

Energy transition in the built environment

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Introduction

State of play and relevance of energy transition in Europe

The global greenhouse gas (GHG) emissions are on the rise as national commitments to combat climate change come up short. In 2017, the global CO₂ emissions are set to grow by around 2% after having remained relatively flat for three years. Evidence outlined here, just days before the start of the 24th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP24), show **global emissions have reached historic levels** at 53.5 GtCO₂e, with no signs of peaking, i.e. emissions switching from increasing to decreasing.¹

Despite that fact, many countries in the Europe consume less energy compared to ten years ago, mainly due to **energy efficiency gains**. Europe also relies less on fossil fuels due to energy savings and the faster-than-expected uptake of renewable energy. In the decade 2005 to 2015, the share of renewables in the European Union's (EU) energy consumption nearly doubled, from 9% to almost 17%.² Some sectors and countries are leading the way towards clean energy; however, fossil fuels continue to be the dominant energy source in Europe, especially in the built environment sector.³

The transition from non-renewable to renewable energy systems has grown quickly throughout Europe. In fact, all EU Member States have **renewable energy policies** and support schemes in place to help favour their use. Recently, the European Commission adopted a strategic long-term vision for a climate neutral economy by 2050 called A Clean Planet for All. The strategy shows how Europe can lead the way to climate neutrality by investing in realistic technological solutions, empowering citizens, and aligning action in key areas such as industrial policy, finance, or research – while ensuring social fairness.⁴

Global, European, and Dutch domestic targets

Taking drastic actions and setting concrete targets today will ease the adaption to climate change in the future. The **Paris Agreement** brings all nations of the world into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects. In order to reach the goals, appropriate financial flows, a new technology framework and an enhanced capacity building framework are to be put in place, thus supporting action by developing countries and the most vulnerable countries, in the line with their own national objectives. The **UN Sustainable Development Goals**, especially SDG 7: “Ensure access to affordable, reliable, sustainable and modern energy for all”, is

¹ UN Environment. (2018, November 27). Nations must triple efforts to reach 2 degrees target, concludes annual review of global emissions, climate action. Retrieved from UN Environment: <https://www.unenvironment.org/news-and-stories/press-release/nations-must-triple-efforts-reach-2degc-target-concludes-annual>

^{2,3} European Environment Agency. (2017, August 29). Energy in Europe - State of play. Retrieved from European Environment Agency: <https://www.eea.europa.eu/signals/signals-2017/articles/energy-in-europe-2014-state-1#tab-news-and-articles>

⁴ European Commission. (2018, November 28). The Commission calls for a climate neutral Europe by 2050. Retrieved from European Commission: https://ec.europa.eu/clima/news/commission-calls-climate-neutral-europe-2050_en



another ambitious global target. The 2018 SDG report⁵ indicates the Goal 7 has come one step closer due to recent progress in electrification, particularly in Least Development Countries (LDCs), and improvements in industrial energy efficiency. However, national priorities and policy ambitions still need to be strengthened to put the world on track to meet the energy target for 2030.

The original EU targets of a 20% reduction of CO₂ emissions, a 20% increase in energy efficiency and a 20% share of renewable energy in 2020 compared to 1990 levels have been raised over time. The **new targets for 2030** envisage energy savings of 32.5%⁶ and a share of at least 27% of renewable energy consumption. In addition, on 25 October 2018, the European Parliament adopted an amendment to impose “the **binding target of at least a 55% domestic reduction in economy-wide greenhouse gas emissions by 2030** compared to 1990” in order to meet the Paris Agreement targets.⁷ These recent EU targets imply that all EU countries will have to step up their ambitions for 2030. To realise the new ambition levels, a dramatic transition in society will need to take place. On 28 November 2018, the Commission presented its **strategy long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050**. The strategy states that Europe is committed to lead in global climate action through a socially-fair transition and it provides a first indication of the direction to frame what the EU could consider as its long-term contribution to achieving the Paris Agreement temperature objectives. This strategy should allow the EU to adopt and submit an ambitious strategy by 2020 to the UNFCCC as well as set the direction of the EU’s future climate and energy policy.⁸

The **Energy Union** is one of the European Commission’s key priorities, launched 2015 and “focused on boosting energy security, creating a fully integrated internal energy market, improving energy efficiency, decarbonising the economy (not least by using more renewable energy), and supporting research, innovation and competitiveness.”⁹

The **Netherlands** is itself in the middle of an energy transition debate. The **Climate Agreement** of the current Dutch government aims to reduce CO₂ emissions in 2030 by 49% (compared to 1990 levels), and the government already announced its willingness to support the new EU target of a 55% reduction by 2030.¹⁰ Five economic sectors – electricity, industry, agriculture, land use, mobility, and the built environment – are currently developing proposals to scale up and speed up efforts to attain the present reduction levels. Even though the Dutch government sets up concrete targets for the CO₂ emissions’ reduction, the gap between current and targeted levels remains substantial. In 2017, only 6% of the energy used in the Netherlands came from renewable sources¹¹, which is the lowest percentage in the EU after Luxembourg according to Eurostat figures. In 2018, Dutch emission levels were only 13% lower compared to 1990, and they have not changed over the past six years, according

⁵ United Nations. (2018, December 05). *Sustainable Development Goal 7*. Retrieved from Sustainable Development Goals - Knowledge Platform: <https://sustainabledevelopment.un.org/sdg7>

⁶ European Commission. (2018). Clean Energy for All Europe (Legislative Package Agreement on 19 June 2018). Brussels: European Commission.

⁷ European Parliament. (2018). (COM (2018)0284 – C8-0197/2018 – 2018/0143(COD)). Strasbourg: European Parliament.

