ENERGY EFFICIENCY IN THE BALTIC SEA REGION Policy and Project Review

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FOREWORD

EFFECT – A dialogue platform on energy and resource efficiency in the Baltic Sea region.

Becoming a low carbon economy is a policy goal formulated 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 towards a low carbon economy is needed. This requires awareness, involvement and engagement of stakeholders at all levels of governance and smart and sustainable solutions.

Financed by the Swedish Institute the project EFFECT provided a Dialogue Platform on Energy and Resource Efficiency in the Baltic Sea Region between the years 2012-2015 and facilitated learning between partners focused on practice, research and policy.

EFFECT primarily aimed at mapping, fostering and communicating good practice solutions that would attract and enable relevant actors from all levels of governance to jointly develop and implement policies and concrete actions on becoming more energy and resource efficient.

THE PROJECT WAS DESIGNED WITH FOUR MAIN GOALS IN MIND:

- to contribute to more structured and coordinated knowledge exchange
- to boost cooperation in the field of energy and resource efficiency in community planning and management
- to develop policy for green growth
- to systematically increase the availability of good practices and solutions, as well as indicators and success factors in energy and resource efficiency for community planning and management – especially among decision makers to plan and manage their communities to become more resilient

This report gives a glimpse of the state of play and work done within the field of energy and resource efficiency in the Baltic Sea region between the years 2012 – 2015. During these years 'Planet Baltic Sea region' has changed dramatically. Not least due to the further implementation of the EU Strategy for the Baltic Sea region and the alignment of relevant stakeholders at all levels of governance in this respect, enabling new open doors for cooperation, across borders, in the field of energy & resource efficiency. EUSBSR Horizontal Action 'Climate' has become a real home for actions for the 'Low Carbon Economy' in the region. EFFECT has clearly paved the way for this and supported the development of a number of strong networks.

The report has been compiled on the bases of three analytical documents elaborated by NORDREGIO during the project; therefore the focus of this report is three fold.

FIRSTLY, it seeks to give a holistic approach to the term 'low carbon economy' with a main aim to make the terms energy and resource efficiency as well as eco-efficiency more applicable and workable on project and policy level.

SECONDLY, the paper provides an overview of existing policy approaches at four levels: the EU level, the Baltic Sea Region level, the national level and the local level of municipalities and communities.

THIRDLY, it maps and forms a collection of good practices, indicators and success factors on possible ways for transition to a low carbon economy. Its implementation is exemplified by introducing different kinds of initiatives and projects, as well as an indicator's overview of policies concerning energy efficiency, with a special focus on energy efficiency in buildings.

WE WOULD LIKE TO THANK all the partners and experts across the Baltic Sea region who contributed to the successful implementation of this project, especially NORDREGIO – the Nordic Center of Spatial Development, which expertise this report mainly builds on.

More information on EFFECT:
www.cbss.org/EFFECT

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September 2015

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FIRST PART

1/ INTRODUCTION

This document provides insight into the concept of the low carbon economy and energy efficiency. Its implementation is exemplified by introducing different kinds of initiatives and projects, as well as indicators. The aim is to provide an overview of policies concerning energy efficiency, with a special focus on energy efficiency in buildings. The paper provides an overview of existing policy approaches at four levels: the EU level, the Baltic Sea Region level, the national level and the local level.

At EU level, the paper reviews the key energy efficiency policy documents and directives. At the Baltic Sea Region level, the report looks into the EU Baltic Sea Region Strategy as well as other relevant pan-Baltic policy documents.

The European Commission has obliged all Member States to draft National Energy Efficiency Action Plans which have to be updated every third year (since 2007). Plans from the Baltic Sea Region states are studied in this paper. When the national level policies are reviewed, the paper also looks shortly into the Norwegian and Russian energy efficiency policies where information in English has been available.

The study on local level approaches to energy efficiency has been conducted with the EU Covenant of Mayors initiative as the point of departure. To illustrate how local level authorities in the different BSR states can engage in increasing energy efficiency, selected Sustainable Energy Action Plans drafted within the Covenant of Mayors framework are studied. In addition, eight selected examples cover implemented measures and initiatives in the Baltic Sea Region dealing with energy efficiency in newly built or renovated buildings.

Energy efficiency is a concept that for several years has been of increasing importance in policies towards improved sustainability and greening the economy. It is often discussed in connection to increased use of renewable energy sources and it is also integrated in current key policy concepts such as low carbon economy and green growth. Investing in energy efficiency is of crucial importance for meeting future energy demands and mitigating climate change globally. Energy efficiency both reduces greenhouse gas emissions and increases productivity (Sustainable Energy for All 2013).

Energy efficiency aims at reduced energy consumption and production and thus decreased costs and emissions. Energy efficiency is generally understood as using less energy for the same energy service or generating more energy service for the same amount of energy.

> ***"ENERGY EFFICIENCY IS SIMPLY THE PROCESS OF DOING MORE WITH LESS. THE GOAL IS TO ACCOMPLISH THE SAME TASKS AND FUNCTIONS AS BEFORE WHILE USING LESS ENERGY."***
>
> Centre for Sustainable Energy 2013

Measures and activities related to energy efficiency usually address supplying energy or consuming energy. To increase energy efficiency, it is important to address both the supply of energy and energy consumption (Organisation of Economic Cooperation and Development & International Energy Agency 2012).

Energy efficiency measures can address the technical efficiency of energy services or include non-technical factors such as behaviour. According to the OECD and the International Energy Agency (IEA), individual behaviour is an aspect of energy efficiency. Therefore it is essential to improve both the technical energy delivery performance and energy management (including awareness) (OECD & IEA 2012).

Energy efficiency has an essential role for the implementation of broad policies and concepts such as sustainable energy policy, low carbon economy and green growth. In addition to contributing to increased environmental sustainability, energy efficiency measures contribute to economic growth and social development. Energy efficiency can be seen as "means to pursue a range of practical improvements for various levels of society" (OECD & IEA 2012).

Increasing energy efficiency is a task spanning over a variety of sectors (e.g. building, manufacturing industry and transport). Increasing energy efficiency requires involvement of and measures taken by different kinds of actors (e.g. policy- and decision-makers, entrepreneurs, civil society). Among others, the European Union (EU) and the United Nations Environment Programme (UNEP) stress in particular the potential for energy efficiency within the building sector. The building sector is globally one of the largest contributors to (Greenhouse Gas) GHG emissions and responsible for one third of global resource consumption (UNEP 2011).

UNEP has studied the benefits of improving the energy efficiency of buildings in a global perspective, but energy efficiency in buildings is also a key issue at the European level. After the energy sector itself, the building sector has the second biggest potential in terms of increasing energy efficiency and decreasing GHG emission in Europe.

As of now, buildings stand for almost 40% of final energy consumption in Europe. In addition to being a goal in itself, improving the energy efficiency in buildings also brings other benefits for the EU by creating jobs, improving health as well as improving energy security and the competitiveness of the region (EC 2013a).

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).

3/ LOW CARBON ECONOMY AND ENERGY EFFICIENCY IN EU POLICIES

In the following section, the main EU policies related to energy efficiency as policy goals are reviewed. Special attention is paid to measures and initiatives related to buildings as well as to the role of the building sector in increasing energy efficiency. Therefore detailed descriptions of measures related to other sectors that are relevant to energy efficiency such as the transport sector are excluded from this review.

Transition towards a low carbon economy and green growth are central targets of the **EUROPE´S GROWTH STRATEGY: EUROPE 2020.** The Europe 2020 Strategy presents targets for increasing the share of renewable energy in the final energy consumption to 20% and moving towards increasing energy efficiency by 20% (EC 2012c). As an initiative under the Europe 2020 Strategy, the **STRATEGY FOR COMPETITIVE, SUSTAINABLE AND SECURE ENERGY - ENERGY 2020** was elaborated in 2010. It prioritises an energy efficient Europe and presents energy efficiency as the "most cost effective way to reduce emissions, improve energy security and competitiveness, make energy consumption more affordable for consumers as well as create employment". Improving energy efficiency in the building and transport sectors is the first action within the priority area of energy efficiency in the strategy (EC 2010c).

In the framework of the Europe 2020 strategy, the EU has also prepared **THREE ROADMAPS** that are particularly relevant for the issue of energy efficiency: 1) Roadmap for moving to a competitive low carbon economy 2050, 2) Roadmap to a Resource Efficient Europe and 3) Energy Roadmap 2050. Short descriptions of the roadmaps, in terms of energy efficiency, are presented here.

"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** sets up targets for climate efforts and emphasises the need for innovation and green growth in transition towards low carbon economy. It states that energy efficiency will be a key driver in the transition process. The EU could be using approximately 30% less energy in 2050 than in 2005. 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). According to the roadmap, emissions from houses and office buildings can be cut by around 90% by 2050. It is stressed that innovation and new green technology needs to be promoted in order to facilitate reductions in all sectors. 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. Passive house technology and retrofitting old buildings will improve the energy performance. According to the roadmap, the increase in public and private investment is estimated to be approximately 270 billion euros annually. The investments made can be recovered over time through reduced energy bills (EC 2011b).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).

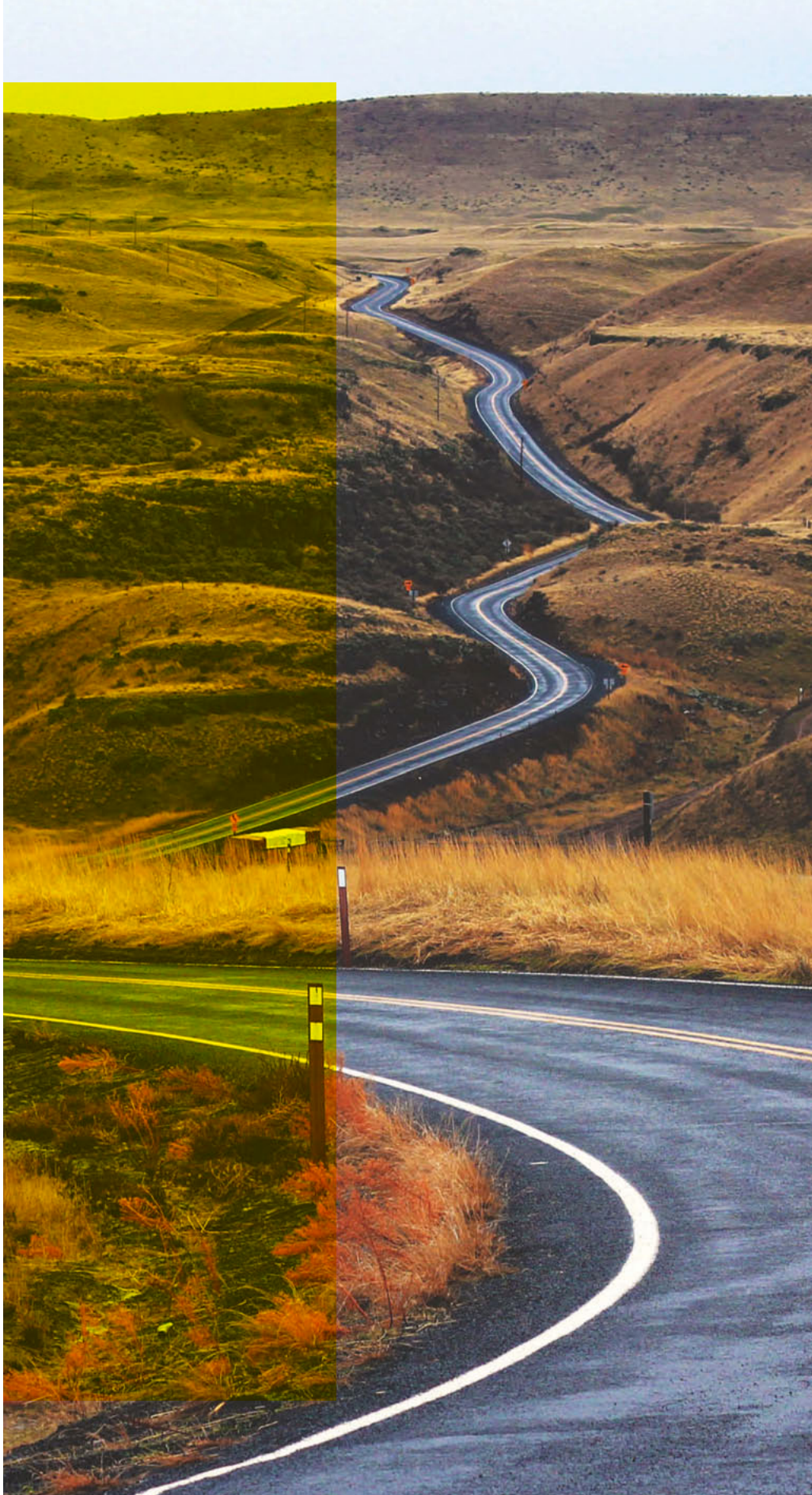
THE ROADMAP TO A RESOURCE EFFICIENT EUROPE was also published in 2011 and outlines how to "transform Europe's economy into a sustainable economy by 2050". It identifies nutrition, mobility and housing as responsible for 70-80% of all environmental impacts in industrialised countries and therefore proposes 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 line with the roadmap the *European Commission* has adopted the Communication 'On Resource Efficiency Opportunities in the Building Sector' in July 2014 (EC 2014c). An impact assessment roadmap published in late 2012 states that existing policy initiatives on environmental performance of buildings have mainly been targeting energy efficiency. The recent initiatives take a more holistic approach by addressing resource use and environmental impacts all along the life-cycle of buildings: from the extraction of building materials to the demolition and recycling of materials. The roadmap on sustainable buildings shows measures to improve the resource efficiency of the sector. These include for instance improving material efficiency, the increase of recycled materials in the construction of buildings as well as supporting a

more intensive use of building in order to reduce the need for a further built environment (EC 2012d, EC 2014a).

In December 2011, the European Commission adopted **THE ENERGY ROADMAP 2050** that also looks at implications that the EU goal of cutting Greenhouse Gas emissions by 85-95% can have on the energy system. It states that energy efficiency should remain the prime focus in transforming the energy system and should be included as a key priority in all decarbonisation scenarios. The roadmap further prioritises improved energy efficiency in both old and new buildings as key actions towards improving the overall energy efficiency of the economy as a whole. Nearly zero-energy buildings should become the norm. Buildings and homes could produce more energy than they use and tools such as smart meters shall provide consumers with improved possibilities to influence their own energy consumption patterns. Both, households and companies should make investments and access to capital should be improved. Further it is considered essential to include incentives to change behaviour (e.g. taxes, on-site advice by experts or monetary incentives). The roadmap emphasises that public authorities need to "lead by example" and use energy criteria in all public procurement. Programmes and technical assistance facilities should be provided to build up capacities among all energy service market participants. Further, EU financial programmes will make energy efficiency a strong condition for financial support (EC 2011a).

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). In relation to energy efficiency, 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) Climate. 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 add content to flagship projects (e.g. EFFECT) outlined under the HA (EC 2013b).

EU DIRECTIVES ON ENERGY EFFICIENCY

As described in the previous section, the European Union has produced several directives, road maps, policies and initiatives related to energy efficiency in its role as a key driver in the transition towards a low carbon economy. In this section, the main EU directives targeting energy efficiency are presented in chronological order.

The **DIRECTIVE ON ENERGY END-USE EFFICIENCY AND ENERGY SERVICES (ESD)** (2006/32/EC) from 2006 established indicative targets and incentives as well as the financial and legal framework for the efficient end use of energy. The ESD set out that all Member States must adopt and achieve an energy savings target of 9% by 2016. All Member States were obliged to outline activities to be implemented in order to reach the target in the National Energy Efficiency Action Plans (NEEAPs). The ESD also obliged the Member States to appoint one or more independent public sector authorities or agencies to monitor the process towards reaching the energy efficiency targets (EC 2006).

In 2010, the EU established a directive on **ENERGY PERFORMANCE OF BUILDINGS: THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD)** (2010/31/EU). The directive focuses on energy efficiency in buildings and declares that each Member State is to establish and apply minimum energy performance requirements for new and existing buildings. All Member States shall also introduce certification of energy performance of buildings and require regular inspection of e.g. boilers and air conditioning systems.

> ***"NEARLY ZERO-ENERGY BUILDING' MEANS A BUILDING THAT HAS A VERY HIGH ENERGY PERFORMANCE […]. THE NEARLY ZERO OR VERY LOW AMOUNT OF ENERGY REQUIRED SHOULD BE COVERED TO A VERY SIGNIFICANT EXTENT BY ENERGY FROM RENEWABLE SOURCES, INCLUDING ENERGY FROM RENEWABLE SOURCES PRODUCED ON-SITE OR NEARBY." (EC 2010A)***

According to the directive, the Member States shall ensure that by 2021, all new buildings are "nearly zero-energy buildings" (EC 2010a). In 2012, the directive was supplemented by the EU Delegated Regulation (No 244/2012) on establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements (EC 2012a).

In 2012, the energy efficiency and energy services directive of 2006 was replaced by a new **ENERGY EFFICIENCY DIRECTIVE (EED)** (2012/27/EU). It sets a framework of common measures to ensure the achievement of the 20% target for increased energy efficiency according to the Europe 2020 Strategy. The EED lays down a series of rules, including those for removing barriers in the energy market and sets out legally binding measures to increase the Member States' efforts for more efficient energy use at all stages of the energy chain. All Member States are obliged to establish energy efficiency obligation schemes or policy measures that aim at increased energy efficiency in households, industries and transport. Further measures concerning the exemplary role of the public sector and the consumers´ right to receive information concerning their energy consumption are included in the directive.

