consumption	TOE or kWh
Structure of energy supply	Percentage
Combined heat and power capacity (useful thermal output)	Btu or kWh
Energy efficiency as % of total energy consumption	Percentage
Total final energy consumed by sectors	TOE
Commercial and public energy consumption and intensities (final energy use per floor area)	TOE, TOE/sq. metre
Energy consumption of households	TOE, Btu
Electricity consumption of households	TOE
Household energy intensities (amount of total residential energy used per person or household or unit of floor area)	TOE/capita
Municipal energy consumption (also per capita)	kWh/capita
Quality of electricity supply (based on public perception)	Score (0-7)
Amount of non-residential and residential floor area certified under recognized green building program (i.e., LEED, Green Globes, Energy Star)	Square metres
Specific heat consumption of buildings joined to the district heating network	kWh/m ³
Percentage of new buildings that are "solar-ready"	Percentage
Consumption per dwelling for space heating	TOE/DW
Consumption of household per m ² for space heating	KOE/sq.metre
Annual energy consumption per surface	KWh/m ² /year
Total annual energy consumption by type of usage (heating, air conditioning, lighting etc.)	KWh/year

Table 3: Examples of indicators related to the transition process (Source: Regions for Sustainable Change 2013 & Odyssee project 2013)

Examples of indicators	Measure unit/description
Carbon dioxide emissions damage (Long-term costs of climate change)	USD, GBP, EUR
Low Carbon Achievement (LCA) Index (progress in reducing the carbon intensity of countries' economies)	Percentage
Low Carbon Challenge (LCC) Index (the distance to go in terms of decarbonisation of the economy)	Percentage
Low carbon improvement index (The ratio between carbon productivity and GDP growth)	Score ranging from -2 to +2
Annual growth in greenhouse gas emissions (also by sector)	Change in emissions (%)
Resources-to-production ratio (ratio of the energy resources remaining at the end of a year to the production of energy in that year)	Years
Energy import dependency/energy resilience	Percentage of energy use/TPES
Local production of renewable energy	kWh
Interconnection between the city's strategy and processes within the municipality	Key processes that have been identified within the municipality are evaluated according to strategic tasks detailed in a city plan, including actualisation of the plan and methods of community planning with public and stakeholder involvement, its connection with an educational plan for municipality employees, including training in community planning techniques.
Governmental measures – Buildings	Renewable energy and energy-efficiency policies and measures for existing homes, existing business premises and new buildings are assessed.
GHG reduction plan in place	Reduction plans in place, plans are being developed, or no plans are reported.
GHG reduction target(s) in place	Reduction targets in place, or no reduction targets are reported.
Participation in international environmental agreements	Score between 0 and 1, with 0 corresponding to no participation and 1 to full participation
Energy-efficiency agencies or renewable energy associations	Tracks whether such agencies exist and assesses their quality and functions.
Legal framework for renewable energy and energy efficiency	Tracks the existence, cover and scope of specific laws that support renewable technologies, impose minimum standards in various areas of energy use, provide guidance for sectoral targets in terms of energy savings, and establish incentives and penalties to encourage the achievement of desirable targets.

Information published externally	Cities actively communicating information about risks and opportunities associated with climate change, details of GHG emissions and reduction plans with stakeholders and cities not reporting communications.
Energy efficiency-related economic and fiscal instruments	Indicates prices, taxes and expenditures.
Subsidies for transport, efficient building technologies and practices, and water/energy saving devices	N/A

6 Summary and outlook

Concepts such as the low carbon economy and green growth have become increasingly important in policy discussion during recent years. The aim of the concepts is to complement the concept of sustainability and emphasise the importance of economy and innovation in reaching the sustainability goals (Olsen 2012). In regards to an energy transition consisting of both increasing use of renewable energy and increased energy efficiency are key factors in the transition process towards low carbon economy and, as noted above, they are also included extensively in EU policy. Furthermore, the role of the building sector as one of the most important contributors to increased energy efficiency has been continuously emphasised.

In this background paper, we have looked at the concept of the low carbon economy and its role in policy, but also moved forward to briefly describe how different EU projects have approached energy transition and especially the energy efficiency of buildings in practice. The initiatives and projects have facilitated the ways in which public actors can make energy transitions and have come up with handbooks and guidelines stressing, among other things, the importance of including all sectors in the work towards more sustainable energy use and identifying local energy potentials and territorial resources. Handbooks and guidelines can provide useful assistance for cities and regions in their own work towards increased energy efficiency and a low carbon economy and is an inspiration for the EFFECT partners.

When committing to an energy transition process, it is essential to find and use the most suitable indicators to measure the current state of play and thereby be able to make informed decisions and prioritisations. Indicators can be used to study the current situation concerning energy by looking at emissions, energy consumption, energy prices and energy efficiency. Further, soft indicators such as climate change knowledge and the percentage of green consumers are applicable to gain a better overview of the current situation among energy consumers.

When the energy transition process is studied, indicators on low carbon achievement (progress in reducing the carbon intensity of countries' economy) can be used, for example. It is also important to look at issues such as the legal framework for renewable energy and energy efficiency as well as the interconnections between the outlined strategy and the actual processes taking place in the municipality or city concerning energy transition. It is also important to study the current situation in different sectors in terms of energy transition. In the building sector, the studied initiatives have used

indicators such as the energy consumption of households and consumption per dwelling for space heating.

In the next steps of the EFFECT project, we will look at different solutions (most likely: low and/or green tech) and practical examples of implementation.

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