⁸ Europa Nu. (2018, November 28). The Commission presents strategy for a climate neutral Europe by 2050 - Questions and answers. Retrieved from Europa Nu Onafhankelijk & actueel: https://www.europa-nu.nl/id/vktuhif0lwzb/nieuws/the_commission_presents_strategy_for_a?v=1&ctx=vg9pjk198axu&s0e=vhdubxdwqrzw

⁹ European Commission. (2018, December 05). Energy Strategy and Energy Union. Retrieved from European Commission: <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union>

¹⁰ Letter to the Parliament of the Dutch Minister for Economic Affairs and Climate (5 October 2018)

¹¹ NN Investment Partners Holdings. (2017, December 18). Energy Transition in the Netherlands: a template for Europe? Retrieved from NN: <https://www.nnip.com/Default-Display-on-9/Energy-Transition-in-the-Netherlands-a-template-for-Europe.htm>



to national figures presented to the higher court in The Hague in a trial of the civil society group *Urgenda Foundation* against the Netherlands. The foundation claims that the Netherlands should intensify its climate actions and calls for a more systematic reform in energy policies.¹²

The depletion of fossil fuels and climate change, as formidable challenges facing contemporary modern societies, urge all countries to make **fundamental and systemic societal changes**. In order to shift towards a more environmentally sound and sustainable economy, Member States can address socio-technical transition, especially energy. Surely, “the **energy transition requires collective, complex and long-term processes involving all major societal actors** to achieve fundamental social innovations and new solutions to social challenges”¹³, which makes it one of the most challenging tasks for contemporary multi-level policy making.

Aim of the conference and this paper

One of the measures of the Dutch government is to make all residential and commercial buildings in the country independent from natural gas. Such a massive transformation of natural gas dependent buildings is quite unique in Europe. The greening of the built environment and the transformation of residential and other buildings into sustainable or even zero-emission neighbourhoods, however, is far from unique and shared among many countries and sub-state actors.

The **EUKN conference on Energy Transition**, organised by the EUKN on behalf of the Dutch Ministry of the Interior and Kingdom Relations, will seek answers to these questions, focusing on experiences in countries outside of the Netherlands. The conference will bring together experts from Austria, Denmark, Germany, France, Spain, Sweden and the Netherlands to share experiences in transforming the existing building stock into green, energy-efficient buildings. Country representatives will be asked: How do they organise transformation processes? And how do they manage to maintain support from citizens and other key factors?

This background paper serves as an entry point to this debate and will be updated to reflect the outcomes of the event.

¹² See <https://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:GHDHA:2018:2610>. The Urgenda Foundation won this trial, also in a court of higher appeal (9 October 2018).

¹³ Bongsuk Sung & Sang-Do Park. (2018). Who Drives the Transition to a Renewable-Energy Economy? Multi-Actor Perspective on Social Innovation. MDPI Sustainability, 1-32.

The role of the built environment in energy transition

Contribution of the built environment to GHG emissions and energy consumption in Europe

The impact of the built environment on energy consumption and greenhouse gas emissions is undeniable. The three most common sources of energy for buildings are purchased electricity, direct consumption of natural gas and petroleum for heating and cooking; and other services such as water supply and construction. The chart below indicates GHG emissions by economic activity in the EU-28 in 2015, showcasing the shares of several main sources of energy for buildings.

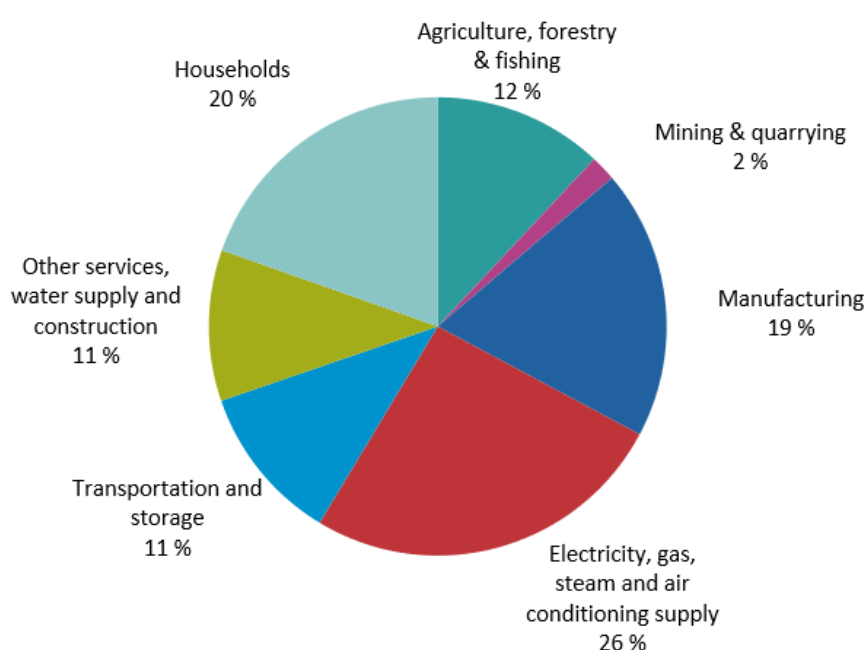


Chart 1: Greenhouse gas emissions by economic activity, EU-28, 2015
Source: Eurostat Statistic Explained (2018)

According to Eurostat, in 2015, the EU-28's electricity, gas, steam and air conditioning supply activities accounted for the largest share (26%) of total GHG emissions. Emissions from the suppliers of electricity, gas, steam and air conditioning result from fossil fuel combustion for electricity generation and district heating. Households accounted for 20%, and other services, water supply and construction for 11% of emissions.¹⁴ Finding responsible and efficient ways to green buildings should therefore be a centrepiece of the efforts to cut carbon pollution. Regarding the general footprint of the built environment, an important finding is that **around 40% of energy consumption and 36% of CO₂ emissions in the EU stem from buildings**, while the renovation rate is at a sobering annual 0.4-1.2% (depending on the country).¹⁵

¹⁴ Eurostat. (2018). Greenhouse Gas Emission Statistic - Air Emissions Accounts. Brussels: Eurostat.

¹⁵ European Commission. (2018, December 05). Buildings. Retrieved from European Commission: <https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>



The Dutch case: towards neighbourhoods free of natural gas

The **Netherlands** is currently experiencing a real transition regarding the country's energy future. The rich gas fields in the north-eastern part of the Netherlands have not only boosted the Dutch economy in the second half of the 20th century, they have also led to a situation in which **practically all Dutch residential and commercial buildings are dependent on natural gas for cooking and heating**. Today, residential and commercial buildings account for 30% of the total Dutch fossil fuel consumption, mainly natural gas (including indirect consumption via the power grid).