According to the directive, all Member States shall submit revised National Energy Efficiency Action Plans to the European Commission every third year, the next one being due in June 2017. The NEEAPs cover significant energy efficiency improvement measures as well as expected and achieved energy savings in supply, transmission, distribution and the end-use of energy. The European Commission assesses the NEEAPs and the progress made by each Member State. Attached to the NEEAPs, the Member States now also have to prepare new long-term strategies for mobilising investments in the renovation of the national stock of both private and public residential and commercial buildings. The first plans were due in 2007 (EC 2012b).

ENERGY EFFICIENCY PLANS

Based on initial analysis of the second National Energy Efficiency Action Plans submitted by the Member States the Commission identified that the EU is not on track to reach its energy efficiency targets. Following that, a specific new plan for increasing energy efficiency was drafted. The **ENERGY EFFICIENCY PLAN 2011 (EEP)** describes concrete measures that are to be taken to increase energy efficiency and facilitate the transition towards a low carbon economy. The energy efficiency measures will be implemented as part of the wider resource efficiency goal of the EU and the plan will be pursued consistently with the Resource Efficient Europe initiative and the roadmaps drafted within its framework (EC 2011d).

In line with other EU communications, the EEP emphasises that buildings have the greatest energy savings potential. It introduces instruments to trigger renovation processes in public and private housing as well as to improve energy efficiency of the building sector. It also presents instruments related to industry and transport as well as to improve the energy performance of devices used by consumers (EC 2011d).

As a concrete way towards a more energy efficient Europe, the plan stresses that the public sector needs to "lead by example" and engage in steering public spending towards energy efficient products, buildings and services. The EEP also encourages public bodies to at least double the current renovation rate of buildings. From 2019 onwards, public bodies that are subject to the EU Public Procurement Directive will have to take into account energy efficiency criteria for buildings (nearly zero-energy performance level). According to the EEP, the EU will present a legal instrument that obliges public authorities to refurbish at least 3% of their building (by floor area) each year (EC 2011d).

The EEP states that energy performance contracting is an important tool in the refurbishment of buildings. Energy performance contracting means energy performance-based purchasing which results in lower utility bills and lower maintenance brought about by the increased energy efficiency. Energy performance contracting has been proven to be cost-effective in several Member States. It has also been found to be relevant for triggering renovation in public buildings as well as upgrading the energy efficiency in public infrastructure. However there are ambiguities in the legal framework and lack of reliable energy consumption data in many of the Member States, which hinders the use of energy performance contracting. The Energy Efficiency Plan 2011 states that the Commission will bring forward legislative proposals to overcome those problems (EC 2011d).

The EEP has stressed that public bodies can engage in implementing energy efficiency "on the ground" by getting involved in the *Covenant of Mayors*. The Covenant of Mayors is a formal commitment to reduce the signatories' CO_2 emissions by more than 20% by 2020. The local authorities involved describe concrete goals in their Sustainable Energy Action Plans (SEAPs) that they develop in line with the *Covenant of Mayors* methodology and that are formally agreed to by each city (EC 2011d).

Low-energy buildings are prioritized in the EEP and the Member States are invited to establish promotion systems for private sector building. Addressing heat consumption in buildings is an important issue to address in the coming years. The EEP states that the Commission will introduce legislative propositions that require Member States to introduce measures to address the problems that arise in situations where both owners and tenants are reluctant to pay for improving energy performance of a rented property (EC 2011d).

Since energy efficient building solutions are often technically demanding, the EEP stresses that the transition towards energy efficient technologies requires new skills, environmentally-conscious vocational education and training in construction as well as other sectors. The EEP supports the Member States in assessing the need for training in the construction sector[1] (EC 2011d).

The role of *Energy Service Companies* (ESCOs) as catalysts for renovation is defined in the EEP. The ESCOs deliver energy efficiency improvements and can help public authorities to upgrade buildings by grouping them into scalable projects under energy performance contracts. However, both private and public sectors usually lack information on those services. The *European Commission* provides Member States with market information, lists of accredited energy service providers as well as model contracts. Access to financial resources for energy service companies through innovative financing is discussed in the EEP as well (EC 2011d).

Improving the energy performance of buildings is one of the most tangible ways in which energy efficiency can benefit household budgets. Member States are obliged to provide at least 80% of their final consumers with smart electricity meters by 2020 to ensure consumers an opportunity to follow their own energy consumption (EC 2011d).

The European Council concludes - reviewing the NEEAPs 2011 drafted under the Energy Services Directive (2006/32/EC - ESD) - that the Union is presently not on track achieving the energy efficiency target of 20% by 2020 and assesses that there is potential for higher energy savings in buildings, transport, products and processes (EC 2011e).

To remedy this, several steps were taken into account to update the legal framework for energy efficiency. The new Energy Efficiency Directive (2012/27/EU - EED) which is the central tool in the energy efficiency policy set up legally binding measures. These include among others the development of energy efficiency obligation schemes, a 3% annual renovation obligation of central government buildings, the promotion of energy audits and moreover to originate measures to enable and develop demand response as well as to promote efficient heating and cooling (EC 2013c).

Indications of not fulfilling the 9% energy savings target set under the ESD by 2016 are to be reported by the Member States under the EED as part of the NEEAP in 2014. The NEEAP was to be submitted in April 2014 and every third year thereafter (EC 2013c).

1. More information available on http://www.buildupskills.eu.

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 2013[2]).

As the focus of the EFFECT project was 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 online[3]. 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 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[4]. 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).

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

3. 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

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

In the following section, a number of finalised and on-going EU transnational cooperation projects that concentrate on energy efficiency and the transition process towards a low carbon economy is presented. The projects provide a few examples on how the transition process can be tackled practically and what kind of measures are suitable for implementation.

PROJECT EXAMPLE I: ENSURE

(Energy Savings in Urban Quarters through Rehabilitation and New Ways of Energy Supply).

The 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 a network of energy info points, 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: **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 CO_2 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 reviewing, 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: **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: **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 concluded in 2014.The expected outcomes included 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: **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.

TABLE 1: Examples of indicators to assess the state of play

(Source: Regions for Sustainable Change 2013 & Odyssee project 2013[5])

EXAMPLES OF INDICATORS	MEASURE UNIT
CO_2/Green House Gas (GHG) emissions (total)	Tonnes of CO_2 or CO_2 equivalent
Green House Gas (GHG) emissions per capita	Tonnes of CO_2 equivalent
CO_2 emissions per capita	
Green House Gas (GHG) /CO_2 emissions from energy production and use	Tonnes of CO_2 or CO_2 equivalent
Emissions from energy consumption for electricity generation	Tonnes of CO_2 or equivalent
Annual growth in greenhouse gas emissions (also by sector)	Change in emissions (%)
Final energy consumption (FEC)	Tonne of oil equivalent (TOE)
Total/final energy/electricity use per capita	TOE/capita
Electricity consumption	TOE or kilowatt-hour (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	US Dollar
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.

5 The project, its database and publications can be assessed under: www.odyssee-indicators.org

TABLE 2: Examples of indicators related to energy efficiency in buildings

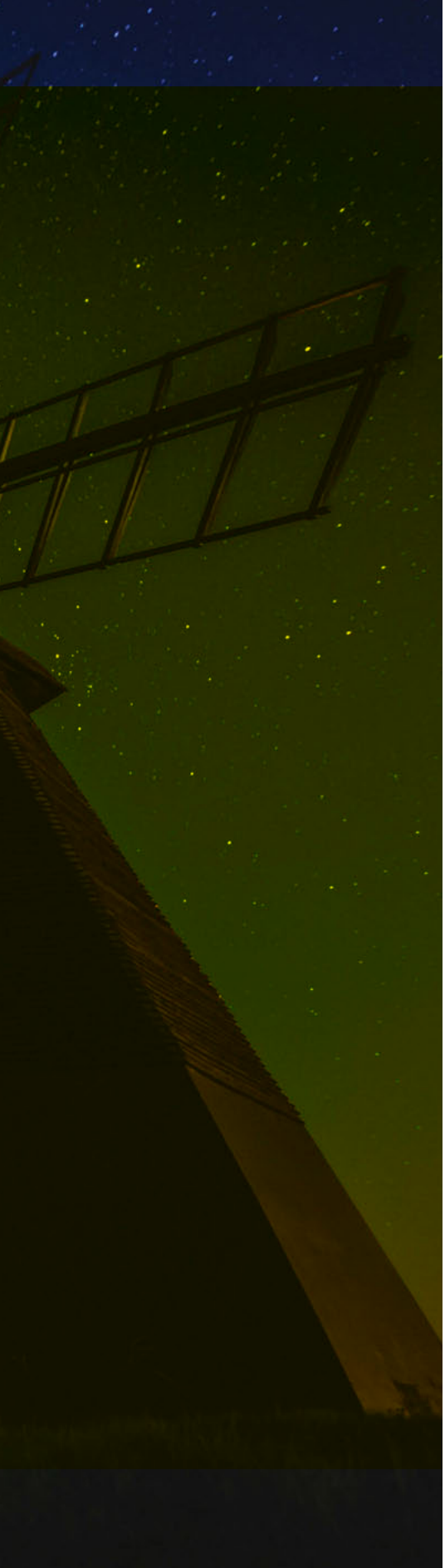
(Source: Regions for Sustainable Change 2013; Odyssee project 2013 & EnSURE project 2011)

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)	British Thermal Unit 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
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 per Dwelling
Consumption of household per m^2 for space heating	Kilotonne of oil equivalent 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/Total Primary Energy Supply 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.



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.

The EFFECT project looked at different solutions of low and/or green tech as well as practical examples of implementation.

SECOND PART

7/ ENERGY EFFICIENCY IN THE BALTIC SEA REGION

The Baltic Sea Region (BSR) is the first macro-region of the EU and includes eight countries (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden). In this section, approaches on energy efficiency at the Baltic Sea Region level by various organisations are reviewed.

In 2009, the EU published the **EUROPEAN UNION STRATEGY FOR THE BALTIC SEA REGION (EUSBSR)**. In 2013 and 2015, the EUSBSR and its Action Plan were revised. The main focus is now on the following three objectives: "Save the Sea", "Connect the Region" and "Increase Prosperity". Energy efficiency has been addressed under the former Policy Area: "Energy – Improving the access to, and the efficiency and security of the energy markets as means to secure energy supply, reduce energy demand and to attain climate, energy and economic targets". The Action Plan states that "there is an urgent need to end the energy isolation of some Member States in the region, to foster market integration, and to support energy efficiency and sustainable energy sources throughout the macro-region" (EC 2013b).

Energy efficiency is integrated into a number of flagships to be implemented within the framework of the Action Plan. Among others, "Promoting energy efficiency measures" is one of the flagships; it aims to ensure the efficient and successful implementation of the Energy Efficiency Directive by exchanging best practices and experience between Member States (EC 2013b).

Energy efficiency has also been an important issue in a number of transnational projects[6] that have received EU funding from the Baltic Sea Region Programme 2007-2013. The projects have dealt with themes such as renewable energy, sustainable technologies and energy efficiency in urban contexts as well as resource savings in buildings.

The pan-Baltic organisation *Union of the Baltic Cities* (UBC) has published a Sustainability Action Programme 2010-2015 identifying inefficient energy consumption and high energy dependency as central challenges in the Baltic Sea Region. The programme states that the current state of material and energy intensity is unsustainable and needs to be addressed at the local level, by cities in the Baltic Sea Region. The important role of the local level and municipalities in increasing energy efficiency is emphasised. One of the goals of the programme is that all UBC cities support energy savings and energy efficiency, but no detailed measures related to energy efficiency are introduced (UBC Commission on Environment 2010).

Energy efficiency and energy savings are also prioritised by the *Baltic Sea Energy Cooperation* (BASREC) that works under the umbrella of the Council of the Baltic Sea States (CBSS). BASREC supports "the development of competitive, efficient and well-functioning energy markets to promote sustainable growth, security and prosperity in the region". The BASREC activities consist of ministerial meetings, meetings of its group of senior officials and executive committee, as well as the previous Project Support Facility with a budget framework of 1 million euros for the period 2009-2011 (CBSS 2013; BASREC 2013).

The following boxes present two projects financed under the *Baltic Sea Region Programme 2007-2013* that deal with energy efficiency:

6 Projects involved: Longlife (Standards for sustainable, energy-efficient residential buildings; see Project example V), SPIN (Eco-innovatice technologies for SMEs), REMOWE (Waste-to-Energy), Co2ol Bricks (Climate protection and cultural heritage), Urb.Energy (Energy efficient urban development for building stocks; see Project example VI), PEA (Public sustainable energy production), Bionenergy Promotion (Biomass-to-Energy) and BalticBiogasBus (Biogas in public transport system).

PROJECT EXAMPLE V: Longlife project

The Longlife project (2008-2012) focused on developing practices, innovative technologies, unified procedures and guidelines for sustainable and energy and resource efficient residential building in the Baltic Sea Region. As the extension stage of the Longlife project, the Longlife Invest initative was undertaken. In January 2013, Longlife Invest started the development of a student apartment building as a Longlife Pilot Building in Klaipeda, Lithuania. In addition, the Longlife Institute e.V. was initiated in connection with the project in September 2011. Longlife Institute is an association for sustainable, energy efficient and resource saving buildings with respect to certification and life cycle analysis. The Institute seeks to continue the international cooperation and harmonisation of building standards in the Baltic Sea Region. It is also possible to apply for a membership in the Longlife Institute.

For more information on the project, see: **www.longlife-world.eu.**

For more information on the Longlife Institute, see: **www.longlife-institute.org.**

PROJECT EXAMPLE VI: Urb.Energy

The Urb.Energy project (2008-2012) addressed the fact that European housing stock is a major contributor to energy waste and CO_2 emissions while the refurbishment rate in the new Member States remains low and sustainable urban development concepts are rarely addressed. The aim of the project was to elaborate and partly implement transferable integrated concepts and strategies for the sustainable and holistic rehabilitation of residential areas in the BSR. The project built upon the results of the BSR Interreg III B project BEEN that focused on strategies to promote the energy efficient refurbishment of the prefabricated housing stock. The Urb.Energy project combined the approach of the BEEN project with an approach for integrated urban development. The project resulted in a number of outcomes, including analyses of potential and constraints in residential quarters in the BSR, manuals and policy recommendation for energy efficient urban areas.

For more information on the project, please see: **www.urbenergy.eu.**

NATIONAL ENERGY EFFICIENCY ACTION PLANS IN BALTIC SEA REGION COUNTRIES

This section provides a review of the second (2011) and third (2014) National Energy Efficiency Action Plans (NEEAPs) of all Baltic Sea Region EU Member States , plus Norway and the Energy Strategy of Russia. The main overall goals and targets for the period up to 2030 concerning energy efficiency are summarised. Measures particularly related to the role of the public sector in increasing energy efficiency as well as measures related to the building sector are presented.

According to the Energy End-Use Efficiency and Energy Services Directive (2006) and later the Energy Efficiency Directive (2012), all Member States are supposed to submit National Energy Efficiency Action Plans to the European Commission. The first NEEAP was to be submitted by June 2007, the deadline for the second plan was June 2011 and for the third plan April 2014. The current deadline for the fourth revision is in 2017. In the NEEAPs, the Member States describe their energy efficiency measures to be taken as well as their progress towards the energy efficiency goals, for example, concerning the shared energy savings target of 9% by 2016 according to the EU Directive from 2006. The NEEAPs also include information concerning the role of the public sector and provide information to energy consumers.

Even though the EU sets the general guidelines on what the NEEAPs shall include, in practice, the characteristics of the NEEAPs vary between Member States. In general, the NEEAPs have different functions in different Member States across the EU. Most of the Member States do not use the NEEAP as an actual policy tool, but instead as an inventory of measures to report the main successes of national energy efficiency policy (Thenius 2012).

When looking exclusively into the NEEAPs of the Baltic Sea Region Member States, it can be noted that scope and character differ. While some of the NEEAPs focus mainly on already implemented measures, others also include extensive descriptions of future activities and clearly defined quantitative targets covering different aspects of energy efficiency.

It should be noted that the Second National Energy Efficiency Action Plans were drafted in 2010-2011, following the former Energy End-Use Efficiency and Energy Services Directive and therefore do not follow the new requirements established in the current Energy Efficiency Directive adopted in 2012. The third NEEAPs submitted in 2014 are the first ones drafted within the framework of the current directive.

DENMARK

The overall objective of the Danish NEEAPs of 2011 and 2014 is to make Denmark independent of fossil fuels by 2050. While the NEEAP of 2011 states that gross energy consumption shall decrease by 4% between 2011 and 2020 compared to 2006, the NEEAP of 2014 even raises the target to reduce gross energy consumption by 12% by 2020 compared to 2006. According to the NEEAP 2014 energy consumption fell by 4.2% between 2011 and 2012, simultaneously the gross domestic product also fell by 0.5%. This entails that energy efficiency improved by 2.6% in 2012. Furthermore the amount of renewable energy was raised by 5.4% in 2012 and presents 25.8% of the energy consumption in 2012. For the period 2008-2016, Denmark sets 9% as target for energy saving. In accordance with Article 7(1) EED the Danish energy saving target of 1.5% each year from 2014 to 2020 is indicated as 6.18 petajoules (PJ) in the NEEAP 2014. Denmark further aims to become one of the most energy efficient countries in the world by 2020.

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

According to the Danish NEEAPs, activities related to energy efficiency in the public sector are incorporated into several policy programmes. A particular "forerunner" role is given to the public administration. Energy consumption in public buildings is to be reduced by 10%. Energy efficient behaviour will be displayed through the procurement of energy efficient products, amongst other measures. State-owned or rented buildings are supposed to be energy labelled as well as constructed and operated as efficiently as possible.