Because of the rising costs of gas mining and of reinforcing numerous mostly residential buildings in the gas mining areas suffering from light, but increasingly damaging earthquakes (estimated costs between 8 and 30 billion euros), the Dutch government has taken a **dramatic decision to stop gas extraction by 2030, and to launch a nation-wide programme to transform the existing 8.8 million buildings into natural gas-free, sustainable buildings**. This is the core of energy transition in the built environment in the Netherlands.

The **Programme Aardgasvrije Wijken** (Neighbourhoods Free of Natural Gas) encompasses 27 pilot neighbourhoods in 2019, rising to a total of 100 neighbourhoods in 2021. Municipalities take the lead regarding ensuring the participation of inhabitants, planning, and the coordination of investments, while the national government facilitates, inter alia by providing subsidies of approx. 120 million euros in 2019. The main goal of the programme is to encourage mutual learning and best-practice exchange, to be achieved fostered by a knowledge sharing platform. In the long term, the efforts are to be scaled up considerably.¹⁶

What can housing corporations, house owners and citizens do?

Social housing being “a key segment of the housing market and a key area of intervention of national and regional housing policies”¹⁷, and having a specific public service mission, a discussion of this sector's role in the energy transition is crucial. As Housing Europe's Deputy Secretary-General **Julien Dijol** points out during his workshop presentation at the EUKN conference¹⁸, there are **several conditions impeding the creation of green and social housing**, namely:

1. A structural mismatch between supply and demand in construction activity, with demographic development as a source for uncertainty;
2. House prices exceeding incomes;
3. Rising building costs and requirements regarding energy performance standards.

While retrofitting is considered an important contribution to a more sustainable building stock, “[t]he **variety of national financial and regulatory frameworks applicable to renovation of**

¹⁶ Information on the programme *Aardgasvrije Wijken* in this paragraph is taken from Joram Snijders' (Dutch Ministry of the Interior and Kingdom Relations) presentation held that day.

¹⁷ Housing Europe. (2018, June 4). The financing of renovation in the social housing sector (A comparative study in 6 European countries). Retrieved from Housing Europe: <http://www.housingeurope.eu/resource-1124/the-financing-of-renovation-in-the-social-housing-sector>

¹⁸ Information on the conditions impeding the creation of green and social housing is taken from Julien Dijol's (Housing Europe's Deputy Secretary-General) presentation held that day.



housing is one of the reasons why it is difficult to have [a] clear comparative view as well as clear policy recommendations at the EU level”¹⁹.

The more pronounced the role of **individual home ownership in a given housing market**, the more efforts are needed to convince owners to invest in sustainability measures. This is exacerbated by the fact that “[n]umerous private owners of houses and flats are already of pensionable age and that trend is rising”²⁰, surely not only to the German context this quote refers to.

Energy efficiency enhancement through renovation measures is thus considered an important cornerstone in the quest of countries like Germany, Denmark, Spain, and other countries to achieve a virtually carbon-neutral building stock by 2050. A recent Housing Europe position paper calls, however, for a more realistic account of the **possibilities and constraints of energetic retrofitting**. It suggests “to rethink the place of energy efficiency in social, public and cooperative housing in the overall strategy to limit CO₂ emissions”²¹. Housing Europe notes that energy need reduction and a low-impact energy type together form a “two-front battle”²² that is not sufficiently taken into account in the current policy debate.

Another important aspect concerns the role of the public as an energy consumer. Without support, commitment, and ownership of a broad public, governmental measures cannot be successful. Awareness-raising programmes will thus need to be intensified to ensure effective behavioural change.

¹⁹ Housing Europe. (2018, June 4). The financing of renovation in the social housing sector (A comparative study in 6 European countries). Retrieved from Housing Europe: <http://www.housingeurope.eu/resource-1124/the-financing-of-renovation-in-the-social-housing-sector>

²⁰ Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). (2016). *Climate Action Plan 2050*. Berlin: BMUB Public Relations Division.

^{21,21} Housing Europe. (2018, April 17). Decarbonisation of the building stock: a two-front battle (A Housing Europe position paper). Retrieved from Housing Europe: <http://www.housingeurope.eu/resource-1096/decarbonisation-of-the-building-stock-a-two-front-battle> p.2



Learning from others: policy instruments and measures in European countries

Countries worldwide are facing an encompassing climate challenge. Within EU climate change and energy policy frameworks, Member States are concretely working towards common targets, even if their agreements of the latter can be time-consuming and may fall short of the level of ambition originally hoped or called for.

With regard to the built environment, the challenges are universal: buildings need to become more energy efficient in order to consume less (mostly fossil) energy. Concrete policy answers however vary enormously because of different policy mixes, legacies, and degrees of politicisation of energy policy. In a nutshell, some core differences among European countries relate to the following aspects:²³

- **Energy policy and energy mix legacy and preferences**, inter alia shaped by geographical location (energy demand/types of available resources), import dependency, energy affordability, earlier landmark decisions;
- **Political decision-making structure**: “ways of doing things” to reach political and societal agreements, actors’ involvement, policy stability;
- **Features of the housing stock**: quality, age, type (detached, terraced, multiple-family) as well as ownership structures.

Energy mix differences throughout Europe

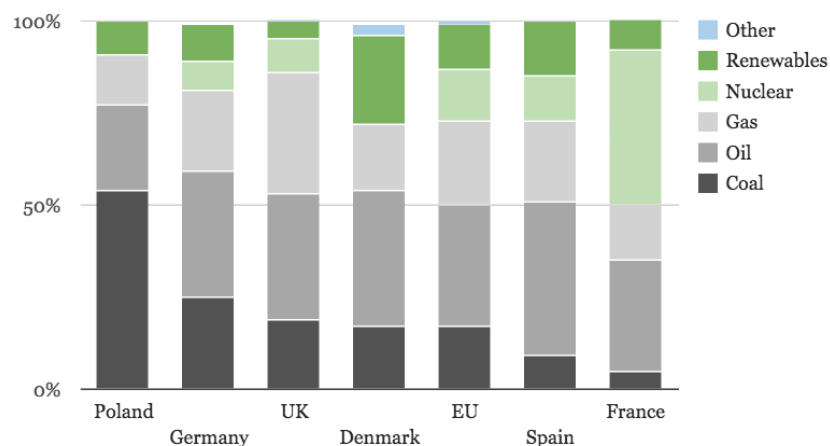


Chart 2: Share of different sources in the energy mix of selected EU countries, with the EU average shown for comparison.²⁴
Source: Eurostat, chart by Carbon Brief (2013).