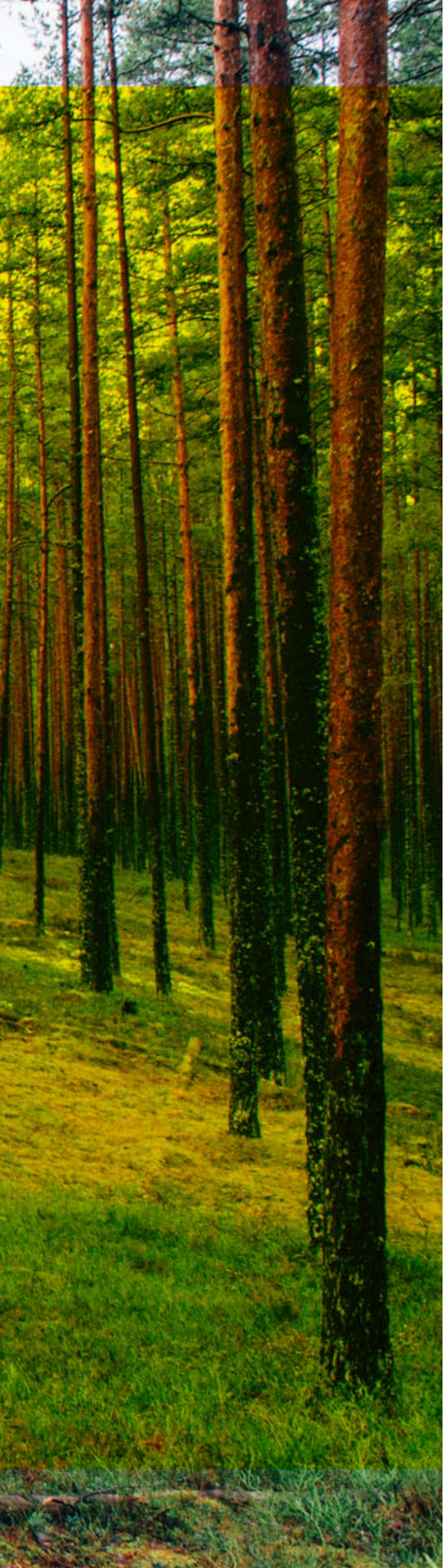
At the local level, energy efficient behaviour and procurement is promoted and a special focus will lie on the energy efficiency of buildings. All local and regional government buildings must be operated and maintained in an energy efficient manner. At the regional level, special attention is paid to energy efficiency in connection to large investments that will have to be made in the future in new hospitals and extensions of existing hospital buildings. Compliant to the NEEAP 2014, the Minister for Climate and Energy entered into agreement with the Danish regions in 2009, concerning energy savings. According to a survey in 2013, 53 of the municipalities stated an energy efficiency plan is in place. Moreover many municipalities at regional and local level agreed to reduce energy consumption or CO_2 emissions locally. The term Climate Communities has been established for communities with the target of reducing the municipalities CO_2 emissions by a minimum of 2% per year (Ministry of Climate, Energy and Building 2014).

ENERGY EFFICIENCY IN BUILDINGS

Tightening up building regulations in 2010 is one of the key measures in the NEEAP 2011. The regulations reduce the limits for the amount of energy that a new building can use by 25% from the 2006 level. The NEEAP 2014 tightens these regulations: the Low-energy Class 2015 aims to reduce energy consumption by 50% compared with the 2006 level. However the Building Class 2020 contains a voluntary framework for cutting the energy consumption of new buildings by 75% (Ministry of Climate, Energy and Building 2014).

Both NEEAPs also stress the major potential for energy savings in existing buildings. They propose requirements for a range of efforts, including an energy framework for new buildings, stricter energy requirements for building envelopes and windows in new buildings, component requirements for minor renovations as well as stricter component requirements for installations and building envelopes in existing buildings. The activities are further supported by information campaigns targeting the building industry and private households. According to the NEEAP 2011, all future buildings will be "positive energy" buildings (i.e. producing more energy than they consume), but no clear schedule for reaching the target is given (Danish Energy Agency 2010). The NEEAP 2014 states that requirements for almost energy neutral buildings will not enter into force until 2018 (Ministry of Climate, Energy and Building 2014).


ESTONIA



In Estonia, the aim is to keep the final energy consumption at the level of 2010 in 2020. The updated "Estonia 2020' Competitiveness Strategy' intends with its energy efficiency objective that final energy consumption should not pass the 2009 level. By 2016, the aim is to achieve energy savings by 9.9 PJ (petajoules) which responds to 9% energy savings (in compliance with the EED). According to the NEEAP 2014 Estonia has not implemented an energy efficiency obligation scheme but makes use of 'alternative measures' which are rather vague.

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

According to the NEEAPs, the public sector in Estonia shall set an example and take on cost-effective energy conservation and efficiency measures. The public sector should also inform the public, produce guidelines and create opportunities for exchange information. To encourage public bodies to adapt measures concerning energy efficiency, Estonia focuses on a 'District Heating Act', putting in order the system of energy production and distribution as well as taking energy efficiency measures into account by implementing an energy conservation programme (NEEAP 2014).

ENERGY EFFICIENCY IN BUILDINGS

The NEEAP 2011 stresses the importance of energy conservation in buildings but also underlines the high economic costs related to the modernisation of buildings to achieve modern energy conservation standards. Measures such as regulations on energy performance of buildings, the modernisation of buildings, tax policy measures, improvements in the skills of construction specialists and applied R&D to ensure analysis of the state of repairs have been implemented to increase the energy performance of buildings. The role of energy performance regulations is well-emphasised and it is stated that Estonia still has a lot to do to ensure high-quality implementation of the regulation.

The NEEAP 2014 highlights the development and provision of financing plans for the reconstruction of buildings as well as regulations on energy efficiency in buildings (Estonian Ministry of Economic Affairs and Communications 2014).

Estonia has drawn up initial proposals for minimum energy efficiency requirements for nearly zero-energy buildings but when the action plan was published in 2011, there was no decision made regarding the schedule for reinforcing the minimum requirements. Even in 2014 the NEEAP does not examine nearly-zero-energy buildings.

The NEEAP 2011 further notes that the reconstruction of existing buildings requires large investments and stresses that reconstructions can be made in situations where state and/or public authorities have adequate budgetary resources (Estonian Ministry of Economic Affairs and Communications 2011). Nevertheless the NEEAP 2014 states that in the period of 2010-2013 investments in the energy performance of 540 public buildings through reconstruction have been made.


FINLAND

The Finnish NEEAP presents on-going and completed activities to reach the energy saving target of 9% by 2016. The new annual target for energy saving is 1.5%. According to the NEEAP 2014 the energy savings in 2010 amounted to 11.9 TWh, which was more than double than the interim target. Calculations state the energy saving projection for 2016 will exceed the ESD target by 43%. Nevertheless the final energy consumption increased by 1.2% between 2011 and 2012, mainly in households and in the service sector (Ministry of Employment and the Economy 2014).

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

All state organisations in Finland prepared energy efficiency plans in 2012 and set comprehensive targets for energy savings according to the Government Resolution on Energy Efficiency Measures of 2010. Related to the energy efficiency of buildings, the central government aims to make its premises approximately 20-25% more efficient. Measures are also set related to the renovation of state property and improving energy efficiency in new construction according to the NEEAP 2011. Providing information for users plays a significant role in reducing energy consumption of the property stock and maintaining energy efficiency. Energy savings are estimated to increase to 11% by 2016 and nearly 16% by 2020. Also Senate Properties (government-owned property asset manager), which manages the majority of the state-owned building stock has signed up to the energy efficiency agreement as announced in the NEEAP 2011. The agreement includes a mandatory energy savings target of 6% for 2011-2016 for the properties and an obligation to prepare an energy efficiency plan. Further, all public buildings of more than 1 000 m^2 must have energy certificates on display.

Finland has introduced an energy efficiency agreement scheme and associated energy programmes for local governments which include – adopting energy efficiency plans, setting an own energy saving target and carrying out energy audits for local government service buildings. Large and medium-sized local governments can enter an agreement with the Ministry of Employment and the Economy. By 2014, 137 local governments had joined the agreement which covers approximately 75% of all Finnish local governments. Moreover an energy saving effect by 2.4% in 2010 has been achieved – annual savings of 3.4 % by 2016 are estimated (Ministry of Employment and the Economy 2014).There is also an energy audit measure that among other things, provides subsidies for energy audits of local government service buildings.

ENERGY EFFICIENCY IN BUILDINGS

According to the NEEAP 2011, the most significant energy saving measures are: more stringent energy efficiency regulations for the construction of new buildings, use of renewable energy sources, advisory services, energy subsidies for residential buildings and energy efficiency agreement work related to oil-heated single-family dwellings.

New energy efficiency regulations for buildings entered into force in 2012. The regulations aim to increase the energy efficiency of new buildings by 20%. Limits for a building's total energy consumption have been set depending on the type of building. In addition to the NEEAP 2011, the Ministry of Environment published a roadmap for improving the energy efficiency of new buildings which aims to have nearly zero-energy construction by 2020. Also, a national plan for nearly zero energy building was drafted in 2011. The regulation and plans mainly address the energy performance of new buildings, but the Ministry of Environment is also in the process of drafting energy efficiency requirements for the renovation of existing buildings (Ministry of Employment and the Economy 2011). According to the NEEAP 2014, national strategies for building renovations include an overview of the building stock as well as cost-effective renovations. In addition cost-optimal levels of minimum energy performance requirements for renovations entered into force in 2013 (Ministry of Employment and the Economy 2014).


GERMANY
HAMBURG

The German NEEAPs include an analysis of existing measures, energy consumption and savings in different sectors. 9% by 2016 is the energy savings target. The NEEAP 2011 stresses that it is central to "wherever possible use market-based elements to increase energy efficiency and to realise energy savings among consumers". Economic incentives and improved information and advice shall help enable both consumers and companies to increase energy efficiency independently.

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

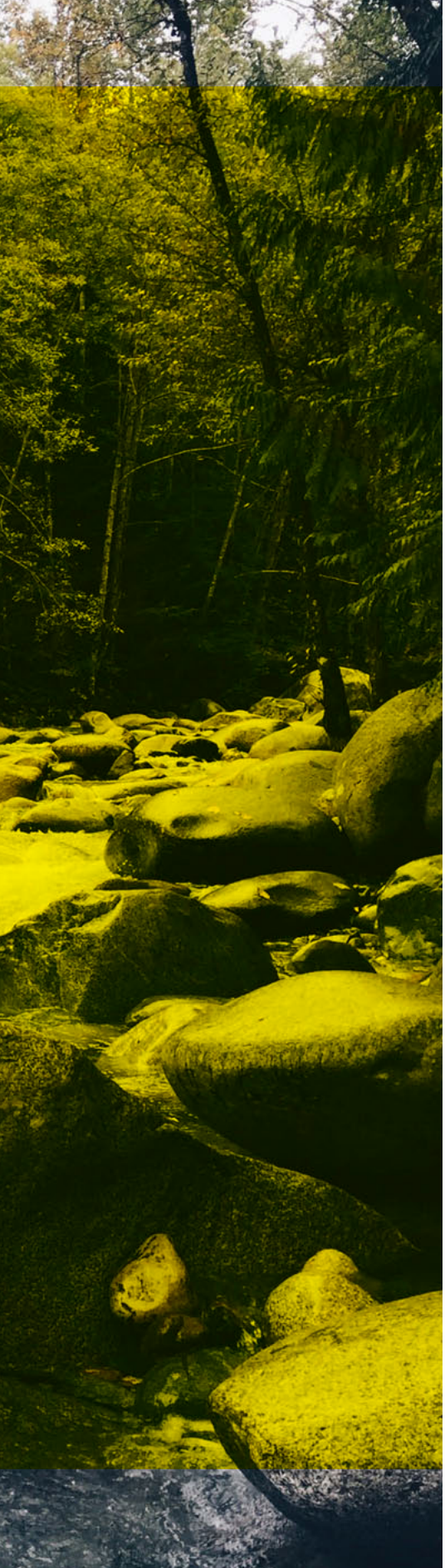
At the state level, initiatives such as procurement guidelines, state economic programmes and programmes for lending to municipalities have been used. The planned measures for the public sector include anchoring energy efficiency criteria legally in the process for awarding public sector contracts. The federal government will continuously engage in developing and promoting the market for energy services. Also, other financial incentives in terms of taxes and funding possibilities are outlined. The analysis done in the NEEAP 2011 shows that the public sector in Germany is already fulfilling its exemplary role. In Germany, the public sector in 13 000 municipalities makes up approximately two thirds of public sector energy consumption. Therefore the NEEAP 2014 stresses that the public sector as the biggest consumer can provide a major impetus by greater application of energy efficient products and services – the potential for increased energy efficiency in the public sectors is substantial. At the local level, energy efficiency measures include a range of investment measures including those for property redevelopment, expansion of local heating networks, replacement of street lights and the leasing of urban roof areas for the expansion of photovoltaic installations. In addition, according to the NEEAP 2014, the Federal Government, Länder and municipalities have been collaborating in the 'Alliance for sustainable procurement' in order to increase the proportion of sustainable products and to exchange experiences. Moreover the government takes an active part at regional and local level by public communication and presenting its energy approach to establish the national 'Energy refurbishment roadmap of Federal Government properties' to increase the energy efficiency in the public building stock. Several federal states have developed their own energy refurbishment plans (Federal Ministry for Economic Affairs and Energy 2014).

ENERGY EFFICIENCY IN BUILDINGS

The main objective here is to reduce heating requirements of the building stock in the long-term. The aim is to achieve an almost climate-neutral building stock by 2050. The required energy would be coming from renewable sources. The mid- and long-term targets of the NEEAP 2011 for the building sector are to double the energy modernisation rate from 1% to 2%, to reduce heating requirements by 20% by 2020, exclusively build new buildings that are climate-neutral and to reduce the primary energy requirement in the building sector by 80% by 2050.

To reach the targets, appropriate and reliable legal framework, time and considerable investments are required. Further a new strategic approach is needed. It is considered important in the NEEAP to define the redevelopment requirements with a long-term perspective so that they can be taken into account in investment plans. However, it is stressed that redevelopment should in no cases be compulsory (Federal Ministry of Economics and Technology 2011). The NEEAP 2014 focuses on the achievements concerning energy audits - the amount of energy consultations increased by 39% by 2011 compared to the base year 2007. Moreover it is stated that efforts are being made to modernize the building stock concerning energy consumption. The Federal CO_2 Building Renovation Programme is the biggest funding programme in Germany. Besides renovation of 3.5 million homes and 1,940 public buildings, building energy efficient new homes is mentioned (Federal Ministry for Economic Affairs and Energy 2014).


LATVIA



The Latvian NEEAP 2011 targets energy savings in both end-use sectors and primary energy savings of 3 484 GWh by 2016. As the residential and transport sectors are the largest energy end-use consumers in Latvia (35,5% and 28,2% respectively), those sectors have been prioritised in the work towards increased energy efficiency.

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

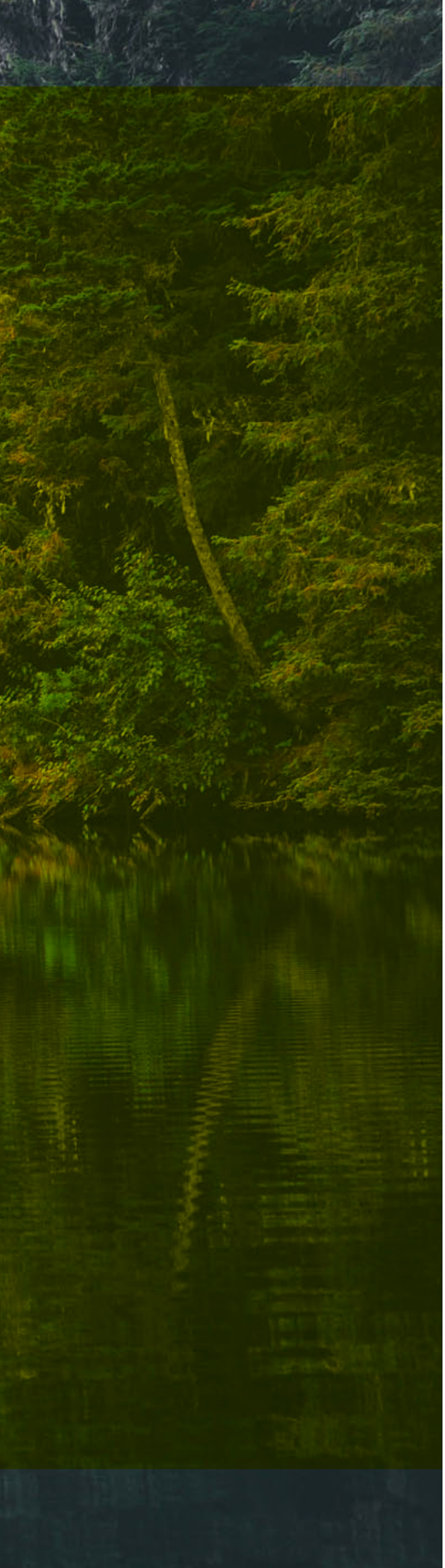
The public sector focuses on improving the energy efficiency of buildings. Energy efficiency of buildings accommodating higher education institutions and local authorities will be improved by preparing energy audit reports, technical inspection reports and calculating the energy efficiency of buildings. These activities will be combined with reconstruction work and improved heating supply. In addition, the Latvian NEEAP 2011 sets out measures to promote the role of the public sector as an example, leading the development towards increased energy efficiency in terms of the procurement of energy efficient equipment and the use of energy audits and the implementation of the resulting cost-effective recommendations.

ENERGY EFFICIENCY IN BUILDINGS

The NEEAP 2011 presents measures to improve the thermal stability of apartment blocks and social housing. The NEEAP states that Latvia has no experience in the construction of nearly zero-energy buildings. When the NEEAP was published, research was still being carried out to lay down specific objectives concerning nearly zero-energy buildings (Ministry of Economics of the Republic of Latvia 2011).