²³ Adapted from Derwort, P. (2015). Analysis of Energy Transition Pathways in the Residential Sector of the Built Environment: A Sectoral Country Comparison. Uppsala University: Department of Earth Sciences.

²⁴ Evans, S. (2015, February 10). Seven charts showing how the EU's energy use is being transformed. Retrieved from Carbon Brief: <https://www.carbonbrief.org/seven-charts-showing-how-the-eus-energy-use-is-being-transformed>.



Despite the variation regarding concrete policies, European countries are facing common targets, challenges, as well as mutual dependencies regarding their energy supply. For many states, the oil crises of the 1970s served as a starting point for dedicated energy policy creation geared towards less dependency on fossil fuels.²⁵ The most important building blocks of the common EU regulatory framework are described in the boxes below.

Energy Performance of Buildings Directive and Energy Efficiency Directive

The 2010 Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive are the EU's main legislative instruments promoting the improvement of the energy performance of buildings within the EU and providing a stable environment for investment decisions to be taken.

By 10 March 2020, the Member States will have to transpose its provisions into national law. The EU has adopted a number of measures to improve energy efficiency in Europe. They include:

- An annual reduction of 1.5% in national energy sales
- EU countries making energy efficient renovations to at least 3% of buildings owned and occupied by central governments per year
- Mandatory energy efficiency certificates accompanying the sale and rental of buildings
- Minimum energy efficiency standards and labelling for a variety of products such as boilers, household appliances, lighting and televisions (eco-design)
- Preparation of National Energy Efficiency Action Plans every three years by EU countries
- The planned rollout of close to 200 million smart meters for electricity and 45 million for gas by 2020
- Large companies conducting energy audits at least every four years
- Protecting the rights of consumers to receive easy and free access to data on real-time and historical energy consumption
- The Commission has published guidelines on good practice in energy efficiency

EU Emissions Trading System (EU ETS)

The EU emissions trading system (EU ETS) is a cornerstone of the EU's policy to combat climate change and its key tool for reducing GHG emissions cost-effectively. It is the world's first major carbon market and remains the biggest one. Currently, it operates in 31 countries (all 28 EU countries plus Iceland, Liechtenstein and Norway). It limits emissions from more than 11.000 heavy energy-using installations (power stations & industrial plants) and airlines operating between these countries, covering around 45% of the EU's greenhouse gas emissions.

²⁵ Renders et al. (2018). Ex post evaluation and policy implementation in the building sector. Bilthoven: European Topic Center on Air Pollution and Climate Change Mitigation.



Renewable Energy Directive

The Renewable Energy Directive establishes an overall policy for the production and promotion of energy from renewable sources in the EU. It requires the EU to fulfil at least 20% of its total energy needs with renewables by 2020 – to be achieved through the attainment of individual national targets. All EU countries must ensure that at least 10% of their transport fuels come from renewable sources by 2020.

The national renewable energy targets for each country range from 10% in Malta to 49% in Sweden. EU countries set out how they plan to meet these targets and the general course of their renewable energy policy in national renewable energy action plans. Progress towards national targets is measured every two years when EU countries publish national renewable energy progress reports.

On 30 November 2016, the Commission published a proposal for a revised Renewable Energy Directive to make the EU a global leader in renewable energy and ensure that the target of at least 27% renewables in the final energy consumption in the EU by 2030 is met.

Regarding policies and instruments on energy transition, there is considerable heterogeneity regarding implementation. Countries generally ‘mix and match’ from a palette of measures – economic, regulatory, information, education, fiscal, planning, voluntary, or research. A key success factor is the policy mix coherence and effectiveness. Hereby, **the ideal policy mix “should target all relevant actors, establish mechanisms to overcome actor-specific barriers and guarantee a reinforcement of the different instruments”**.²⁶

Regulation and obligatory measures

The following sections provide a selective account of examples of **regulation and obligatory (“hard”) measures** on energy transition in the built environment. These samples from different EU countries (featured also in the EUKN conference) are understood as established and impactful practices in the attempt to reduce greenhouse gas emissions stemming from the built environment. Non-binding measures are discussed further below.

In **Spain**, climate change and energy transition laws are top policy priorities. The energy consumption of the residential sector is below the EU average with an increasing trend.²⁷ With its renewable energy share (17.3% in 2016), Spain is on track to reach its 2020 renewable energy target (20%).²⁸ Spain underlines the role of municipalities as the drivers of a new energy paradigm.²⁹ “Cities have the capacity to cut their greenhouse gas emissions by 80 % by 2040, if they adopt the right action plans.”³⁰

²⁶ Renders et al. (2018). Ex post evaluation and policy implementation in the building sector. Bilthoven: European Topic Center on Air Pollution and Climate Change Mitigation. p.10

²⁷ Instituto para la Diversificación y ahorro de la Energía. (2018, December 05). Building. Retrieved from IDAE: <http://www.idae.es/en/tecnologias/eficiencia-energetica/building>

²⁸ European Commission. (2017). Energy Union Factsheet Spain. Brussels: European Commission.

²⁹ Fundación Renovables. (2018). Hacia una Transición Energética Sostenible. Marzo: Fundación Renovables.

³⁰ Fundación Renovables. (2018). Ciudades con futuro Necesidad y oportunidad de un sistema energético sostenible. Fundación Renovables.

In 2014, Spain has developed a National Framework Long-term strategy for energy renovation in the building sector which was rated as the best National Strategy by the European Commission's Joint Research Centre's Assessment Report from 2016. The National Framework comprises of several hard-regulatory approaches such as Urban Regeneration Law, Technical Building Code, Energy Efficiency Certificate and Regulation on Building Heating Installations. These measures aim to set out more strict requirements concerning the energy performance of equipment and energy efficiency in buildings.