The NEEAP 2014 is not available in English.


LITHUANIA



The Lithuanian NEEAPs also aim at 9% energy savings based on the average final energy consumption during 2001-2005. The Lithuanian NEEAP 2011 introduces specific measures related to households, services, the industrial sector, the energy sector as well as transport sector together with horizontal measures.

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

In the Lithuanian NEEAP 2011 and 2014, the role of the public sector is mainly included in the obligatory chapter on the exemplary role of the public sector. It is stated that energy efficiency improvements in public buildings are being implemented in various programmes intended for 2003-2020. It is also stated that exchanges of experience in the area of energy efficiency will be promoted. However, actual activities are not clearly outlined. Furthermore, the role of green public procurement is discussed. The NEEAP 2014 aims at improving energy efficiency in the sector of residential and public buildings by upgrading them. 48 kilotonne of oil equivalent (ktoe) are to be saved annually by improved heat efficiency, public procurement procedures promoting energy saving by the use of energy efficient appliances. To improve the energy performance of the national pool of buildings the long term strategy focuses on renovation (Minister for Energy of the Republic of Lithuania 2014).

ENERGY EFFICIENCY IN BUILDINGS

The NEEAP 2011 focuses on measures related to housing but does not set targets for energy consumption in new buildings or the share of nearly zero-energy buildings. Lithuania is implementing a multi-apartment building renovation/upgrading programme (2005-2020), where energy efficiency measures such as heating unit renovation, repair and sealing of windows and doors are carried out. The NEEAP 2014 however sets a target for reducing heat energy consumption in buildings by 30-40% by 2020 via upgrading. Buildings with highest energy efficiency improvement potential are prioritised (Minister for Energy of the Republic of Lithuania 2014). Both NEEAPs (2011 and 2014) include various new and planned measures and programmes such as the town of Visagina's multi-apartment building renovation programme and a special programme for climate change and renewable energy (Ministry of Economy of the Republic of Lithuania 2011).


NORWAY

As a non-EU Member State, Norway does not have a National Energy Efficiency Action Plan in place. As an EEA member, Norway has however adapted other energy related directives and, for example, drafted a National Renewable Energy Action Plan applying the EU framework. Norway has also adopted the Energy Performance of Buildings Directive.

The key themes in Norwegian energy policy are improved energy efficiency, flexibility in energy supply and decreased dependency on direct electricity for heating as well as an increased share of renewable energy (other than hydropower) in the energy mix. The target for the proportion of renewable energy is 67.5% by 2020 which indicates an increase of 9.5% from 2005 and is the highest renewable energy target in Europe (Norwegian Ministry of Climate and Environment 2014).

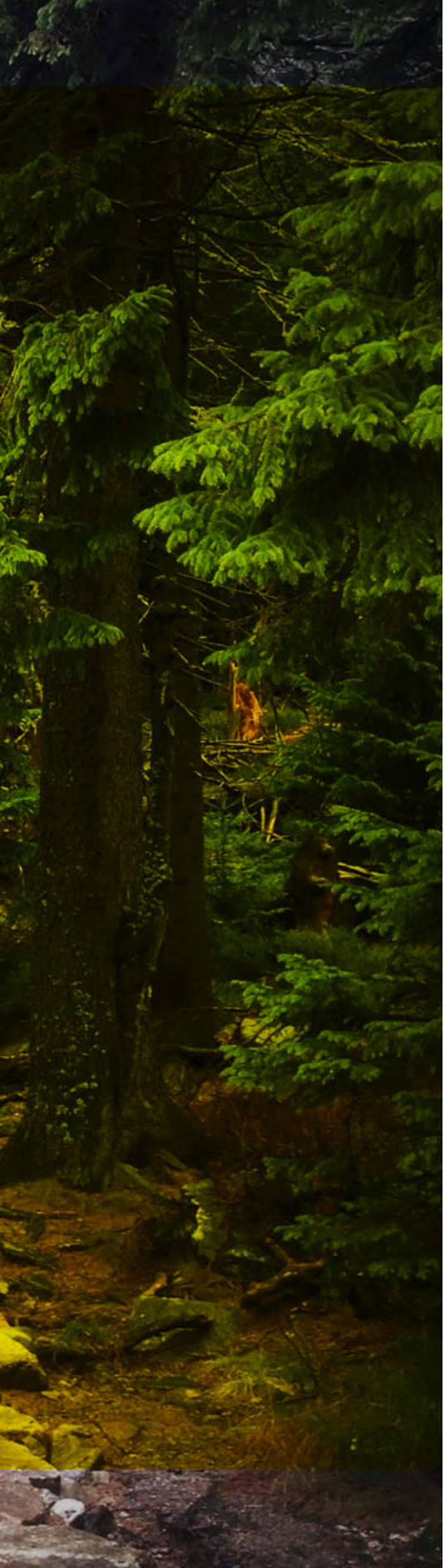
ENERGY EFFICIENCY IN THE PUBLIC SECTOR

The government-owned enterprise Enova SF manages the transition towards more sustainable energy production and consumption in Norway. All municipalities are obliged to draft climate and energy plans. In addition the government plans to phase out the use of fossil fuels in all public buildings by 2018 (Norwegian Ministry of Climate and Environment 2014).

ENERGY EFFICIENCY IN BUILDINGS

Energy efficiency for buildings and the residential sector is supported by financial and legislative measures in Norway. For example, Norway has grant programmes for energy savings in built environment, energy saving loans and information campaigns on the issue. Private and public building owners can apply for grants covering the additional costs of planning and constructing more energy efficient buildings. Enova SF provides free energy saving advice, amongst other things. In 2010, Norway started implementing a new standard for passive and low energy houses, including definitions concerning elements such as heat loss, heating demand and requirements for building components (IET 2012). By broad political agreement on Climate 2012, fossil oils for heating in households and for base load in other buildings are banned from 2020 (Norwegian Ministry of Climate and Environment 2014).


POLAND



The Polish NEEAPs of 2011 and 2014 state that during the last 20 years, Poland has made significant progress towards energy efficiency. Polish energy efficiency policy includes goals to maintain zero-energy economic growth and to consistently lower the energy consumption of the Polish economy to reach the level of EU-15. According to the NEEAPs Poland also aims at 9 % energy saving until 2016 and envisions itself heading into a good direction to fulfil this target.

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

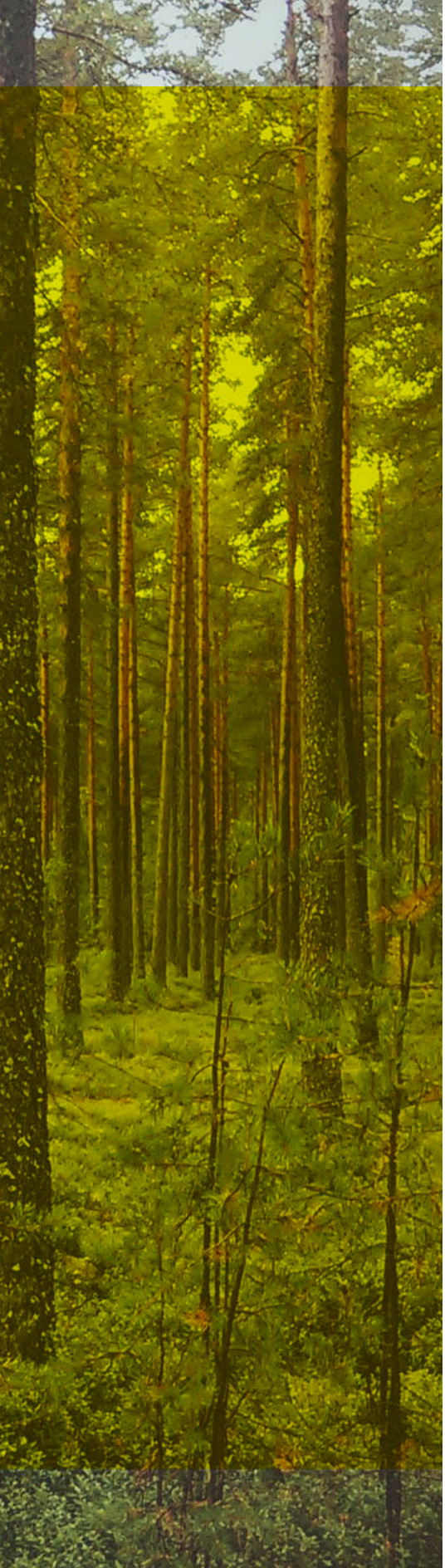
Poland has implemented several measures related to energy efficiency in the public sector, among others, producing an open register of persons authorised to prepare energy performance certificates for buildings. The NEEAPs 2011 and 2014 further include measures to decrease energy consumption in public utility facilities and state that the public sector plays an exemplary role in implementing and promoting buildings with a low energy consumption as well as nearly zero-energy buildings for public utility facilities. Construction of facilities should be awarded primarily (and after 2015 exclusively) to buildings with increased energy efficiency.

Thermo-modernisation is a central theme of the NEEAP 2011 that includes specific activities such as the insulation of buildings, exchange of windows and doors as well as use of energy management system in buildings. Energy efficiency and environmental protection in public procurement are also discussed. The NEEAP 2014 states that from 2014 3% of the total floor area of heated or cooled buildings owned and occupied by the central government bodies is to be renovated each year to at least the minimum energy performance requirements on the energy performance of buildings. New buildings and major renovation activities in existing buildings shall consider the maximum value of the non-renewable primary energy factor (Ministry of Economy 2014).

ENERGY EFFICIENCY IN BUILDINGS

In promoting the energy efficiency of buildings, the NEEAP 2011 focuses mainly on repair investments and thermo-modernisation including lower energy demand for heating. Investors can receive a thermo-modernisation bonus for reaching the requirements set in the Polish legislation (Ministry of Economy 2012). According to the NEEAP 2014 Poland aims at improving the technical conditions of existing housing resources and simultaneously reducing the demand for heating due to a huge existing renovation gap. Additionally the Polish government is introducing stricter regulations concerning minimum requirements for energy saving. At the same time newly constructed buildings are forced to be nearly-zero-buildings. Furthermore Poland is preparing a National Plan intending to increase the number of buildings with low energy consumption focussing mainly on new build buildings (Ministry of Economy 2014).


RUSSIA



The objective of Russian energy policy is "to maximize the effective use of natural energy resources and the potential of the energy sector to sustain economic growth, improve the quality of life of the population and promote the strengthening of foreign economic positions of the country". The main focus is on a transition to the path of innovative and energy efficient development, change in the structure and scale of energy production, development of competitive market environment and integration into the world energy system.

ENERGY EFFICIENCY

In terms of energy efficiency, the aim is to maximise the rational use of energy resources by ensuring that saving energy and using the potentials of organisational and technological energy saving are in the energy consumers' interests. The Russian Energy Strategy provides a list of planned measures for achieving energy efficiency of the economy, but does not set out a detailed description of their implementation or responsible authorities. The measures include:

- Elaborating comprehensive federal and regional legislation concerning energy saving,
- Promoting entrepreneurial energy savings activities,
- Increasing responsibility and penalties for violation of energy savings standards,
- Developing energy savings programmes at all administrative levels and
- Developing international cooperation.

Furthermore, Russia has published a programme called "Energy Saving and Energy Efficiency Improvements until 2020" which aims at reducing the energy intensity of GDP by 40% by 2020 compared to 2007, with 26.5% of reductions coming from structural changes in the economy and 13.5% from new efficiency measures or new construction standards that were approved in 2011 (ABB 2012).

ENERGY EFFICIENCY IN BUILDINGS

Russia aims to implement measures to improve energy efficiency in housing and communal complexes including a method of return on investments, new mandatory construction norms and regulations for effective use of energy for housing properties, public, commercial and industrial buildings, amongst others (Ministry of Energy of the Russian Federation 2010).

SWEDEN

The Swedish NEEAPs of 2011 and 2014 state that the effective utilisation of resources, including energy, is the foundation for economic growth and sustainable development. The objective is to achieve economic growth without increasing energy consumption. In line with the Energy Efficiency Directive, Sweden aims at 9% energy savings by 2016. According to the NEEAP 2014 energy use shall be 20% more efficient by 2020 compared with 2008 and a 20% reduction of energy intensity shall be reached between 2008 and 2020 – these targets were adopted by the Swedish Parliament in 2009. Moreover the proportion of renewable energy sources shall extend. In 2011 36% of the total energy supply already came from renewable energies (Ministry of Enterprise, Energy and Communications 2014).

ENERGY EFFICIENCY IN THE PUBLIC SECTOR

The public sector engages in measures and programmes with both tangible (such as new procurement rules) and intangible objectives (such as increased cooperation). The NEEAP 2011 includes six actions that respond to the Energy Services Directive and each of the 180 state agencies have to implement at least two of those. According to the NEEAP 2014 the counties have to set up their own energy efficiency action plan and have to report the progress annually.

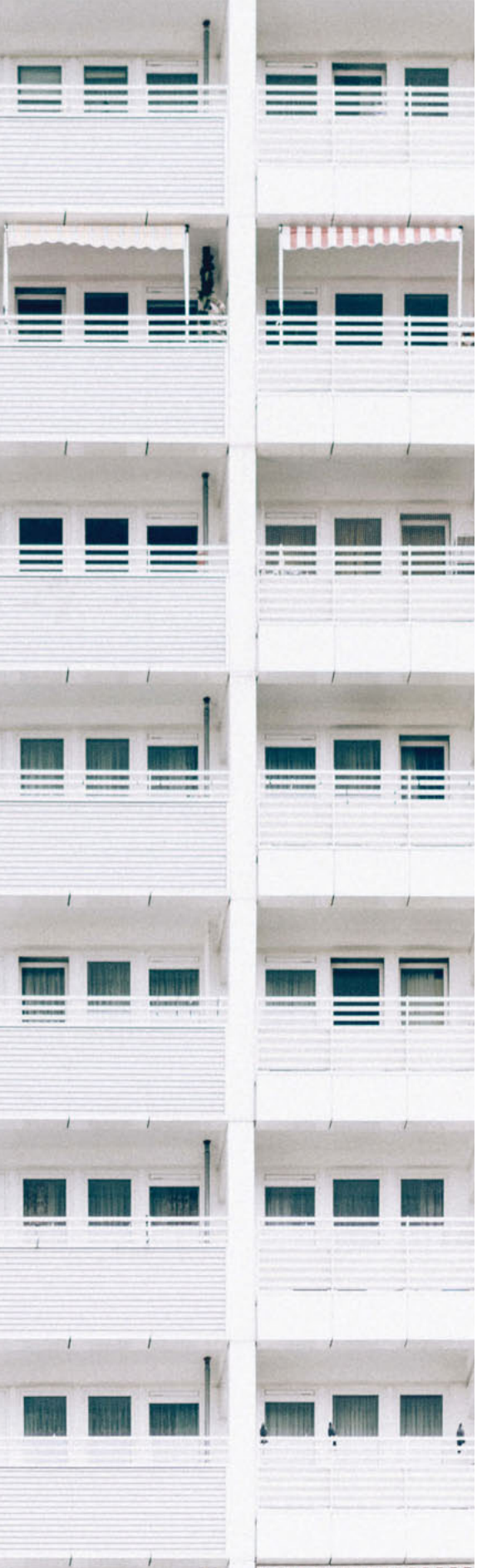
Swedish municipalities and county councils can receive state aid for strategic work on improving energy efficiency. The Swedish Energy Agency and the county administrative boards support and provide information to municipalities. The Energy Agency also runs the Sustainable Municipalities Programme that supports energy efficiency in municipalities and supports possibilities for citizens, households and local business communities to get involved in local energy efficiency work. The municipalities are asked to provide a sound political basis and produce energy and climate strategies.

The NEEAP 2014 states that a 3% annual saving for state-owned buildings is to be achieved. For coordinating these targets a special Energy Efficiency Council has been established (Ministry of Enterprise, Energy and Communications 2014).

ENERGY EFFICIENCY IN BUILDINGS

Swedish building regulations include requirements on energy management as well as upper limits for energy use in new buildings. Furthermore, all buildings that are sold, rented, built or occupied by public authorities must have an energy certificate. In 2011, the general guidance on the alteration of buildings was revised and it became a binding administrative provision. Similar functional requirements are to be applied for both new buildings and renovation. It is the responsibility of the municipalities to ensure that the regulations concerning buildings are followed.

The Swedish NEEAP 2011 includes building-related measures on windows, biofuels and conversion to renewable energy, as well as technology procurement as a method of commencing a shift in the market towards efficient technology. The Swedish Low-Energy Buildings Programme coordinated by the Swedish Construction Federation aims at stimulating the energy efficiency of new buildings. Low-energy buildings are promoted in a five year programme, where developments with buildings with energy consumption at least 50% below the requirements can receive funding (Ministry of Enterprise, Energy and Communications 2011). The NEEAP 2014 contains further measures: as part of the Planning and Construction Act, which sets down minimum requirements for buildings with regard to their energy management as well as mandatory regulations were introduced for modifying buildings. These include energy performance requirements, also for the construction of new buildings. Additionally it is prohibited to heat new buildings with electricity. In 2014 the Swedish Parliament laid down qualitative guidelines and frameworks for energy-management requirements for nearly-zero-buildings and started demonstration initiatives at the same time. As a consequence of the established measures, energy savings for buildings are estimated by 12-15% by 2050 (Ministry of Enterprise, Energy and Communications 2014).



SUMMARY

In compliance with the Energy Efficiency Directive, all EU Member States in the Baltic Sea Region have prepared National Energy Efficiency Action Plans (NEEAP) in 2011 as well as in 2014. In their NEEAPs the countries outline how they are going to reach the energy saving target of 9% by 2016. Depending on circumstances in the countries, Member States prioritise and describe measures differently in their NEEAPs. As stated in the BSR's NEEAPs of 2014 primary energy consumption decreased in the majority of the Member States in 2012 – only Finland and Lithuania have to report an increase.

In all NEEAPs in the Baltic Sea Region, the role of the public sector as setting an example is discussed. The public sector will reduce its own energy consumption but also engage in providing information for energy consumers. In many cases, clear targets are not provided, but for example, the Danish NEAAP states that energy consumption shall be reduced by 10% by each ministerial area.

As another example, the Finnish and Swedish NEEAPs favour agreements between local actors and the state to facilitate the work towards increased energy efficiency in municipalities. Finnish municipalities can enter agreements with the ministry responsible for energy efficiency. The German NEEAP includes lending programmes to municipalities. Swedish municipalities can apply for state aid for strategic work on improving energy efficiency in their own activities.

All of the NEEAPs studied emphasise the need for increased energy efficiency in the building sector in both new and existing public and residential buildings. Furthermore, the NEEAPs set targets on the share of nearly-zero energy buildings. In the third NEEAP of 2014 new programmes such as strengthened regulations concerning buildings have been introduced, e.g. in Denmark, Estonia, Finland, Germany, Latvia and Lithuania (EC 2014b). The Danish NEEAP 2011 also mentions positive energy buildings that produce more energy than they consume. However, specific targets concerning the share of nearly-zero energy buildings are not specified in the Estonian, Latvian and Lithuanian NEEAPs - neither in 2011 nor in 2014 – or the Russian Energy Strategy. A lack of knowledge and experience in constructing nearly zero-energy buildings is mentioned for example in the Latvian NEEAP. The NEEAPs also have a strong focus on heating provision as more efficient heating is an important contributor to the overall energy efficiency of buildings.

The availability of financial investments and funding is essential for increasing the energy efficiency of the building sector. The fact that the reconstruction of existing buildings requires extensive investment, and can only be implemented when adequate budgetary resources are available, is underlined in the Estonian and Latvian NEEAPs of 2011. The Latvian NEEAP of 2014 can boast progress by introducing a new revolving National Energy Fund financing building renovation (EC 2014b). In connection to the redevelopment of private buildings, the German NEEAP highlights that it is essential to have a strategic long-term approach to building redevelopment requirements so that the owners are encouraged and able to take them into consideration in their investment plans.

The table below provides a list of examples of measures concerning energy efficiency in buildings and shall provide an overview of the variety of different measures taken in the NEEAPs. The list is not exhaustive. Many of the measures are implemented in more than one country but mentioned only once to avoid too much repetition.

TABLE 4: Main responsible authorities for NEEAPs and examples of measures concerning energy efficiency in buildings (non-exhaustive)

COUNTRY	RESPONSIBLE AUTHORITY	EXAMPLES OF MEASURES
DK	Danish Energy Agency (2011), Ministry for Climate, Energy and Building (2014)	> Tightening up building regulations for e.g. building envelopes (separators) and other components > Energy efficiency labels for state-owned buildings
EE	Ministry of Economic Affairs and Communications	> Energy conservation in apartment blocks > Programme for renovation loans > Support scheme for reconstruction of apartment buildings especially for insulation and utility systems
FI	Ministry of Employment and the Economy	> Energy efficiency regulations for new buildings > Energy subsidies for residential buildings > Mandatory water meters for homes
DE	Federal Ministry of Economics and Technology (2011), Federal Ministry for Economic Affairs and Energy (2014)	> Investment subsidies and long-term low-interest loans for e.g. energy efficient redevelopment and housing modernisation > Subsidies for low-energy buildings within eco allowances > Funding for on-site consultation by accredited energy advisors (thermal insulation, heat generation and distribution)
LV	Ministry of Economics and Latvian Investment and Development Agency	> Support for low-energy buildings (e.g. energy audits, preparation and approval of design in accordance with efficiency requirements, reconstruction work, replacement of heating supply systems, inspecting building envelopes) > Complex solution to reduce GHG emissions for housing and public buildings
LT	Ministry of Energy	> Energy consumption audits for buildings and certification of specialists performing the audits > Programme for upgrading (e.g. replacement of windows and doors, renovation of heating units, installation of ventilation systems)
NO	Ministry of Petroleum & Energy (2011), Ministry of Climate and Environment (2014)	> Grants for energy savings in the built environment > Free energy saving advice > Energy guidance label “Enova recommends” to promote the best products in terms of energy (e.g. windows and insulation)
PL	Ministry of Economy	> Support system for thermo-modernisation and repair investments
RU	Ministry of Energy	> Mandatory construction norms and regulations for effective use of energy for housing properties and public, commercial and industrial buildings
SE	Ministry of Enterprise, Energy and Communications	> Low-energy buildings programme (at least 50% below the requirements) > Support (state aid) for municipalities and county councils to improve energy efficiency

8/ ENERGY ACTION PLANS IN SELECTED BALTIC SEA REGION CITIES

The Sustainable Energy Action Plans (SEAPs) are an important tool for promoting sustainable energy policy at the local level. In SEAPs, European cities outline actions to reduce CO_2 emissions by at least 20% by the year 2020. Participation is voluntary. As of today, 4375 European cities have elaborated a SEAP. The Covenant of Mayors monitors the implementation of the SEAPs and facilitates the exchange of experiences between participating cities. Every two years (after the submission of the SEAP), the signatories are expected to submit an implementation report outlining the interim results of the implementation of the SEAP.

Generally, the SEAPs are relatively similar in their structure and content, following the guidelines provided by the Covenant of Mayors. Cities can also adapt their SEAPs to their individual needs and contexts however. All signatories have to make a baseline emission inventory, quantifying the amount of CO_2 emissions due to energy consumption in their territories to identify the main sources of emissions as well as to investigate the reduction potentials related to them. In table 5, the main quantitative targets related to CO_2 emissions are presented. The baseline years vary, while the recommendation of the Covenant of Mayors for a baseline year is 1990. In the following section, we present how energy efficiency has been addressed in SEAPs developed by six cities located in the Baltic Sea Region. The plans were chosen based on whether they have been submitted to the Covenant of Mayors and are available to download on the Covenant website, preferably in English.

Furthermore, SEAPs have been selected for the review according to reduction targets (to gain a variety of different targets), status (preferably accepted) and language (preferably available in English language). In addition to the SEAPs of Malmö (SE) and Kaunas (LT), the plans from Frederikshavn (DK), Tampere (FI), Jelgava (LV) and Warsaw (PL) have been reviewed.

TABLE 5: Cities and their reduction targets

CITY	TARGETS
FREDERIKSHAVN SEAP adopted in 2012	> Overall CO_2 emission reduction target: 53% (compared to 2007) > Reduction of CO_2 emission for electricity & heat production, transport: 53% > Increase of renewable energy production to 70% > 100% independent of fossil fuels by 2030
JELGAVA SEAP adopted in 2010	> Overall CO_2 emission reduction target: 20% (compared to 2005) > Energy efficiency increase target: 20% > 20% of the total consumed energy from renewable sources
KAUNAS SEAP adopted in 2010	> Overall CO_2 emission reduction target: 30% (compared to 1990) > At least 50% of multi-storey dwellings planned to be renovated by 2010
MALMÖ SEAP adopted in 2009	> Overall CO_2 emission reduction target: 40% (compared to 1990) > Share of renewable energy at least 50% by 2020 and energy exclusively from renewable sources by 2030 > Decrease in energy use by 20% > Decrease in energy use in the municipality's own operation and companies by 30% > Increase of the share of renewable energy to 100%
TAMPERE SEAP adopted in 2009 (updated in 2012)	> Overall CO_2 emission reduction target: 30% (compared to 2005)
WARSAW SEAP adopted in 2011	> Overall CO_2 emission reduction target: 20% (compared to 2007) > Reduction in use of energy: 20%

As buildings have the greatest potential for increasing energy efficiency, examples of measures related to energy efficiency and buildings are presented in Table 6.

TABLE 6: Examples of measures concerning energy efficiency in buildings

CITY	TARGETS
FREDERIKSHAVN SEAP adopted in 2012	> Consultancy regarding heating and electricity in the private housing sector > Systematic Energy Management in municipal buildings > Energy renovation of existing municipal buildings > Effective insulation of buildings and replacement of building components with the parts that insulates better and/or consume less energy > Recovery of heat by effective ventilation systems > Information and motivation of employees, establishing of cooperation groups on energy savings
JELGAVA SEAP adopted in 2010	> Technical status inspection and energy audit report of multi-residential buildings > Elaboration of concept for energy efficiency improvements of multi-residential buildings > Renovation and energy efficiency improvement of multi-residential buildings > Increasing energy efficiency and renovation of schools (e.g. heat insulation, renovation of water supply and sewage systems)
KAUNAS SEAP adopted in 2010	> Renovation of public buildings (kindergartens, schools, hospitals etc.) to reduce thermal energy consumption (e.g. renovation of heating units and roof insulation) > High-efficiency thermal power plant construction in Kaunas Median University Hospital > Implementation of residential home renovation programme covering more than 50% of Kaunas city housing (e.g. wall insulation, window replacement, installation of individual thermal sensors) > Support for citizen participation in the renovation of apartment houses
MALMÖ SEAP adopted in 2009	> New buildings on municipal land must follow the energy demands in the Environmental Building Programme or aim at A-level efficiency > Information about energy efficiency of buildings provided in connection to e.g. planning permission application processes > Establish dialogue with bigger private real estate owners concerning energy efficiency measures > Use energy mapping as the basis for establishing e.g. efficiency programmes for buildings and structures
TAMPERE SEAP adopted in 2009 (updated in 2012)	> Efficient use of space in public buildings > Maintenance and renovation and fundamental improvement of public buildings to increase energy efficiency in existing buildings > Construction of new energy efficient buildings (close to the best energy certificate level) > Efficient use of space, e.g. decreasing the inside temperature by one degree > Maintenance and renovation (e.g. LED lightning, installation of water saving appliances) > Fundamental improvement of housing (e.g. more efficient heating, installing more energy efficient domestic appliances, and other installations in apartments, especially plumbing)
WARSAW SEAP adopted in 2011	> Comprehensive thermal retrofitting of all residential buildings with standards close to the Thermal Retrofit Act > Modernisation of indoor lighting, replacement of electronic equipment and household appliances etc. > Same measures that are used to increase efficiency in the housing sector are also implemented in public sector buildings > All advances in technology should be used to enrich construction sector, among others passive houses, low-energy houses and energy-efficient houses

9/SUMMARY

The signatories (cities) can choose their focus areas independently, but in principle the Covenant of Mayors expects the SEAPs to cover themes such as buildings, industries, transport, local small-scale electricity production and local district heating, as well as combined heat and power production (CHP). The SEAP Guidebook[7] published by the Covenant of Mayors provides extensive information and guidance on how to draft a SEAP. It presents among other things the preferable SEAP structure and lists the main points to keep in mind when drafting a SEAP.

Being a local level policy document, a SEAP is supposed to have a specific focus on issues where local authorities have a particularly central role to play. These issues can include land use planning, public procurement (including energy efficiency requirements), working with citizens and other stakeholders as well as waste and water management (Covenant of Mayors 2013).

All of the studied SEAPs stress the importance of increased use and production of renewable energy in their territories. For example the City of Kaunas plans to build a new power plant for incineration of municipal waste (City of Kaunas 2010). In Jelgava a biofuel CHP plant is planned (City of Jelgava 2010). Several other SEAPs that were studied include plans concerning increased production of renewable energy. Different renewable sources are to be used in energy and electricity production as well as in the provision of heat and hot water. The SEAPs include commitments from local actors to start using energy from renewable sources.

When it comes to the use and production of renewable energy, the differences in the energy systems and the current state of play in terms of sustainable energy between the countries are visible in the SEAPs. Energy production in Poland is still largely based on the use of traditional energy sources but the SEAP of the City of Warsaw notes increasing awareness of environmental damages caused by conventional energy production. However, the listed measures for 2010-2020 still do not include measures concerning renewable energy (City of Warsaw 2011).

Heat production and the development of combined heat and power production are important priorities in several of the plans. In particular, measures are taken to decrease heating losses and thereby increase efficiency. The City of Jelgava wants to reduce heat losses in the district heating system and the City of Kaunas is going to reconstruct and develop its district-heating network. In the City of Frederikshavn, it is estimated that renovation of the district-heating grid can result in one percentage point reduction in heat loss (City of Frederikshavn 2012; City of Kaunas 2010; City of Jelgava 2010).

The SEAPs of Malmö and Frederikshavn emphasise the need for linking the energy strategies with municipal physical or land-use planning both in cities and rural areas. The City of Tampere stresses the importance of densifying the settlement structure to enable an increase in energy efficiency (City of Frederikshavn 2012; City of Malmö 2011; City of Tampere 2012).

Land-use and urban planning are also important focus areas in other SEAPs where the notable need to develop the public transport systems, foot and cycle paths as well as increasing the amount of green areas are included. In terms of land-use and planning, transport issues are crucial for energy efficiency and include investigating opportunities for using green buses in public transportation in Tampere, purchasing of low-polluting means of transportation in Kaunas and targeting at 10% of the fuel used being biofuel by municipal public transportation in Jelgava (City of Jelgava 2010; City of Kaunas 2010; City of Tampere 2012).

At the local level, public procurement is used to promote sustainable energy consumption. All of the studied SEAPs include measures concerning sustainable energy use in public procurement in terms such as public transportation, public and residential buildings and more efficient outdoor lightning. The City of Tampere stresses the key role of public procurement in energy efficiency. Public procurement measures range from increasing energy efficiency of lightning to favouring vegetarian seasonally produced food. For example, the City of Malmö aims to only purchase electricity, gas and district heating produced from renewable energy sources (City of Malmö 2011; City of Tampere 2012).

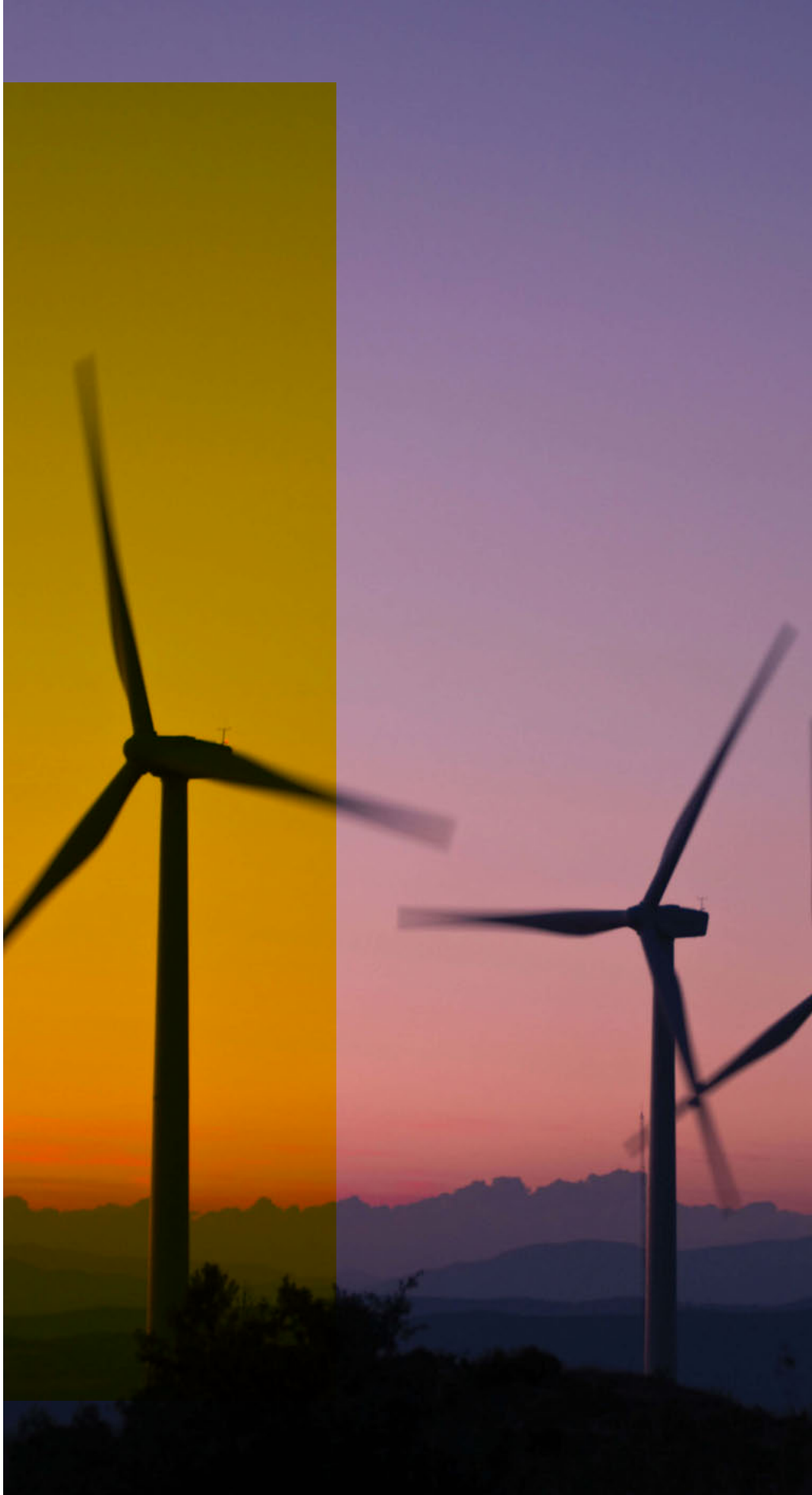
The guidelines from the Covenant of Mayors concerning SEAPs underline the importance of citizen involvement and information and the studied SEAPs do include related activities. However, in most cases the practical role of involvement for energy efficiency or the actual information activities are not outlined in detail.