On a regional level, Spain collects data and assesses the intervention needs for the retrofitting of the building stock. The Urban Regeneration Strategy includes a complete methodology for every municipality.³¹

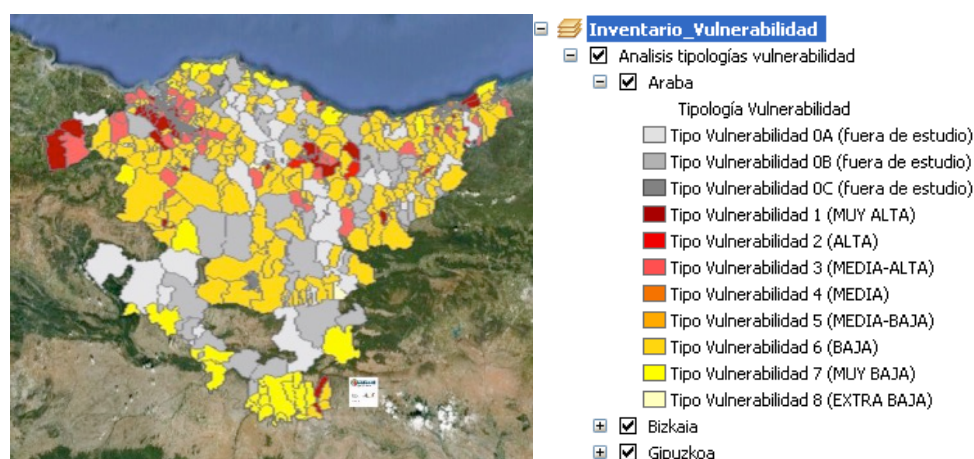


Figure 1: Assessment of the intervention needs for the retrofitting of the building stock in the Basque Country
Source: Tecnalía

On the local level, Barcelona for example has developed a sustainable energy action plan (SEAP) in which it sets out the actions that cumulatively will decrease its CO₂ emissions by 23% by 2020. Drafting the plan has changed city's governance, since different departments have collaborated to collect accurate energy consumption data in each sector, in order to best assess where improvements can be made.³²

In **Germany**, the national approach builds on two pillars: increased energy efficiency and increased use of renewable energy. The Climate Action Plan 2050 spells out the desire goal to attain a virtually carbon-free building stock by 2050. Several regulatory measures are supposed to contribute to this goal, including a “zero-energy building standard for new buildings” as of 2021, and the introduction of energy performance classification possibilities for owners as part of the energy-saving legislation³³. Regarding the building standard for all, including existing, buildings, the Climate Action Plan foresees “long-term strategies for refurbishing the building stock and a gradual phase out of fossil-fuel heating

³¹ Information in this paragraph is taken from Patricia Molina Costa's (Tecnalía) presentation “Building renovation and integrated urban regeneration for sustainable energy uptake: Governmental instruments in Spain” held during the Conference.

³² Donnerer, D. (2015). Local Governance from A to Z: positive glossary of the energy transition. Energy Cities.

³³ Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). (2016). Climate Action Plan 2050. Berlin: BMUB Public Relations Division. p.47



systems”.³⁴ In addition, there will be a “phase out [of the German government’s] funding for replacing heating technology based exclusively on fossil fuels by 2020”.³⁵

Since the 1970s, **Denmark** has introduced strict building requirements improve energy efficiency in the built environment and far-reaching measures to promote the use of renewable energy in homes and offices. Furthermore, it consciously couples energy renovation of buildings with general maintenance and repairs. Consecutive governmental agreements have been concluded with broad parliamentary involvement and support.³⁶

In May 2014, the Danish government adopted a new strategy for energy renovation of buildings, which is to reduce net energy consumption for heating and hot water by 35% in 2050, compared to existing consumption levels. Energy transition and urban renovation are usually combined. The **Building Code** defines the minimum standard of the energy performance of the component replacing the older one. It has become one of the main policy instruments to achieve energy savings.³⁷ In addition, the Danish government also introduced **Energy Labelling of Buildings**, which is the status on Energy Performance Certificates (EPC); a publicly funded Knowledge Centre promotes **Investing in Energy Saving Skills** to building sector professionals.

Partnership, deals, incentives, experiments

Next to regulatory approaches, **soft measures** are understood more and more as necessary elements in the policy mix. They can take the form of information and educational **campaigns**, financial **incentives** such as attractive loans, or other forms of **voluntary agreements or partnerships** between different parties.

In **Spain**, a measure called Som Energia, established in 2010, is the first renewable energy cooperative supported by the city of Pamplona and several others. It produces and sells 100% renewable electricity, thanks to small scale production plants situated close to its members. Participation is guaranteed with 100.00 EUR. This initiative is active throughout Spain and has 22,000 members. Annually it generates 5GWh powering homes of 2,000 members.³⁸ Furthermore, soft measures of the National Framework are set to promote building renovation, urban regeneration and renewal, but also serve as a good tool to reduce buildings total energy rating (PAREER; PAREER-CRECE Programmes).

Traditionally, cooperative approaches and voluntary partnerships have played a big role in **Dutch** policy-making; this is often referred to as the ‘polder model’ that relies on seeking a consensual agreement between a high number of stakeholders. The Dutch **Agenda Stad** (Urban Agenda) provides the framework for voluntary cooperation between various political and societal actors on pre-defined core themes in the Netherlands. Since its introduction in 2015, the *Agenda Stad* has been established around so-called *City Deals*: are agreement between cities and the national government to address

³⁵ Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). (2016). Climate Action Plan 2050. Berlin: BMUB Public Relations Division. p.48

³⁶ Derwort, P. (2015). *Analysis of Energy Transition Pathways in the Residential Sector of the Built Environment: A Sectoral Country Comparison*. Uppsala University: Department of Earth Sciences.

³⁷ State of Green. (2018). *Energy Renovation of Buildings (Retrofitting Buildings for Cost, Comfort and Climate*. Copenhagen: Nordic Ecolabel.

³⁸ Donnerer, D. (2015). Local Governance from A to Z: positive glossary of the energy transition. Energy Cities.



specific urban challenges.³⁹ Several *City Deals* deal explicitly with various aspects of energy transition, and partly also touch upon the links with the built environment. Example are:

- **Clean Tech:** the cities Apeldoorn, Deventer, Zutphen, Epe, Brummen, Voorst and Lochem working together with various ministries, two provinces, foundations and company networks to create a clean tech region based on energy-neutral and circular production and consumption;⁴⁰
- **Elektrische deelmobiliteit in stedelijke ontwikkeling:** the cities The Hague, Amersfoort, Apeldoorn, Rotterdam, Utrecht, Amstelveen and Amsterdam working together with the Province of South Holland, private-sector actors, and the Ministries for Infrastructure and Water Management as well as Interior and Kingdom Relations on ways to integrate e-mobility infrastructure and solar energy installations in newly built areas;⁴¹
- **Gelrestad:** the cities Apeldoorn, Arnhem, Nijmegen and Ede-Wageningen working together with the Ministries of Economic Affairs and Climate Policy as well as Interior and Kingdom Relations and the Province of Gelderland to create a “Smart Energy Environment”, linking the energy, food, and health sectors;⁴²
- **Woningabonnement:** the cities Deventer, Enschede, Zutphen, Lelystad, Haarlem, Ede, Lochem and Breda working together with the Ministry of the Interior and Kingdom Relations, the Province of Overijssel as well as financial institutions and associations on the provision of an accessible instrument for house owners facilitating investment in energy-saving measures by way of a monthly compensation.⁴³

Financial incentives are much-used tools in energy retrofitting as well. In the **Netherlands**, there are several country-wide subsidy schemes targeting house owners and are supposed to incentivise them to invest in retrofitting measures. A recent Platform31 publication⁴⁴ investigates the *Investeringssubsidie Duurzame Energie* (ISDE; Investment Subsidy Sustainable Energy), the *Subsidie Energiebesparing Eigen Huis voor VvE's* (Subsidy Home Energy Savings for Home Owners Associations), and the *Zeer Energiezuinig Pakket* (ZEP; Very Energy-efficient Package). The authors conclude that each of the instruments has stronger and weaker points, the weak ones being: the absence of a real market demand of what the tool offers (ISDE), communication worthy of improvement (all three), and the lack of fit with people's living reality and complex technical requirements (ZEP).

Funding strategies and financial incentives for integrated sustainable urban development help **Spanish** municipalities shift towards low-carbon economy (Strategies Competition; Property Tax; Construction Permit).

³⁹ Federal Institute for Research on Building, Urban Affairs and Spatial Development. (2017, Hune). Ten Years after the Leipzig Charter. Retrieved from Federal Institute for Research on Building, Urban Affairs and Spatial Development: <https://www.bbsr.bund.de/BBSR/EN/Publications/SpecialPublication/2017/10-years-after-leipzig-charta-node.html>

⁴⁰ Agenda Stad. (2018, December 05). Clean Tech. Retrieved from Agenda Stad: <https://agendastad.nl/citydeal/clean-tech/>

⁴¹ Agenda Stad. (2018, December 05). Elektrische deelmobiliteit in stedelijke gebiedsontwikkeling. Retrieved from Agenda Stad: <https://agendastad.nl/citydeal/elektrische-deelmobiliteit-in-stedelijke-gebiedsontwikkeling/>

⁴² Agenda Stad. (2018, December 05). Gelrestad. Retrieved from Agenda Stad: <https://agendastad.nl/citydeal/smart-energy-environment-gelderland/>

⁴³ Agenda Stad. (2018, December 05). Woningabonnement. Retrieved from Agenda Stad: <https://agendastad.nl/citydeal/energiebesparing-door-de-markt-woningabonnement/>

⁴⁴ Bronvoorst et al. (2018). Van klimaatpakkoord naar duurzame woning. Den Haag: Platform31.



Equally, in **Germany**, financial schemes to spur energetic retrofitting are in place. Well-known and long-standing examples (also presented at the EUKN conference on 6 December)⁴⁵ are the KfW Banking Group programmes *Energieeffizient Sanieren – Kredit* (Energy-efficient Retrofitting Loan) targeting home owners and *Energetische Stadtsanierung* (Energy Efficient Urban Redevelopment) targeting municipalities, energy suppliers, and housing companies. The latter programme is unique in that it seeks to bring about an integrated approach for the energy-efficient redevelopment of urban areas, moving away from the focus on individual buildings. The tool, established in 2011, is delivered by way of grants handed out to municipalities, energy suppliers, and housing companies as well as loans for investments in supply systems of local infrastructure. Lastly, the *CO₂-Gebäudesanierungsprogramm* (CO₂ Building Rehabilitation Programme) of the Federal Ministry of Economy, which provides funding for measures for more energy efficiency in new and existing buildings, has been a central measure for reaching the targets.

Joint Programming Initiative Urban Europe (JPI UE) SET Plan

Energy transition requires urgent transnational attention in the fields of urban innovation and technological development. The Joint Programming Initiative Urban Europe (JPI UE) responds to this urgency by developing a transnational research and innovation agenda.

Embedded in the JPI UE, the Strategic Energy Technology (SET) Plan Action 3.2 aims to support the planning, development and replication of 100 Positive Energy Districts (PED) by 2025 for sustainable urbanisation and is joined by 17 EU Member States. PEDs, the focus shifts from the individual building to whole neighbourhoods and thus a new level of impact on sustainable urban development and the energy transition process. By establishing PEDs, the focus shifts from the individual building to whole neighbourhoods and thus a new level of impact on sustainable urban development and the energy transition process (Gollner, 2018).

Synthesis: how to create societal support?

A challenge as encompassing as the energy transition can only succeed when broad societal support is ensured. This certainly counts for policies and initiatives aimed at making the built environment more energy efficient. Various studies and experiences in practice have shown that the **behaviour of households** with respect to their reaction to energy expenditures is extremely important. The government should aim more towards behavioural change of building users. For that purpose, the investments should be focused on expanding knowledge creating partnerships with relevant parties from education, research and business to achieve effective behavioural change programmes.

In **the Netherlands**, for example, after successful projects in Leeuwarden and Rotterdam, a manual has been drawn up which can help municipalities and housing corporations to implement projects aimed at energy savings through behavioural change. The so-called smart meters, energy meters which can provide feedback to the consumer, are important tools to achieve behavioural changes. Consumers with a smart meter are sent an overview with feedback on their actual use, six times a year, allowing them to adjust their energy consumption.