Due to the fact that awareness concerning energy related issues has been low – and the share of conventional energy sources high in Poland - the City of Warsaw considers information and education, as well as raising awareness for the existence of the SEAP, as a key activity. The plan also introduces a few actions such as an annual "picnic with climate" event. The SEAP of Malmö can be considered as having a pedagogic approach seemingly aiming at explaining technical issues in a way that can be understandable for the general public. It also provides a glossary of the concepts used as well as clarifications on measurements which make it easier to understand the targets and their scale even for readers without wide knowledge of the energy sector (City of Malmö 2011; City of Warsaw 2011).

7 In order to get acquainted with the guidebook, please download it at the Covenant of Mayors website: www.eumayors.eu.

Outlining the responsibilities of different actors concerning the implementation of the plans is also an essential part of the SEAPs. The funding of measures is often outlined in the SEAPs or, at the very least, opportunities are listed initially. For example, the City of Jelgava extensively presents the ways in which different funding sources can contribute to reaching its goals (EU Structural and Cohesion Funds as well as green investment schemes). The role of credits granted by commercial banks is identified as a major instrument for financing energy efficiency measures for the renovation of buildings in the city (City of Jelgava 2010).

Furthermore, indicators to monitor the implementation of the plans are presented in some of the SEAPs. The City of Tampere identifies four different types of indicators in its SEAP that can be used to follow up different types of measures. For example, concrete, measurable energy conservation or efficiency measures require different kinds of indicators than more qualitative and non-measurable measures (City of Tampere 2012).



THIRD PART

10/ ENERGY EFFICIENCY IN BUILDINGS – A COMPLEX ISSUE

Energy efficiency in buildings is a complex sociotechnical and socio-economical system with diverse actors engaged (Ryghaug and Sørensen 2009; Golubchikov and Deda 2012; Bulkeley and Betsill 2005). Therefore energy efficiency policies have to be designed and implemented in a way that involves the whole range of actors affected (Jolland et al. 2009; Golubchikov and Doda 2012). This process includes governmental authorities as well as non-governmental associations and a large number of (individual) actors from different sectors.

From the social perspective, investing in the housing stock is a way to boost local jobs and economic activity. Although energy efficient housing can lead to decreasing energy costs, these investments can result in higher rental costs for individual tenants. Consequently there is a need to involve individual tenants and other stakeholders in the process for it to be sustainable in the long run (IEEP 2013). Involving stakeholders in the process can be viewed as crucial as these can point to local circumstances or interests, which authorities might miss.

Projects targeting energy efficiency usually rely on some kind of public funding. Economic validity is consequently an important aspect to be taken into consideration in energy efficiency projects. IEA (2010) describes steady and reliable funding as "essential" for energy efficiency programmes. Countries that use well defined frameworks for funding usually fare better than those without. IEA also regards "stop-go" funding as a perennial problem. Stop-go funding is when decisions regarding budget for projects have to be decided each year instead of at the start of a project. Energy efficiency projects tend to have a low political priority and are often the first to receive cutbacks in case of a stagnant economy. This of course makes it very difficult to maintain continuity (IEA 2010).

Since different countries and cities have very different platforms regarding funding, it would be helpful to find ways to facilitate funding through new and innovative ways. To be able to do this, questions needs to be asked about how, why and what is being funded. For private investors these questions are particularly interesting. OECD Green Growth Studies (2011) addresses the problem of how to involve the market in the move towards a greener economy. The studies imply that "capital is limited" and that "returns need to be sufficient" in order for market driven actors to respond to environmental challenges. It is in many cases up to the national government to create a beneficial environment for these private actors. In order to do this there is a need for policy predictability, which facilitates economic assessments made by these stakeholders (OECD 2011). IEA (2010) found that many governments use earmarking of specific taxes, which in turn are aimed towards a certain project. Since most projects are funded by government this makes for a very rigid, though effective type of measurement policy and should be accompanied by other actions.

Measuring the environmental impacts of energy efficiency projects is often challenging. URBACT (2013) points this out with the notion that environmental, social and economic factors are interwoven and cannot be separated. Projects therefore need to take this into account when making an environmental assessment. There are numerous methods that can be used for environmental impact assessments of buildings that are used for monitoring and assessing different types of buildings (URBACT 2013). In addition to finding the suitable assessment methods and being aware of possible difficulties, it is important to transfer the knowledge gained. Having a well-defined framework for how the knowledge received from using an assessment method is one important feature for this transfer (IEA 2010).

Since the process of constructing houses involves different actors across different sectors there is a particular need for policy integration increasing cooperation over different sectors of government. In addition, there is a need to involve private actors such as architects, construction companies, energy providers etc. into the process as well. Incorporating numerous different actors will increase the knowledge base and facilitate innovation (OECD 2011). Integrating sectors in practice relies on that "one hand knows what the other is doing". The process needs clear communication between different actors involved in order to avoid miscommunication (OECD 2011). Integration into the process also implies participatory efforts to involve future tenants as well as residents in the area of construction. These kinds of participatory efforts can provide good results at low costs (IEA 2013). Efforts like these also create a sense of cooperation and can enhance the performance of the measures.

Projects aiming at increased energy efficiency in buildings are rather complex and involve a number of different actors and sectors. Thus there is a need to determine who will lead the process. Having a clearly defined leadership is vital for the process (IEA 2010) in terms of being able to define a clear framework and establish efficient ways of communication (OECD 2011). According to the OECD, local authorities are often assumed to take leadership. They can influence the project by applying green public procurement; i.e. implementing environmental standards when purchasing services and products which benefit the project itself and also help to drive the market for greener products and services (EU 2010).

Also Bulkeley and Bestill (2005) and Puppim de Oliveira et al. (2013) define local authorities as the key actor in terms of coordination between different partners as well as in fa-

cilitating community involvement towards increasing energy efficiency in buildings. They emphasise the changing role of local authorities from being regulatory towards enabling others to act. Local and regional governance may also provide the opportunity to experiment and learn about innovative solutions at small scale (Corfee-Morlot et al. 2009).

In line with the EU policies and the National Energy Efficiency Action Plans, the SEAPs emphasise the need for increasing the energy efficiency of buildings mainly by renovating both public buildings and residential buildings. The SEAPs generally seem to have less of a focus on new zero energy buildings or the share of new buildings being zero energy buildings even though they are in most cases discussed in the NEEAPs. Energy efficiency has become a key element in European policies towards green growth and low-carbon society (COM 2011a). The Europe 2020 Strategy promotes energy efficiency as the "most cost effective way to reduce emissions, improve energy security and competitiveness, make energy consumption more affordable for consumers as well as create employment" (COM 2010a). Energy efficiency should consequently increase by 20% by 2020 (compared to 1990 levels; COM 2010a).

A high potential for enhancing energy efficiency has been identified for buildings (IEA 2014, COM 2011b). Member States shall consequently establish minimum energy performance requirements for new and existing buildings, certification systems for energy performance of buildings and regular inspection of e.g. air conditioning systems. Newly built houses shall be "nearly zero-energy buildings" by 2021 and investments shall be mobilised in the renovation of national stock of private and public residential and commercial buildings (COM 2010b, COM 2012). Hereby investment incentives and energy labelling play an important role as well as public authorities who should "lead by example" and use energy criteria in all public procurement (EU 2012).

SOLUTIONS TOWARDS INCREASING ENERGY EFFICIENCY IN BUILDINGS – EXAMPLES FROM THE BALTIC SEA REGION

This section introduces eight practical examples from the Baltic Sea Region that were selected by EFFECT project partners for qualitative analysis (thus they are not meant to be representative). These examples cover implemented measures and initiatives in the Baltic Sea Region dealing with energy efficiency in newly built or renovated buildings as well as buildings where energy efficiency was improved by small adjustments without major renovations. Besides a clear focus on increasing energy efficiency in buildings, selection criteria were successful implementation, location in the Baltic Sea Region, availability of material and project leader for interview as well as possibility for learning from these examples and potential for transferability to other places/buildings. In-depth interviews with project leaders were conducted in May-June 2014 and March 2015 by telephone using a questionnaire.

BALTIC SEA REGION MAP: Location of the examples

Map layout: Linus Rispling, Nordregio

The Map provides an overview of the locations:

- Passive house concept for Nordic countries (Estonia)
- Lighting control and changing habits in school buildings (Finland)
- Community straw bale building (Lithuania)
- Passive office building (Poland)
- Thermal insulation in kindergarten building (Russia)
- EcoSKAL architectural concept (Sweden)
- Energy audits in rural grocery stores (Sweden)
- Green roofs on public buildings (Sweden)

LIGHTING CONTROL AND CHANGING HABITS IN SCHOOL BUILDINGS (FINLAND)

The City of Vantaa is the fourth biggest municipality in Finland (208 310 inhabitants) and part of the Helsinki metropolitan region. Vantaa municipality works actively on promoting energy efficiency in public buildings and energy efficiency in schools is one of its priority areas since 2008. The work on energy savings in schools was jointly initiated by the Municipal Expert dealing with energy efficiency and the Department of Education. The idea stemmed from the municipal administration but is implemented together with the users of the school buildings. Improving energy efficiency in schools contributes to the general energy efficiency goals of the municipality that among other things

has committed itself to the EU Covenant of Mayors by setting up a goal of decreasing its CO_2 emissions by 25% by 2020.

The reason for focusing on energy efficiency in schools stems from school buildings comprise a large part of public buildings owned by the municipality with a high potential for saving energy. At the same time, promoting energy efficiency in schools is beneficial for educational reasons in terms of teaching sustainable practices to the school children.

Ten schools were chosen by the municipality to participate in the project based on an application process. Asking the schools to participate instead of forcing them has been considered a good way to engage the building users in activities. The participants received information on how to save energy and the students were encouraged to come up with their own ideas. The project is ongoing and each school participates in the project for one year. The schools receive half of the saved electricity costs and can use them for common activities such as school trips.

So far the work on energy efficiency in schools has mainly been focused on two initiatives that were established in 2012. One of them concentrates on technology that makes it possible to steer the various kinds of technologies in the buildings as well as e.g. installing automated lighting control (motion and daylight detectors). The practical work has been procured from a company following the regular public procurement procedures. The other initiative focuses on the use of the school buildings where the users (teachers, other staff and students) are encouraged to adopt energy saving habits. The initiative includes measures on planning, education, follow up and calculation of the results.

In practice, energy was saved by small measures such as lowering the indoor temperature, decreasing the amount of lighting and decreasing air conditioning during night time. It has been calculated that the technical project has saved 1 500 tonnes of CO_2 emissions per year. The project focused on the use of the buildings has had more modest direct savings as the activities are on a lower scale while the project on the other hand has an important educational role. The good practice examples and experiences are spread within the municipal organisation by an "eco-support network" that consists of municipal employees in all departments with the responsibility to spread knowledge on how to adopt energy saving measures locally in their department.

Cooperation between the department responsible for the public buildings and the Department of Education as well as between the municipal organisation and the private company responsible for setting up the energy saving technology has in general been well-functioning. There have however been some challenges related to negative attitudes. Communication and education has been a key to address these issues. The municipality has organised a large amount of educational events for specific groups such as janitors. It is also considered a challenge that building users may tire of the employed energy efficiency methods. Therefore it is considered as important to present new information continuously based on current research. This is also because recommendations change over time and the recommendations from five years ago may not be relevant any longer in the light of more recent research findings.

THERMAL INSULATION IN A KINDERGARTEN BUILDING (RUSSIA)

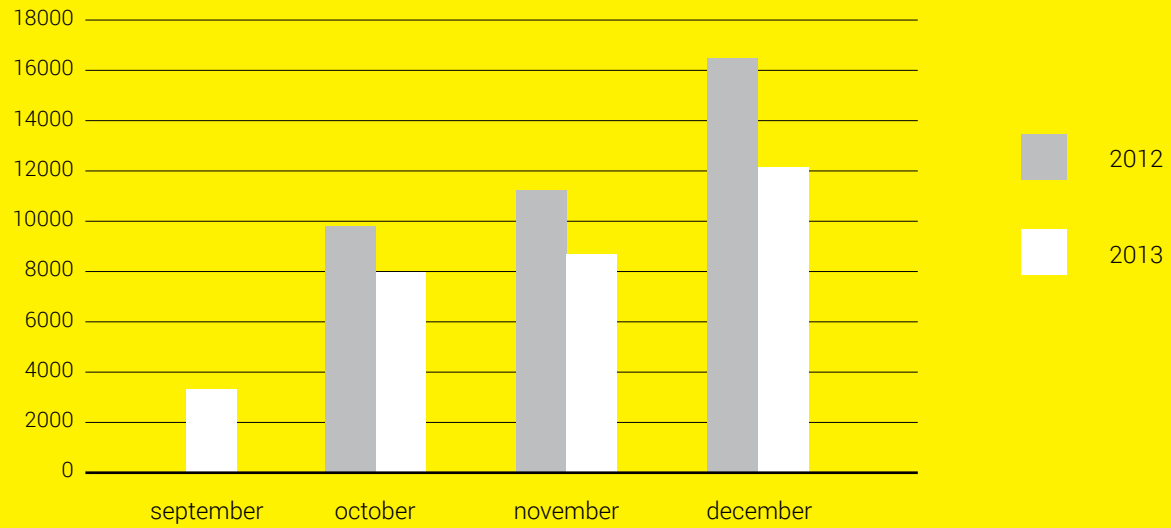
The Republic of Karelia is characterised by wooden one- and two-storey buildings constructed according to obsolete norms and rules compared to today's standards. At that time energy prices were rather low. Today, the wooden buildings often accommodate social infrastructure, e.g. kindergartens, schools or medical centres. The buildings are frequently disconnected from the district heating system and heated by electricity instead. As energy costs increase and the described type of construction entails intense heat losses, the institutions situated in those buildings face high heating expenses.

Within the framework of ENPI Cross-border Cooperation Programme "Karelia" and the project "Green Cities and Settlements – Sustainable Spatial Development in Border Areas", Karelian Regional Institute of Management, Economics and Law (PetrSU) developed low-tech methods for increasing energy efficiency. Hereby they used the example of "Kindergarten Rucheek" located in Kalevala, Republic of Karelia. This building was chosen in consultation with the local administration due to its social importance and high heating expense.

The overall target was to decrease heating costs while maintaining the required temperature indicator (24 °C for kindergartens) in the building by detecting sources for energy losses in order to identify modern solutions. Based on a first thermal imaging[8] survey of the building in April 2013, energy efficiency measures were recommended by an energy consultancy and accepted by a commission including representatives of the kindergarten, the administration of Kalevala and the municipal education department. As the analysis detected considerable sources of heat loss in the attic floor areas, wooden sawdust (the former heat insulation material) was replaced by basalt mineral wool in August 2013. Thereafter a second thermal imaging survey as well as a comparative analysis of the previous survey results was carried out. The final energy efficiency estimation of 2014 stated a decrease of energy consumption by an average of 19%. This implies annual savings by 1500 EUR.

8 Thermal imaging is used to visualise temperature differences of an object based on it's infrared radiation (FLIR 2015).

FIGURE 1: Heating energy consumption before and after the insulation (kWh).
Source: Sergey Koshelev, Karelian Regional Institute of Management, Economics and Law



The total costs for the reconstruction of heat insulation amounted to 6000 EUR which corresponds to a payback period of 4 years. The results were presented at the "Greensettle – Green Cities and Settlements" Conference in Oulu, Finland in February 2014 and published in the final report of the project. Currently the local administration of Kalevala is planning the implementation of similar measures for several other municipal buildings in the coming years.

ENERGY AUDITS IN RURAL GROCERY STORES (SWEDEN)

The County of Dalarna is located in central Sweden and was appointed as a pilot region for green growth by the government in 2010. The Dalarna County Administrative Board was one of the first Swedish counties that prioritized energy and climate issues by implementing national policies for energy transition and reduction of climate impact (Länsstyrelsen Dalarna 2013a). Moreover the County Administrative Board initiated a programme called "Branschvis Energieffektivisering" (Sectoral Energy Efficiency in English) to support different actors in the private sector, such as shops, hotels, restaurants, ski resorts, food production facilities and the manufacturing industry, in becoming more energy efficient. The implementation of the programme included the following steps:

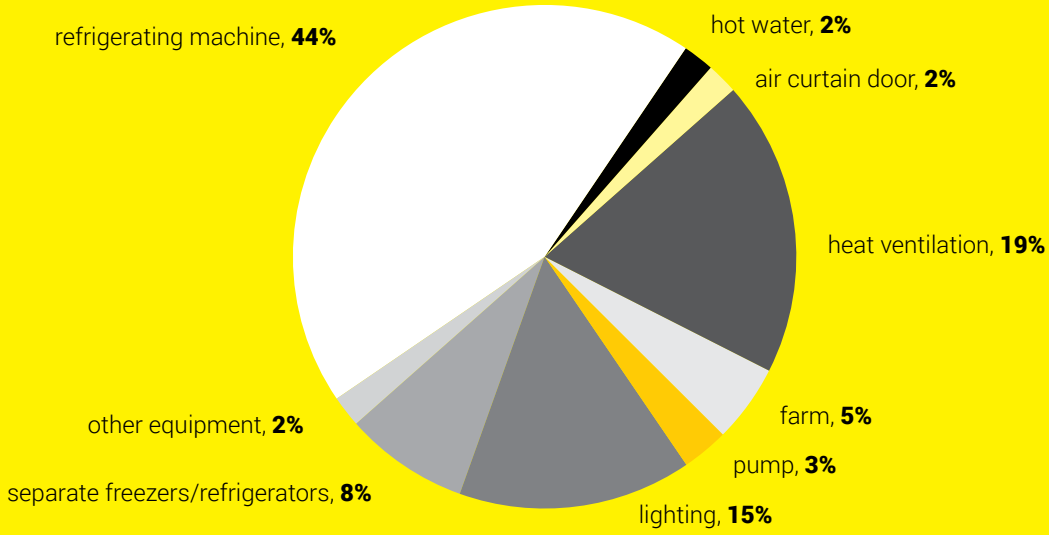
1. Dialogue with representatives of the business sector
2. Adjusting and adopting energy efficiency tools and concepts that fit the sector
3. Actions at the companies
4. Lessons learned and reflection
5. Spreading information

Within the programme the County Administrative Board has a special focus on grocery stores in rural areas as they provide an important service function for the surrounding areas. Figure 2 overleaf shows an example of energy consumption in a typical grocery store. Founded in the course of the project "Energismarta landsbygdsföretag" (*Smart Energy in Rural Businesses*) and "Dalarnas regionala serviceprogram"[9] (*Dalarna's Regional Service Programme*) grocery stores are offered cost-free energy audits. In exchange they agree to implement reasonable measures concerning energy efficiency (Länsstyrelsen Dalarna 2013b). The main purpose is twofold. Firstly, the County Administrative Board aims to support the owners in maintaining their shops in rural areas despite difficult economic conditions. Secondly, it wants to demonstrate how these problems can be addressed by implementing energy efficiency measures. The County Board calculated a possible decrease by 20-25 % of energy consumption per store.