⁴⁵ Information on the programme *Energetische Stadtsanierung* in this paragraph is taken from Barbara Crome's (German Federal Ministry of the Interior, Building and Community) presentation held that day.



Another important aspect of tenants' behaviour is related to the quality of the interior environment. New technologies to make homes more energy efficient are not always the easiest to use. Builders and suppliers will have to seek out new concepts and techniques where the occupant is central to the idea, and not the technology. The Dutch urban research institute Platform31⁴⁶ recommends policy-makers to **make better use of insights from behavioural science and marketing** in the design and implementation of energy policy instruments: This may include nudging, but also enhanced transparency, reduced complexity, and a more target-group-based approach taking into account the customers' journey.

The German **Energiewende**, which started off in 2011 with the popular decision to phase out nuclear energy until 2022, is generally praised for its strong rootedness in citizens' engagement. This is exemplified inter alia by the high number of renewable energy cooperatives.⁴⁷ In addition, the German Federal Government has invited a broad public to make use of the online and offline consultation carried out in the wake of the Green Paper on Energy Efficiency (*Grünbuch Energieeffizienz*) in 2016.⁴⁸ In addition, the information campaign *Deutschland macht's effizient* (Germany does it efficiently) has been a tool to reach various societal actors and showcase the need for energy efficiency since 2016 (ibid.). Another key aspect stressed in the German debate on more energy efficiency in housing is that housing should be affordable especially for tenants with lower income if rents increase after renovation.

As a general conclusion, both **long-term policy consistency** as well as an **effective policy mix** are presented as key success factors to effective energy policy. This background paper, together with the discussions and outcomes of the 6 December 2018 EUKN Conference on Energy Transition in the Built Environment, hopes to add to an exchange and identification of useful practices in this highly complex, yet so topical and fascinating field.

⁴⁶ Bronvoorst et al. (2018). Van klimaatpakkoord naar duurzame woning. Den Haag: Platform31.

⁴⁷ Wieg, A. (2013). Please in my backyard: How renewable energy cooperatives advanced citizen involvement in the German energy transition. Washington, DC.: Heinrich Böll Stiftung.

⁴⁸ Bundesministerium für Wirtschaft und Energie. (2016). Die Energie der Zukunft - Sechster Monitoring-Bericht zur Energiewende. Berlin: Bundesministerium für Wirtschaft und Energie.



The urban dimension of energy transition: how do cities contribute?

The case for cities' involvement making the energy transition happen

Europe is a highly developed society where a lot of energy is consumed in homes, in businesses, and in industry. Some energy use is related to personal travel and for transporting goods. Cities play the major role in modifying the energy consumption as these are the places where the consumption is highest. As **urban areas account for more than two thirds of global primary energy use** and produce 70% of CO₂ emissions, it is essential that cities take a leading role in the energy transition. National policies must encourage the deployment of clean energy technologies and include GHG emission reduction targets, carbon pricing mechanisms, and investment in energy research, development and demonstration. These targets must then be complemented by action at the local level.

To meet their renewable energy targets, cities can, for example, provide detailed solar maps giving valuable information on expected energy yields and installation costs for buildings and houses in various neighbourhood. On transportation and fossil fuel emissions, cities can also invest in the long-term development of walking and cycling infrastructure. For energy efficiency, cities can take a leading role in adopting, monitoring and enforcing building energy codes for new construction.

There are **countless examples of individual cities, often in partnership with key actors at different political and societal levels, pioneering the transition** to energy-efficient, post-fossil settlements that offer a high quality of life to its residents and lead by example. Cities that are already taking serious actions with ambitious goals are **Copenhagen** aiming to be carbon neutral by 2025, or **Salzburg** aiming to be fossil-fuel-free by 2050 with citizen campaigns and investment in modern technology.

European initiatives and city networks on energy transition

There is growing momentum behind the role of the city in acting on climate, sustainability and energy. The **C40 Cities Climate Leadership Group** was established as a global network of cities that are developing and implementing policies to reduce emissions. C40 network consists of more than 75 cities, representing more than 550 million people. As part of the C40 network, **Paris** has committed to reducing CO₂ emissions in municipal buildings, in part by undertaking deep renovations of 600 public schools to save 65 gigawatt hours of electricity per year. More than 2,000 of such measurable actions have been taken by C40 cities around the globe.

Another example of successful networks is **Covenant of Mayors**, launched by the European Commission to endorse and support the efforts deployed by local authorities in the implementation of sustainable energy policies. The Covenant of Mayors is a unique bottom-up movement that has succeeded in mobilising a great number of local and regional authorities to develop action plans and direct investments towards climate change mitigation measures.



The **Urban Agenda for the EU** established under the Dutch EU Council Presidency in 2016 with the Pact of Amsterdam ⁴⁹, represents a new way of multi-level and multi-stakeholder cooperation on contemporary urban topics. Several of the Urban Agenda's Partnerships deal with the nexus of social, environmental, and economic development, which become evident in Partnership "priority themes" such as climate adaptation, circular economy, energy transition, housing, or air quality.

The Urban Agenda for the EU **Partnership on Energy Transition** is led by three cities: Gdańsk (PL), London (UK), and Roeselare (BE). Further partners are six cities, one region, as well as the two umbrella associations Council of European Municipalities and Regions (CEMR) and EUROCITIES, ministries from Germany and France, the European Investment Bank, and the European Commission's Directorate-General for Regional and Urban Policy. The partners' goal, according to the Orientation Paper presented in late 2017, is to achieve "a smart integrated system that is able to meet a city's energy demand in the most carbon and cost-efficient way". The discussions stretch across four areas: 1) sources, production and storage, 2) distribution networks, 3) smart data platforms, controls and management, and 4) consumption. The Partnership will present draft Actions by early 2019, to be presented to a larger public, and subsequently implemented in a joint effort with the partners involved.

Another successful examples of initiatives and city networks that contribute to energy efficiency and transition are Energy Cities, Klimabündnis (TANDEM project), European Energy Award, as well as URBACT and EUROCITIES thematic networks, among others.