The implementation of the "Branschvis Energieffektivisering" programme in rural grocery stores can be demonstrated as follows. Initially, grocery stores sign up for the programme. They do it either by self-initiative after representatives have acted as door-openers (by spreading information about the programme), or they have agreed in cooperation with the County Administrative Board. Full cost-free energy audits (including e.g. thermal imaging and measuring of energy consumption and energy losses) are carried out in the participating grocery stores by an energy consultant that has been selected by public procurement before.

9 The regional service programme was initiated by the Swedish government in 2009 to support and stimulate the work of commercial and public services in Sweden's sparsely populated and rural areas. Every county shall draw up a regional service programme (Swedish Agency for Economic and Regional Growth 2015).

FIGURE 2: Exemplary energy consumption in ICA Nära, Österfarnebo.
Source: Energi Teknik 2014



After the energy audit, an energy report is drawn up by the consultant showing how energy is consumed in the store and measures are suggested regarding increased energy efficiency. The report also includes information concerning costs, savings per year and pay off amount. As the County Administrative Board has access to funding in order to support rural stores on the one hand and energy efficiency measures on the other hand, Dalarna is able to set up contracts with the shops. If the store owners accept to implement a certain amount of the suggested low-cost measures, the County Administrative Board finances the remaining, more expensive measures. The process is monitored by a regular questionnaire conducted by the County Administrative Board

FIGURE 3: "It's not just any door. It saves 50% of energy! Cool, huh?"
Photo: Anna George

Up to March 2015, more than 70 stores have participated in this programme and 20% of the suggested measures have been implemented. Naturally the costs of these energy efficiency measures are higher than the business-as-usual equivalent. Nevertheless, an evaluation by the County Administrative Board shows that stores can decrease their energy consumption by 38% by implementing measures that pay off within 5 years. Shop owners making usually nearly zero profit can therefore quickly increase their profit by implementing suggested energy efficiency measures and thereby decreasing their energy costs.

Experiences and guidelines that resulted from the programme are published by the County Administrative Board in a brochure called "Energismart Handlare" as well as on their website.[10]

10 www.lansstyrelsen.se/dalarna/Sv/naringsliv-och-foreningar/naringslivsutveckling/avslutade-projekt/Pages/energismarta-handlare-.aspx

GREEN ROOFS ON PUBLIC BUILDINGS (SWEDEN)

The Augustenborg neighbourhood is situated in Malmö, Sweden and has changed from a district facing significant social and environmental problems to a representative example of a district applying a holistic approach to sustainable urban development (World Habitat Awards 2010).

Augustenborg, mainly built by Malmö's municipal housing company MKB, was a popular neighbourhood at the time of its creation in the 1950s. Starting in the 1970s the buildings and apartments became old-fashioned and people started moving from the area. In the 1990s' Augustenborg neighbourhood faced social and economic problems as well as physical degradation of buildings and outdoor areas. Moreover the area suffered from recurrent seasonal flooding due to an inadequate drainage system (SGRI 2015a).

The City of Malmö initiated a large-scale renovation project in 2000 to transform the neighbourhood into an ecologically, socially and economically sustainable city district. Besides increasing green areas, the implementation of more than 10 000 m^2 green roofs (see figure 4) played an important role in the process. A botanical roof garden covering 9 000 m^2 of the roofs of the industrial area was opened to the public in 2001. In addition all newly built houses, including public buildings, were equipped with green roofs. At the same time 89% of the total housing stock has been renovated and upgraded by implementing measures to increase energy efficiency, open access to recycling facilities as well as by using renewable energy sources, e.g. solar collectors, ground source heat pumps and photovoltaic cells (SGRI 2015, World Habitat Award 2010).

Up until now, 50% of all of the former environmental problems have decreased significantly. Flooding is avoided by an integrated open storm water management system and by the implementation of 10 000 m^2 green roof vegetation. It is estimated that 85% of district heating is provided by renewable resources. Moreover the production of solar energy within Augustenborg covers 10-15% of hot water demand in the neighbourhood (World Habitat Awards 2010).

The transition to Augustenborg EcoCity amounted to SEK 200 million (approx. 21,5 million EUR) in total. Primarily the project was funded by the local government (SEK 70 million, approx. 7,5 million EUR) but it also received SEK 24 million (approx. 2,6 million EUR) from the Local Investment Programme[11] as well as SEK 6 million (approx. 644,000 EUR) from the EU LIFE-programme. The ongoing management is jointly funded by MKB housing company and the City of Malmö (World Habitat Awards 2010).

EXAMPLE VII: Green roofs

"A green roof is a living surface of plants growing on top of a roof" (SGRI 2015b). There are different versions of green roofs, approaches and installation techniques. Generally green roofs are categorized in Extensive, Semi-intensive and Intensive as they differ in plants being used, substrate depth and weight. The concept is implemented after considering the physical conditions of the building as well as slope, length and direction. After a membrane is installed to make the roof waterproof, root barriers and a drainage layer are needed. In a final step e.g. herbs or grass up to shrubs and trees are planted. Implementing green roofs can compensate lost green areas and enhance quality of life in cities but also prevent local flooding, decrease urban heat island effect, enhance air quality and increase the lifetime of roof membrane (SGRI 2015b). The Scandinavian Green Roof Institute (SGRI) was founded in the beginning of 2000 to manage the development of Augustenborg Botanical Roof Garden. Besides conducting research and participating in other local and European projects, SGRI offers guided tours and technical visits in Augustenborg EcoCity (SGRI 2015c).

FIGURE 4: Green Roofs, Malmö

Stefanie Lange Scherbenske

11 national funding programme promoting ecologically sustainable development

New projects, for example the "Greenhouse" project that enables residents to garden collaboratively, are constantly developed in the neighbourhood. Measures that were implemented in Augustenborg have been applied to other areas of Malmö (World Habitat Awards 2010). As Augustenborg EcoCity won the UN World Habitat Award in 2010, the project has also become an international example of green regeneration and outreached beyond Malmö (SGRI 2015a).

COMMUNITY STRAW BALE BUILDING (LITHUANIA)

In Lithuania, the knowledge concerning buildings' potential to commit a significant impact on environment in all life cycle stages was present early on. The "technology" concerning straw bale building was created more than a century ago and is now considered as an ecological way of building because communities can grow the building material themselves. Straw bale buildings have good insulation and thus use potentially less energy compared to other buildings during the heating period. Using straw bale as a material to build has become popular again in Lithuania in recent years and other countries are becoming more and more interested in using this method. The method has been applied among others in Estonia, Norway, Sweden, as well as Canada, the UK and the US.

The Project "Community Straw Bale Building in Upyte" ran between 2007 and 2009. It aimed at introducing the straw bale construction technology to Lithuanian society in order to keep the tradition of crafting alive, to make use of the vast amount of straws which would be wasted material otherwise, and to reduce carbon emissions from construction work. Some of the local communities submitted applications for funding straw bale house construction and Upytė community was one of them. Together with a NGO, they started building a linen crafts and community centre (Project Development of Rural Entrepreneurship through Promotion of Linen Crafts and Straw Bale Construction in Upytė, sponsored by Panevezys Municipality) and started implementing a project to promote the old traditions with the usage of already existing organic material, with financial support from the United Nations Development's Small Grant Program, Lithuanian Ministry of Agriculture and the municipality (which covered 50% of the costs) and the Nordic Council of Ministers Office in Lithuania.

Communication of the results was an important part of the project. The straw bale building technique was presented in a showcase house which today is used as a handicraft centre. In the handicraft centre inhabitants are trained to use local cotton material, flax and ryes to craft linen. Once a year a workshop is organized to present the straw bale building technique. Beyond utilising the straw bale building technique and creating energy saving potential, the project contributes to the wellbeing of the local community and the tourism sector.

The Straw Bale Houses project is the result of local, national and international cooperation with the strong involvement of local community. The purpose of the showcase house is to inform about buildings' impact on environment, the advantage of the usage of natural building materials, straw bale construction methods, and to inspire public and private actors to look for further information for designing healthy and harmonious living or working environment with less use of energy. Through raising awareness about the use of straws and other organic material (flax and ryes) with the showcase house, the project managed to inspire people for practical implementation of sustainable building solutions whilst keeping the old traditions.

PASSIVE HOUSE CONCEPT FOR NORDIC COUNTRIES (ESTONIA)

Lately, Passive Houses (or eco-houses) have become popular in Estonia. According to the German Passive House Institute (Passivhaus Institut 2015) the building standard of Passive Houses is energy efficient but also comfortable and affordable. The construction of Passive Houses has been tested and proved to have the following advantages:

- Energy consumption related to heating and cooling is up to 90% lower compared to common buildings. Energy savings of more than 75% are stated in comparison to the average of newly built houses. Passive Houses consume less than 1.5 l oil or 1.5 m^3 gas per square meter of living space per year – even less than common "low-energy" buildings (Passivhaus Institut 2015).
- As Passive Houses make use of solar energy, internal heat sources and heat recovery, conventional heating systems are not required. Special windows and a building envelope, consisting of a highly insulated roof, exterior walls and floor slab, keep the warmth in winter months. During summer months, passive cooling techniques, such as strategic shading, keep interior spaces comfortably cool (Passivhaus Institut 2015).
- The ventilation system supplies constantly fresh air without draught. A highly efficient heat recovery unit re-uses the heat contained in stagnant air (Passivhaus Institut 2015).

In order to demonstrate that Passive Houses and the concept of nearly-zero-energy buildings can be applied even to the climate conditions in Northern Europe, the Institute of Technology of the University of Tartu collaborated with Reinberg architects (Wien, Austria) and others to develop a prototype for a Passive and plus energy building. The outcomes of the research funded by the European Regional Development Fund were implemented by constructing a one-family Passive House in Põlva, South-East of Estonia in 2013 (Mauring 2013).

As the Northern European climate differs from Central European climate where Passive House construction is used more widely, aspects like lower temperatures, deeper and longer lasting snow had to be taken into account in the process of developing an architectural concept for the prototype. The effect was that besides implementing general Passive House construction principles, the south side of the building has been equipped with a huge glass façade, as winter sun can

contribute to a positive balance during heating season. The heating system is based on a ground source heat pump combined with a solar thermal system providing warm water. Apart from roof collectors, a separate array of solar thermal collectors optimised for winter operation was integrated to the southern façade. Moreover a separate lightweight construction carrying a large array of photovoltaic panels (90m^2) was built on top of the building (Mauring 2013).

Heat balance and energy demand were calculated in forecast by using PHPP2007 software redeveloped by PassiveHouse OÜ, a spin-off company of University of Tartu. In average, heat losses (mainly resulted by windows) are compensated by internal and solar heat gains. The final energy demand of the building amounting 10400 kWh/a can be nearly covered by the solar PV producing approximately 10120 kWh/a. In 2013 the Passive House Institute, Darmstadt, Germany certified the building as the first Passive House in Estonia (Mauring 2013). The prototype shows that building a zero energy house based on Passive House principles is possible in the Estonian climate.

PASSIVE OFFICE BUILDING (POLAND)

The Euro-Centrum Science and Technology Park was established in 2007 and is situated in the Silesian voivode (municipal district). The park embodies a base for businesses as well as research and development institutions dealing with energy saving technologies and energy efficiency measures in buildings by providing them offices and laboratories. The infrastructure of the Euro-Centrum consists of two modern buildings with a total floor area of 9000 square meters: a revitalised building, the Training Centre for Modern Heating Techniques and a newly built passive office building regarded as a forerunner in terms of energy efficiency within Eastern Europe (Polish Information and Foreign Investment Agency 2014).

The passive office building was designed by Sławomir Kostur in cooperation with Walter Brown who is well-known for having designed Europe's biggest passive building "Lu-teco" in Ludwigshafen, Germany. In spring 2011 the Euro-Centrum Science and Technology Park issued a tender for the construction of the building (Katowice the City 2011a). Budus S.A. received the permission to build the five-storey office building between 2012 and 2014. Besides rentable offices and administrative rooms, the facility provides a Data Centre, technological laboratories as well as conference and training rooms for innovative research and development companies to test their devices before integrating them into production lines (Katowice the City 2011b).

According to EU regulations for newly built public buildings, the annual demand for primary energy consumption must not exceed 263 kWh/sqm/y (Ministry of Economy 2014). The passive office building consumes only 137 kWh/sqm annually and thus deceeds the EU target by 50% (E-biurowce 2014). Moreover the building's annual heating consumption of 15 kWh/sqm is eight times lower compared to a common office building of the same size. This was achieved by using for example geothermal energy, heat pumps, photovoltaic modules, solar collectors, mechanical ventilation, façade shutters and additionally a building management and heat recovery system. Furthermore the passive house hibernates during weekends to save energy (Katowice the City 2014a).

The project costs amounted PLN 35,8 million (approx. 8,8 million EUR) and were primarily funded by the European Regional Development Fund under the Innovative Economy Operational Programme but also partly by the Polish state. The amount is comparable to common construction costs. Also funded by the European Regional Development Fund, tenants are granted a 30% rent discount for the period of three years (Katowice the City 2014a). In 2013 the Euro-Centrum received the GreenBuilding Award from the European Commission for its passive office building. The jury took the architectural concept, energy saving technologies and the energy consumption of the building into account (European Commission 2013).

At the moment the Euro-Centrum expands its capacity by constructing a new assembly and warehouse hall, which is designed as a demonstration plant of about 800 photovoltaic modules. Further facilities are announced as part of the project "Creating of the Science and Technology Park of Euro-Centrum" (Katowice the City 2014b)

ECOSKAL ARCHITECTURAL CONCEPT (SWEDEN)

EcoSKAL is an architectural concept created by Zoltan Kiss, who is an architect at Urban Vision AB based in Malmö, Sweden. The concept consists of creating an "outer shell" on top of an already existing structure in order to save energy. The extra space created consists of an air space which works as packing. The creation of the outer shell reduces the energy demand within the building as well as creates additional living space. The aim of the concept is to create energy efficient housing by using design and not technical solutions.

The concept was created in the mid 90's and was inspired by several similar concepts around Europe. Double façade glass walls in office buildings in Essen, Germany, were cited as inspiration.

Zoltan Kiss has created a reference house in Malmö to showcase the concept. The reference house is a free standing detached one-family home constructed between 1998 and 2000. The construction of the house was funded by Zoltan Kiss himself and total costs of construction were estimated to be 3,8 million SEK in the year 2000. This would amount to around 440 000 EUR in today's value.

The EcoSKAL concept is also applicable on other types of buildings such as multi-storey apartment buildings and townhouses. The basic design is the use of an inner concrete frame within the inner shell. This frame is the

only one that gets heated. The air is then circulated between the outer and inner shell which balances temperature.

Measurements performed by the Swedish National Board of Housing and Planning (Boverket) have shown that the reference house is extremely energy efficient. The house consumes around 35-45 kWh/sqm/a, depending on the season, which is around 50% lower than the standard Swedish detached house. It is also below Swedish regulatory standards regarding passive housing set by the Swedish Energy Agency which is around 45 KwH/sqm/y.

Assessments on how to perform this style of building on apartment housing have been made by a real estate company named AB Balder, Lund University and Malmö University. These assessments have used computer models (Derob-LTH) to calculate energy efficiency of these projects. A decrease of 30% of energy use within buildings was estimated. However, so far no actual construction on apartment buildings with this style of concept has been made. Attempts had been made to realise a project in an apartment building in Gothenburg through AB Balder but had to be scrapped. The reason was that the construction would lead to increased rent for tenants who opposed the idea. This increased rent was due to the extra space created, this space however would not be considered as "living area" because it would not be heated directly. According to estimates the increase in rent of the extra space would equal 50 % of the original rental cost per/sq in order for the budget to hold.

The municipal organisation has been informed about the concept and contacts have been established between the architect and the local housing agency (MKB – Malmö Kommunala Bostäder) regarding the reference house. The concept however has yet to been proven in apartment buildings. As an effect of this there is little knowledge of how to perform actual construction of this concept. If projects using this concept are to be realized there is a need for great flexibility and clear guidelines for the constructing company.

11/ ASPECTS SUPPORTING THE DEVELOPMENT AND IMPLEMENTATION OF ENERGY EFFICIENCY PROJECTS

The eight examples were analysed in terms of good practice, governance and sustainability aspects. The analysis revealed the following aspects as being beneficial for projects and initiatives aiming at increasing energy efficiency in buildings (figure 5):

- Active involvement of target group
- Political/governmental support and cost efficiency
- Common goal/vision and individual engagement
- Continuous communication and information as well as education
- Monitoring and indicators

ACTIVE INVOLVEMENT OF TARGET GROUP

The examples studied previously differ widely in their approaches, initiators and target groups. The spectrum of initiators ranges from municipalities and university institutes to private sector actors and NGOs. Local residents were defined as the target group of implemented energy efficiency measures in some of the examples while others addressed educational facilities and companies. However, the active involvement of target groups contributed to projects being socially beneficial. In nearly all examples, stakeholders representing different sectors, were involved in the planning process. In the green roof example for instance, the municipality (City of Malmö), the local housing agency, the Scandinavian Green Roof Institute as well as local inhabitants cooperated successfully to reach the aim of the project.