The density of human, economic and intellectual capital in cities can be a driving force for the acceleration of clean energy development and deployment. As more and more cities take the opportunity to act as innovation hubs and test beds for sustainable urban energy technology, the closer the whole world is to providing secure, sustainable and affordable energy for all.

⁴⁹ The Netherlands Presidency of the Council of the European Union. (2016). Pact of Amsterdam. Amsterdam: EU Commission.



Further reading

Webpages

- **C40:** A network of the world's megacities committed to addressing climate change. C40 supports cities to collaborate effectively, share knowledge and drive meaningful, measurable and sustainable action on climate change.
www.c40.org
- **Confederation of Danish Industry - Dansk Industri:** A private organisation, funded, owned and managed entirely by approximately 10,000 companies within the manufacturing, trade and service industries.
www.di.dk
- **Energy Cities:** The European Association of local authorities in energy transition.
www.energy-cities.eu
- **Energiesprong:** Solution providers and housing providers working on Energiesprong solutions.
www.energiesprong.org
- **European Institute of Innovation & Technology – EIT Climate-KIC:** The mission is to bring together, inspire and empower a dynamic community to build a zero-carbon economy and climate resilient society.
www.eit.europa.eu/eit-community/eit-climate-kic
- **European Urban Knowledge Network - EUKN EGTC:** the only independent Member State driven network in the field of urban policy, research and practice. As a network of national governments, EU Member States and knowledge institutes, the EUKN is deeply involved in EU policy-making.
www.eukn.eu
- **Federal Ministry of the Interior, Building and Community, Germany**
www.bmi.bund.de/
- **HEART:** A multifunctional retrofit toolkit including different components (ICT, BEMS, HVAC, BIPV and Envelope Technologies) that cooperate to transform an existing building into a smart building.
www.heartproject.eu
- **HOUSEFUL:** An innovative paradigm shift towards a circular economy for the housing sector. The main goal is to develop and demonstrate an integrated systemic service (HOUSEFUL Service) composed of 11 circular solutions co-created by stakeholders in current housing value chain. www.houseful.eu



- **Housing Europe:** A network of 45 national and regional federations which together gather about 43.000 public, social and cooperative housing providers in 24 countries.
www.housingeurope.eu
- **InnoEnergy:** The European company for innovation, business creation and education in sustainable energy.
www.innoenergy.com/
- **Interreg – North-West Europe E=O:** Address poor energy performance of residential buildings by generating a new mass market for net zero energy retrofits across NWE.
www.nweurope.eu/projects/project-search/e-0-desirable-warm-affordable-homes-for-life
- **JPI Urban Europe:** Created in 2010 to address the global urban challenges of today with the ambition to develop a European research and innovation hub on urban matters and create European solutions by means of coordinated research.
www.jpi-urbaneurope.eu
- **Ministry of the Interior and Kingdom Relations, the Netherlands**
www.rijksoverheid.nl/ministeries/ministerie-van-binnenlandse-zaken-en-koninkrijksrelaties
- **MOBISTYLE:** Motivating end-users behavioural change by combined ICT based tools and modular information services on energy use, indoor environment, health and lifestyle.
www.mobistyle-project.eu
- **MORE-CONNECT:** Making step forwards by a combination of product innovation, process innovation and innovative market approach, in a process of cost and quality optimization, driven by motivated and innovation-driven SME's. It develops prefabricated, multifunctional renovation elements for the total building envelope (façade and roof) and installation/building services.
www.more-connect.eu/
- **P2ENDURE:** Promotes evidence-based innovative solutions for deep renovation based on prefabricated Plug-and-Play systems in combination with on-site robotic 3D-printing and Building Information Modelling (BIM), demonstrated and monitored at 10 real projects in 4 geo-clusters with EU-wide replication potentials.
www.p2endure-project.eu/en
- **PARENT:** PARticipatory platform for sustainable ENergy management. The aim of the project is to provide communities with the technology and support to help reduce energy consumption in their homes and to investigate ways in which communities can work towards more sustainable life styles.
www.parent-project.eu
- **ProGETone:** New solutions for more comfortable, efficient and seismic-safe homes
www.progetone.eu



- **TECNALIA RESEARCH & INNOVATION:** A private, independent, non-profit applied research centre of international excellence.
www.tecnalia.com
- **TranSition Zero:** An EU Horizon 2020-funded project, carried out by Energiesprong, to establish the right market conditions for the wide-scale introduction of net zero energy homes across Europe. It will build on the success of Energiesprong in the Netherlands and advance its implementation even further.
www.transition-zero.eu/
- **Urban Agenda for the EU:** A new multi-level working method promoting cooperation between Member States, cities, the European Commission and other stakeholders in order to stimulate growth, liveability and innovation in the cities of Europe and to identify and successfully tackle social challenges.
www.ec.europa.eu/futurium/en/urban-agenda
- **Urban Futures Studio:** The UFS of the Utrecht University, works at the intersection of science, art and policy.
www.uu.nl/en/research/urban-futures-studio
- **Urban Innovative Actions:** An Initiative of the European Union that provides urban areas throughout Europe with resources to test new and unproven solutions to address urban challenges.
www.uia-initiative.eu

Danish Publications Section:

- **District Energy, Energy efficiency for urban areas** | Think Denmark, White papers for a green transition | 2018
<https://stateofgreen.com/en/publications/district-energy/>
- **Energy Renovation of Buildings, Retrofitting Buildings for Costs, Comfort and Climate** | Think Denmark, White papers for a green transition | 2018
<https://stateofgreen.com/en/publications/energy-renovation-of-buildings/>
- **Wind energy moving ahead, How wind energy has changed the Danish energy System** | Think Denmark, White papers for a green transition | 2017
<https://stateofgreen.com/en/publications/wind-energy-moving-ahead-how-wind-energy-has-changed-the-danish-energy-system/>
- **Smart Buildings, Combining energy efficiency, flexibility and comfort** | Think Denmark, White papers for a green transition | 2015
<https://stateofgreen.com/en/publications/smart-buildings/>
- **From sustainable biomass to competitive bioenergy, Insights into Danish bioenergy solutions** | Think Denmark, White papers for a green transition | 2015
<https://stateofgreen.com/en/publications/smart-buildings/>