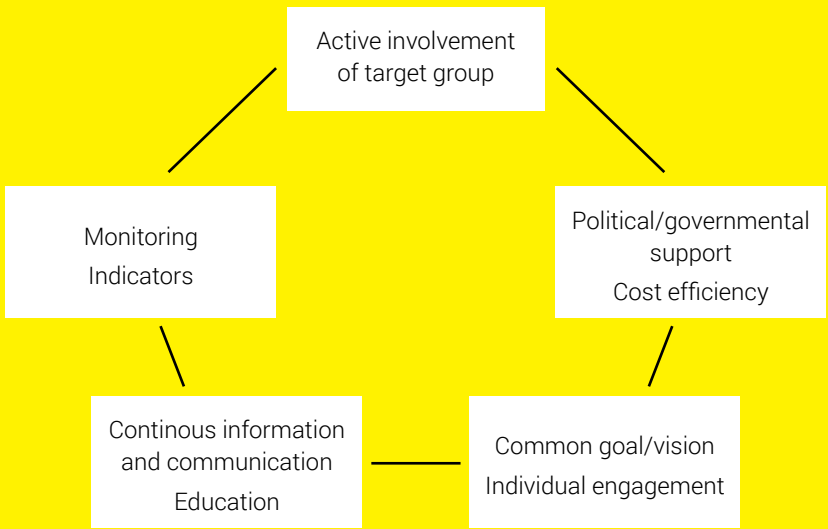
Given the definition of governance as a concept aiming at openness, active participation and effectiveness of policy processes seems to be mostly fulfilled in the presented projects. In most of the projects, local public was (at least) informed about the process and a broad range of actors and institutions has been involved in the planning process. Nevertheless the participation of the local public can in many cases still be improved. The interviewees mentioned that retrospectively the local public should have been involved to a greater extent in order to better support the successful implementation of the project.

POLITICAL/GOVERNMENTAL SUPPORT AND COST EFFICIENCY

Energy efficiency projects should be economically valid in terms of stable financing (that often comes along with political support) and cost efficiency. All examples received political/governmental support either from the local, regional or national level. For example the City of Malmö provided EkoSkal building permits and awarded the work in terms of innovation and design. Furthermore the Municipality of Vantaa signed an agreement concerning energy efficiency with the Finnish Ministry of Employment and the Economy which gave activities a political boost. The County Administrative Board of Dalarna and the City of Malmö initiated the projects involving the rural grocery stores and the transition of the Augustenborg neighbourhood.

The projects received not only political but also financial aid that supported their successful implementation. It is worth mentioning that in most cases several institutions funded one project. The projects of kindergarten, Euro-Centrum, Passive House and green roofs were partly funded by the EU, e.g. by the European Regional Development Fund (Euro-Centrum, passive house) or the ENPI programme (kindergarten). Several projects were financially supported by the municipality (e.g. green roofs, straw bale buildings) and by the state (e.g. school project, Euro-Centrum). The EcoSkal project was self-financed and the measures implemented in rural grocery stores were partly self-financed by the shop-owners.

FIGURE 5: Aspects supporting energy efficiency projects and initiatives.



As there was an emphasis on low costs/ cost efficiency, the intention was to cover investment costs by (future) energy savings. To evaluate this principle, it is important to distinguish between newly constructed buildings on the one hand and measures implemented in existing building stock on the other hand. The construction costs of new buildings, i.e. the passive office building (Euro-Centrum) and the straw bale buildings are comparable to common new buildings. In contrast the EkoSkal concept has not yet been realised because its construction and application to a residential building would have meant an increase in rental costs, which has so far not been accepted by the tenants. Regarding existing building stock, as seen in the rural grocery stores and the kindergarten, costs were paid off quickly due to energy and cost efficiency.

COMMON GOAL/VISION AND INDIVIDUAL ENGAGEMENT

A common goal (e.g. energy saving, increased energy efficiency), individual engagement and support from the local level have been underlined as promoters during the start-up and the implementation of the projects. Also participation of the local public is crucial to ensure success. The fact that it is a long-term process both in terms of convincing people, making the idea work and pay-off has also been stressed. As many stakeholders are involved in the process, a clearly determined project leader is important and the roles of every stakeholder should be defined. In most of the examples the project initiator also acted as the project leader. The way leadership was carried out varied from supervising, instructing, and organising to advising and actively participating.

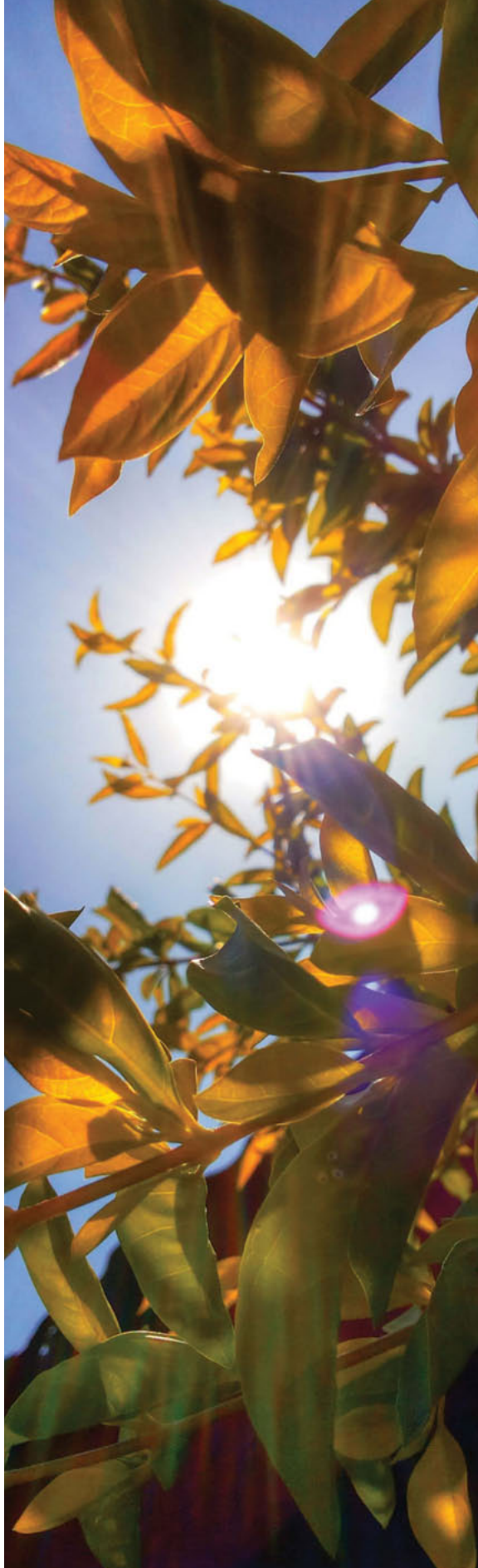
CONTINUOUS COMMUNICATION AND INFORMATION AS WELL AS EDUCATION

Extensive and continuous communication about the project and project results in relation to energy efficiency has been highlighted as important. Providing information increases the understanding of the project among the local public, helps engage different stakeholders and ensures continuity of the activities. Vantaa municipality, for example, has created an Eco support network to share information and promote best practice examples on (among other things) energy efficiency.

Also education has been an important aspect in many of the energy efficiency projects. School personnel and students in Vantaa have received information and education on how to save energy.

MONITORING AND INDICATORS

In nearly all projects an environmental assessment has been made before and after the implementation. Indicators like energy consumption, CO_2 emissions, heat losses and energy costs were assessed, mostly by an energy consultant. Relating to methods used, the examples of rural grocery stores and kindergarten focused on thermal imaging whereas PHPP2007 software[12] was used to forecast the environmental impact on the Estonian passive house. Even after the completion, the environmental impact was assessed in the majority of projects, e.g. by questionnaires (grocery stores), sensors (passive house), the municipality (school project) or by an energy consultancy (kindergarten).



12 www.passivehouse.ee/7.html

12/ CHECKLIST FOR PRACTITIONERS

The checklist summarises the outcomes of the analyses in an easy accessible and practical way. The checklist shall support and inspire practitioners in their work towards the implementation of energy efficiency measures and should preferably be used when starting to plan such a project/initiative and applied throughout its duration. Since each project/initiative has to cope with specific local circumstances, practitioners may use the table as a tool and add specific aspects to be considered.

TABLE 7: Checklist "Towards the implementation of energy efficiency measures"

ACTIVE INVOLVEMENT OF TARGET GROUP	✓
Has the target group(s) been identified/defined?	
Is the target group aware/informed of the project/initiative?	
When should the target group be involved? Why?	
How can the target group be involved actively?	
Who is in charge of the involvement process?	
POLITICAL/GOVERNMENTAL SUPPORT AND COST EFFICIENCY	✓
Which policies are involved?	
Have relevant authorities and/or politicians been identified and informed?	
How can they support the project/initiative concretely?	
Has their support been requested?	
Is cost efficiency an explicit goal/precondition of the project?	
Who is in charge for coordinating the financial resources?	
Is there funding (e.g. by the EU) which could support the project?	
Is the target group/other groups affected by increasing costs as a consequence of the project?	
Are future costs included in the budget calculation?	
COMMON GOAL/VISION AND INDIVIDUAL ENGAGEMENT	✓
What is the problem/issue/theme of the project?	
What are the intended goals?	
Which sectors are involved? Who is representing the different sectors?	
Whose input is needed?	
Are there similar projects whose experiences could be used?	
Do all actors involved in the project/initiative have the same goal/vision?	

Has the common goal/vision been defined and explained to everyone?	
How can different actors representing other levels/sectors cooperate to achieve the goal of the project?	
Who owns the project/initiative?	
What is the formal/informal distribution of power?	
Who is responsible for the theme and taking decisions?	
Is the role of every stakeholder defined?	
CONTINUOUS COMMUNICATION AND INFORMATION AS WELL AS EDUCATION	✓
Who is in charge for communication and information about the project/initiative?	
Who should receive latest information?	
Which information channels should be used?	
Is feedback desired/requested and if yes, how should it be given and integrated?	
Is education a part of the project/initiative?	
If yes, how could education be facilitated?	
If not, could the project benefit from including an education angle?	
Who should be “educated”?	
What is the aim of education, e.g. changing habits?	
MONITORING AND INDICATORS	✓
Is monitoring already a part of the project/initiative?	
How and when should the environmental impacts been monitored and who is in charge?	
Have indicators been developed to measure project results?	
How do you feel about the end result?	
Has the project turned out as planned?	
What could have been done differently?	
Can lessons learned be integrated into future projects?	

CONCLUSIONS

Energy efficiency, and energy efficiency in the building sector in particular, has become one of the most central focus areas in EU policy. Nearly 40% of final energy consumption and 36% of GHG emissions comes from houses, offices, shops and other buildings. Buildings have the second largest potential after the energy sector for energy savings. According to the Energy Strategy 2020, energy efficiency is "the most cost efficient way to reduce emissions, improve energy security and competitiveness". The co-benefits of improving energy efficiency in buildings include job creation, fuel poverty alleviation, health improvements, better energy security and improved industrial competitiveness (EC 2010b; EC 2013a).

Improving the energy efficiency of both new and existing buildings plays a key role in increasing the overall energy efficiency of the economy. Energy efficiency of the building sector is discussed in EU policy documents concerning sustainable energy and is also discussed as an essential part of the more general overall transition towards low-carbon resource efficient economy. Related to the key issue of energy efficiency and buildings, the European Commission published a **ROADMAP ON SUSTAINABLE BUILDINGS** in 2014 in which the issues of energy efficiency are of key importance. It also includes a shift towards a more holistic approach, taking into consideration not only energy efficiency as such but also addressing resource use and environmental impacts during the entire life cycle of buildings (EC 2012d).

THE ENERGY EFFICIENCY DIRECTIVE (EED) and the **ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD)** are currently the most central directives concerning energy efficiency and buildings. Among other things, the EPBD states that all EU Member States shall establish and apply minimum energy performance requirements for buildings by introducing certifications and regular inspections. It also obliges Member States to ensure that by 2021 all new buildings are nearly zero-energy buildings (EC 2010a).

The Energy Efficiency Directive sets out legally binding measures to increase Member States' efforts for increased energy efficiency in all sectors. It obliges all EU Member States to draft National Energy Efficiency Action Plans where they describe their implemented and planned energy efficiency activities (EC 2012b). All EU Member States in the Baltic Sea Region have prepared a NEEAP according to the Directive even though they are drafted and used differently as policy tools (Thenius 2012).

"NEARLY 40% OF FINAL ENERGY CONSUMPTION AND 36% OF GHG EMISSIONS COMES FROM HOUSES, OFFICES, SHOPS AND OTHER BUILDINGS. BUILDINGS HAVE THE SECOND LARGEST POTENTIAL AFTER THE ENERGY SECTOR FOR ENERGY SAVINGS."

All of the NEEAPs stress the role of the public sector setting an example on energy efficiency and many countries also provide national level support in programmes for local and regional level authorities to facilitate the local work towards increased efficiency. All of the national plans identify the building sector as having a large potential in increasing energy efficiency in their countries. Many states have made their building regulations stricter as part of the NEEAP 2014 or at least plan to do so particularly in terms of energy efficiency .They also aim to increase the share of nearly zero-energy buildings as well as to renovate existing public and residential buildings to increase their energy efficiency. However, there are notable differences between the countries. Particularly relevant in the context of this report, the Baltic States note that they may lack the needed know-how in constructing low-energy buildings. There, the thermo-modernisation of the existing building stock can be considered a more pressing issue in terms of energy efficiency in buildings.

Crucial to increasing the energy efficiency of the building stock is the availability of investment incentives and funding. The challenge related to a lack of financing is underlined among others in the Estonian NEEAP. A report on financial support for energy efficiency in buildings published by the European Commission looks at the effectiveness of EU funding and other public funding forms, as well as coordination between national and EU funding. The analysis of 25 financial support schemes shows that the most successful support programmes are based on preferential loans often supplemented with grant and/or technical assistance packages. However, success also depends on other factors such as administrative procedures and information to citizens (EC 2013a).

According to the report on financial support for energy efficiency in buildings, it is essential to improve the financial support for energy efficiency in buildings by ensuring that the regulatory framework of the EU is properly followed by the Member States. This would increase the amount of financing available and address the key technical, financial, informational and behavioural barriers. Close cooperation between public authorities, finance providers and the building sector is needed. It is also important to convince building owners of the benefits of improving the energy efficiency of their buildings. According to the Energy Efficiency Directive, in 2014 all Member States were for the first time obliged to submit long-term strategies for mobilising investments in the renovation of the national stock of both private and public residential and commercial buildings (EC 2012b; EC 2013a).

To facilitate work towards increased energy efficiency at local level, the EU initiative the

Covenant of Mayors, encourages local governments to draft and submit local sustainable energy action plans (SEAP). The covenant supports the signatories and also provides guidelines and assistance for drafting the action plans.

For this paper, six SEAPs from around the Baltic Sea Region were studied to get an overview of what kind of issues are typically discussed and prioritised. Renewable energy was identified as an important factor for increased sustainability in energy production even though the current situation between regions and states differ. The SEAPs also extensively cover issues related to energy efficiency and link the sustainable use of energy to different sectors and activities. In some of the plans, it is seen as especially important to take energy issues into consideration in other policies and link land use planning and energy.

Both NEEAPs and SEAPs provide a variety of measures that can be studied as inspiration for increasing energy efficiency but that can also be further developed. Many of the NEAPs and SEAPs successfully analyse the challenges and potentials of their territories in terms of energy efficiency and sustainable energy in general and link the background analysis to the planned measures. However in many cases, both NEEAPs and SEAPs would benefit from improved follow up and clearer targets that would facilitate a better overview of the progress concerning energy efficiency in the entire economy. The European Commission criticises that many policy regulations are designed within a 2020 timeframe and do not provide long-term measures and funding sources for investing in energy efficiency and moreover that the cost-effective saving potential is not fully realised (EC 2014b).

Especially in the SEAPs, it is essential to increasingly aim at a pedagogic approach that makes the content accessible for different kinds of stakeholders, which would facilitate engagement among different groups towards common objectives.

Energy efficiency is a priority in energy policy in BSR countries and cities and has also been addressed by various transnational projects in the BSR. NEEAPs and SEAPs, together with other initiatives, are important in setting targets and working towards increasing energy efficiency in all sectors. Addressing energy efficiency in the **EU STRATEGY FOR THE BALTIC SEA REGION** will help to keep the issue on the agenda, which in return supports and motivates public authorities at different levels to address energy efficiency issues.

Analysis by the European Commission suggest that at the current pace the EU energy efficient target for 2020 will be missed by 1 to 2 percentage points (EC 2014b). Therefore it is important to increase the overall energy efficiency of the Baltic Sea Region even more and to implement the actions indicated in the NEEAP 2014. Evaluation and reviews as well as the next NEEAP 2017 will show what policy instruments will be needed concerning the phase after 2020 (EC 2014b). Until then it would be beneficial to include more BSR cities in the Covenant of Mayors and have more BSR cities adopt a SEAP which would facilitate and increase the awareness as well as the exchange of experiences and good practices in the region. For the energy efficiency and competitiveness of the Baltic Sea Region, it would be beneficial to also encourage cities from Belarus and Russia to work with energy efficiency at the local level.

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